TANK LANDINGS CRUDE
(FOR H2S CALCULATIONS ONLY)

	Tank Numbers									
	117	118	119	120	121	114	115	31	32	39
Tank Diameter (ft)	110	100	80	80	150	120	150	125	125	125
Heel Height (ft)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Volume (ft3)	38,013	31,416	20,106	20,106	70,686	45,239	70,686	49,087	49,087	49,087
Volume (bbl)	6,771	5,596	3,581	3,581	12,590	8,058	12,590	8,743	8,743	8,743
Volume (gal)	284,377	235,023	150,414	150,414	528,801	338,432	528,801	367,223	367,223	367,223
Volume (liters)	1,076,368	889,560	569,319	569,319	2,001,511	1,280,967	2,001,511	1,389,938	1,389,938	1,389,938
Avg Temp (F) (T)	54.18	54.18	54.18	54.18	54.18	54.18	54.18	54.18	54.18	54.18
Avg Temp (K) (T)	285.47	285.47	285.47	285.47	285.47	285.47	285.47	285.47	285.47	285.47
temp corr	0.9568	0.9568	0.9568	0.9568	0.9568	0.9568	0.9568	0.9568	0.9568	0.9568
Moles	45,978	37,998	24,319	24,319	85,496	54,718	85,496	59,372	59,372	59,372
VP of VOC (psia)	12.61	12.61	12.61	12.61	12.61	12.61	12.61	12.61	12.61	12.61
VOC theo fraction	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Saturation Factor	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Moles VOC	23,665	19,558	12,517	12,517	44,004	28,163	44,004	30,559	30,559	30,559
Molecular weight (g/g-mole)	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
VOC (grams/landing)	1,183,230	977,876	625,841	625,841	2,200,221	1,408,141	2,200,221	1,527,931	1,527,931	1,527,931
VOC (lbs/landing)	2,608.53	2,156	1,380	1,380	4,851	3,104	4,851	3,368	3,368	3,368
Number of Landings per Yr	1	1	1	1	1	1	1	1	1	1
Average Days per Landing	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
VOC (lbs) Filling	2,609	2,156	1,380	1,380	4,851	3,104	4,851	3,368.45	3,368.45	3,368
VOC (lbs) Standing	793	655	419	419	1,475	944	1,475	1,024.01	1,024.01	1,024
Total VOC (lbs) (Lf + Ls)	3,402	2,811	1,799	1,799	6,325	4,048	6,325	4,392	4,392	4,392
Total VOC (tons)	1.70	1.41	0.90	0.90	3.16	2.02	3.16	2.20	2.20	2.20

NOTE: Landing emissions calculated using methodology from API Technical Report 2567 - Evaporative Loss from Storage Tank Floating Roof Lar

JULY AND OCTOBER SPECIATION FOR LANDINGS

JULY VAPOR FRACTION FOR LANDINGS***

	Gasoline	Distillate	Crude	Blendstock
	Average Vapor Wt%	Average Vapor Wt%	Average Vapor Wt%	Average Vapor Wt%
hexane	0.613%	0.039%	0.36%	5.673%
benzene	0.691%	0.194%	0.34%	0.523%
2,2,4 TMP	0.794%	0.000%	0.03%	0.541%
toluene	0.797%	2.294%	0.17%	0.581%
ethylbenzene	0.053%	0.308%	0.02%	0.051%
xylenes	0.230%	6.008%	0.07%	0.157%
naphthalene	0.0004%	0.048%	0.0001%	0.000%
cumene	0.0090%	0.000%	0.0000%	0.006%
methanol				

Speciation to use for Landing:

Blendstock*	Refined Product**
Vapor Wt%	Vapor Wt%
5.673%	0.613%
0.691%	0.691%
0.794%	0.794%
2.294%	2.294%
0.308%	0.308%
6.008%	6.008%
0.048%	0.048%
0.009%	0.009%

OCTOBER VAPOR FRACTION FOR LANDING***

	Gasoline	Distillate	Crude	Blendstock
	Average Vapor Wt%	Average Vapor Wt%	Average Vapor Wt%	Average Vapor Wt%
hexane	0.367%	0.045%	0.29%	4.758%
benzene	0.398%	0.219%	0.26%	0.422%
2,2,4 TMP	0.446%	0.000%	0.02%	0.426%
toluene	0.425%	2.401%	0.12%	0.435%
ethylbenzene	0.026%	0.296%	0.01%	0.035%
xylenes	0.112%	5.728%	0.04%	0.107%
naphthalene	0.0002%	0.036%	0.00003%	0.000%
cumene	0.0041%	0.000%	0.00000%	0.004%
methanol				

Speciation to use for Landing:

Blendstock*	Refined Product**
Vapor Wt%	Vapor Wt%
4.758%	0.367%
0.422%	0.398%
0.446%	0.446%
2.401%	2.401%
0.296%	0.296%
5.728%	5.728%
0.036%	0.036%
0.004%	0.004%

* Blendstock is based on worst case of gasoline, distillate, and blendstock.

** Refined product is based on worst case of gasoline and distillate.

*** Vapor Fraction is calculated based on speciation calculated for specific month in this location (see the following tabs in Tank PTE spreadsheet: Gasoline Monthly Speciation, Blendstock Monthly Speciation, Distillate Monthly Speciation, and Crude Monthly Speciation).

	Total VOCs (lb/yr	Total VOCs (ton/yr	Ethanol (lb/yr	Ethanol (ton/yr)
TANK SUMMARY FOR IFR TANKS IN ETHANOL SERVICE				
Routine Emissions, All Tanks	11,012	5.5	8,073	4.0
Tank Landings, All Tanks	44,325	22	27,991	14.0
Total of Routine Emissions and Tank Landings, All Tanks	55,337	27.7	36,064	18.0
LOADING SUMMARY FOR ETHANOL LOADING				
Truck Loading, Ethanol	14,674	7.34	8,779	4.39
Rail Loading, Ethanol	5007	2.50	2,995	1.50
Marine Loading, Ethanol	6,159	3.08	3,684	1.84
TOTAL LOADING AND TANK EMISSIONS WITH FACILITY IN ETHANOL SERVICE	81,177	41	51,522	26

SUMMARY OF TANK ROUTINE EMISSIONS - TOTAL VOCS IN ETHANOL SERVICE			SUMMARY PER MONTH											
Tank ID	Total		January	February	March	April	May	June	July	August	September	October	November	December
ROUTINE EMISSIONS	lb/yr	ton/yr	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month
IFR Tanks														
117														
Standing	344.43	0.17	10.30	11.43	15.87	24.69	34.94	47.34	53.41	50.93	38.98	25.81	18.26	12.47
Working	312.83	0.16	26.07	26.07	26.07	26.07	26.07	26.07	26.07	26.07	26.07	26.07	26.07	26.07
118														
Standing	726.57	0.36	21.73	24.11	33.47	52.07	73.70	99.86	112.68	107.44	82.24	54.44	38.51	26.31
Working	278.56	0.14	23.21	23.21	23.21	23.21	23.21	23.21	23.21	23.21	23.21	23.21	23.21	23.21
119														
Standing	820.77	0.41	24.54	27.24	37.81	58.83	83.26	112.81	127.29	121.37	92.90	61.50	43.50	29.73
Working	224.88	0.11	18.74	18.74	18.74	18.74	18.74	18.74	18.74	18.74	18.74	18.74	18.74	18.74
120														
Standing	513.17	0.26	15.34	17.03	23.64	36.78	52.06	70.53	79.58	75.88	58.08	38.45	27.20	18.59
Working	224.36	0.11	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70
121														
Standing	1331.86	0.67	39.83	44.20	61.36	95.46	135.11	183.05	206.55	196.94	150.75	99.79	70.59	48.24
Working	426.95	0.21	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58	35.58
114														
Standing	479.00	0.24	14.32	15.90	22.07	34.33	48.59	65.83	74.29	70.83	54.22	35.89	25.39	17.35
Working	395.97	0.20	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
115														
Standing	784.36	0.39	22.27	25.15	35.59	56.65	81.18	110.49	124.71	117.26	88.04	56.89	39.39	26.74
Working	471.88	0.24	39.32	39.32	39.32	39.32	39.32	39.32	39.32	39.32	39.32	39.32	39.32	39.32
31														
Standing	906.47	0.45	27.11	30.08	41.76	64.97	91.95	124.59	140.58	134.04	102.60	67.92	48.05	32.83
Working	415.10	0.21	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59
32														
Standing	906.47	0.45	27.11	30.08	41.76	64.97	91.95	124.59	140.58	134.04	102.60	67.92	48.05	32.83
Working	415.10	0.21	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59	34.59
39														
Standing	724.89	0.36	20.58	23.25	32.89	52.36	75.03	102.11	115.25	108.37	81.37	52.57	36.40	24.71
Working	308.43	0.15	25.70	25.70	25.70	25.70	25.70	25.70	25.70	25.70	25.70	25.70	25.70	25.70

SUMMARY OF TANK ROUTINE EMISSIONS - ETHANOL SERVICE - ETHANOL EMISSIONS ONLY			SUMMARY PER MONTH											
Tank ID	Total		January	February	March	April	May	June	July	August	September	October	November	December
ROUTINE EMISSIONS	lb/yr	ton/yr	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month	lb/month
IFR Tanks														
117														
Standing	214.36	0.11	5.43	6.13	8.94	14.80	21.92	30.82	35.27	33.44	24.79	15.56	10.49	6.78
Working	303.45	0.15	25.29	25.29	25.29	25.29	25.29	25.29	25.29	25.29	25.29	25.29	25.29	25.29
118														
Standing	452.20	0.23	11.46	12.93	18.86	31.22	46.23	65.01	74.39	70.54	52.30	32.83	22.14	14.30
Working	270.21	0.14	22.52	22.52	22.52	22.52	22.52	22.52	22.52	22.52	22.52	22.52	22.52	22.52
119														
Standing	510.83	0.26	12.95	14.61	21.30	35.26	52.23	73.44	84.04	79.69	59.08	37.08	25.01	16.15
Working	218.13	0.11	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18
120														
Standing	319.38	0.16	8.10	9.13	13.32	22.05	32.65	45.91	52.54	49.82	36.94	23.19	15.64	10.10
Working	217.63	0.11	18.14	18.14	18.14	18.14	18.14	18.14	18.14	18.14	18.14	18.14	18.14	18.14
121														
Standing	828.93	0.41	21.01	23.70	34.57	57.22	84.75	119.16	136.37	129.31	95.86	60.18	40.58	26.21
Working	414.14	0.21	34.51	34.51	34.51	34.51	34.51	34.51	34.51	34.51	34.51	34.51	34.51	34.51
114														
Standing	298.12	0.15	7.56	8.52	12.43	20.58	30.48	42.86	49.04	46.51	34.48	21.64	14.59	9.43
Working	384.09	0.19	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01	32.01
115														
Standing	494.40	0.25	11.82	13.60	20.27	34.41	51.63	72.90	83.41	77.89	56.55	34.57	22.76	14.60
Working	457.72	0.23	38.14	38.14	38.14	38.14	38.14	38.14	38.14	38.14	38.14	38.14	38.14	38.14
31														
Standing	564.17	0.28	14.30	16.13	23.53	38.95	57.68	81.10	92.81	88.01	65.24	40.96	27.62	17.84
Working	402.65	0.20	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55
32														
Standing	564.17	0.28	14.30	16.13	23.53	38.95	57.68	81.10	92.81	88.01	65.24	40.96	27.62	17.84
Working	402.65	0.20	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55	33.55
39														
Standing	456.92	0.23	10.92	12.57	18.73	31.80	47.72	67.37	77.09	71.99	52.26	31.95	21.03	13.49
Working	299.17	0.15	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93

LANDING EMISSIONS IN ETHANOL SERVICE[1]		
Tank ID	Total VOCs (lb/yr	Ethanol (lb/yr)
IFR Tanks		
117	4357.25	2752.18
118	2951.67	1864.37
119	2304.66	1455.70
120	2304.66	1455.70
121	8102.33	5117.68
114	2592.75	1711.77
115	8102.33	5117.68
31	2584.67	1632.55
32	2584.67	1632.55
39	8439.93	5250.50

[1] = Ethanol emissions are based on speciation for July and October, see Ethanol Monthly Speciation

SUMMARY OF TANK HAP EMISSIONS										
Tank ID	Total HAPS	hexane	benzene	2,2,4 TMP	toluene	ethylbenzene	xylenes	naphthalene	cumene	methanol
	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr
ROUTINE HAP EMISSIONS										
IFR Tanks										
117	408.1	247.29	29.52	35.60	50.49	8.59	34.98	1.58	1.95	6.08
118	741.3	506.63	52.17	58.36	73.25	10.23	39.16	1.48	2.08	12.13
119	819.0	572.43	57.09	63.06	76.92	10.23	37.95	1.35	2.00	13.54
120	166.6	25.65	29.96	36.23	43.58	5.48	24.79	0.92	1.27	8.62
121	1459.7	1006.72	101.60	113.80	141.58	19.74	73.47	2.76	3.97	22.08
114	662.4	414.86	47.19	56.35	77.90	12.88	50.94	2.24	2.86	9.08
115	923.8	605.06	65.80	75.79	99.98	15.16	59.60	2.44	3.23	13.37
31	298.8	45.55	53.33	64.68	78.32	9.99	45.19	1.71	2.32	15.25
32	298.9	45.56	53.35	64.68	78.36	10.00	45.24	1.71	2.32	15.25
39	234.5	36.05	42.23	51.13	61.47	7.67	34.64	1.27	1.76	12.12
130	151.1	30.07	33.27	37.81	37.10	2.39	10.47	0.03	0.41	0.00
SubTotal	6164.11	3535.86	565.51	657.49	818.95	112.36	456.43	17.50	24.16	127.51
FRT Tanks										
28	253.33	1.17	5.77	0.00	66.64	8.72	169.76	1.28	0.00	707.57
29	253.33	1.17	5.77	0.00	66.64	8.72	169.76	1.28	0.00	707.57
64	203.10	0.96	4.73	0.00	53.99	6.96	135.47	0.98	0.00	568.76
33	252.29	1.16	5.74	0.00	66.37	8.68	169.06	1.28	0.00	2198.32
30	253.33	1.17	5.77	0.00	66.64	8.72	169.76	1.28	0.00	2208.67
SubTotal	1215.37	5.62	27.78	0.00	320.29	41.79	813.80	6.10	0.00	6390.88
Horizontal Tanks										
A-1	54.39	0.00	0.00	0.00	0.00	13.87	40.51	0.00	0.00	0.00
A-4	36.33	0.00	0.00	0.00	0.00	9.27	27.06	0.00	0.00	0.00
A-5	4.56	0.00	0.00	0.00	0.00	1.16	3.40	0.00	0.00	0.00
A-6	2.29	0.00	0.00	0.00	0.00	0.58	1.70	0.00	0.00	0.00
A-7	36.36	0.00	0.00	0.00	0.00	9.27	27.08	0.00	0.00	0.00
A-Generic	36.33	0.00	0.00	0.00	0.00	9.27	27.06	0.00	0.00	0.00
A-Exxon	18.03	0.00	0.00	0.00	0.00	4.60	13.43	0.00	0.00	0.00
SA	36.33	0.00	0.00	0.00	0.00	9.27	27.06	0.00	0.00	0.00
A-Red Dye	1.29	0.00	0.00	0.00	0.00	0.33	0.96	0.00	0.00	0.00
A-Red Dye 2	2.93	0.00	0.00	0.00	0.00	0.75	2.18	0.00	0.00	0.00
WHFO	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
W-3	31.65	0.00	0.00	0.00	0.00	8.07	23.58	0.00	0.00	0.00
D-Fire Pump	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
R-Fire Pump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GAFO	0.07	0.01	0.00	0.00	0.03	0.01	0.02	0.00	0.00	0.00
SubTotal	260.57	0.01	0.00	0.00	0.04	66.45	194.07	0.00	0.00	0.00
TOTAL ROUTINE HAPS	7640.05	3541.49	593.29	657.49	1139.28	220.60	1464.30	23.60	24.16	6518.39
LANDING PTE HAP EMISSIONS (LB/YR)										
Tank ID	Total HAPS	hexane	benzene	2,2,4 TMP	toluene	ethylbenzene	xylenes	naphthalene	cumene	methanol
IFR Tanks										
117	651.49	227.26	24.26	27.03	102.30	13.15	255.68	1.82	0.29	-
118	441.33	153.95	16.43	18.31	69.30	8.91	173.20	1.24	0.19	-
119	344.59	120.20	12.83	14.29	54.11	6.95	135.23	0.96	0.15	-
120	235.40	11.29	12.55	14.29	54.11	6.95	135.23	0.96	0.15	-
121	1211.45	422.59	45.11	50.25	190.22	24.45	475.43	3.39	0.53	-
114	410.08	147.09	17.92	20.59	59.49	7.98	155.76	1.24	0.23	-
115	1211.45	422.59	45.11	50.25	190.22	24.45	475.43	3.39	0.53	-
31	263.99	12.66	14.08	16.03	60.68	7.80	151.66	1.08	0.17	-
32	263.99	12.66	14.08	16.03	60.68	7.80	151.66	1.08	0.17	-
39	846.80	37.87	41.85	47.45	199.65	25.29	491.31	3.37	0.49	-
Total LANDING HAPS	5880.55	1568.17	244.22	274.54	1040.76	133.73	2600.60	18.53	2.91	0.00
TOTAL TANK PTE										
	Total HAPS	hexane	benzene	2,2,4 TMP	toluene	ethylbenzene	xylenes	naphthalene	cumene	methanol
Total (lb/yr)	**13,521**	**5,110**	**838**	**932**	**2,180**	**354**	**4,065**	**42**	**27**	**6,518**
Total (tpy)	6.76	2.55	0.42	0.47	1.09	0.18	2.03	0.02	0.01	3.26
Total (lb/hr)	1.54	0.58	0.10	0.11	0.25	0.04	0.46	0.00	0.00	0.74

RACK THROUGHPUTS

	Stored	Rack Loaded	Rail Loaded	Ship/Barge Loaded	
Gasoline	1,548,300,000	879,300,000	300,000,000	369,000,000	gal
Blendstock	380,000,000			380,000,000	
Crude	450,000,000			450,000,000	gal
Facility Total	2,378,300,000	879,300,000	300,000,000	1,199,000,000	gal

TANK THROUGHPUTS

Floating Roof
Material: Refined Product
Total Permitted Storage: **1,929,000,000** **gal/yr**

ID	Type	Tank Volume (gal)	Throughput (gal/yr)	Diameter	Tank Height or Length
117	IFR	2,743,229	160,152,189	110	48
118	IFR	2,220,637	129,642,796	100	48
119	IFR	1,434,161	83,727,616	80	48
120	IFR	1,430,858	83,534,784	80	48
121	IFR	5,105,286	298,051,213	150	48
114	IFR	3,787,905	221,141,319	120	48
115	IFR	5,642,527	329,415,828	150	48
31	IFR	3,801,825	221,953,981	125	45
32	IFR	3,801,825	221,953,981	125	45
39	IFR	3,073,373	179,426,294	125	45
	Total	33,041,626	1,929,000,000		

Floating Roof
Material: Blendstock
Total Permitted Storage: **506,540,000** **gal/yr**

ID	Type	Tank Volume (gal)	Throughput (gal/yr)	Diameter	Tank Height or Length
117	IFR	2,743,229	42,180,000	110	48
118	IFR	2,220,637	42,180,000	100	48
119	IFR	1,434,161	42,180,000	80	48
121	IFR	5,105,286	190,000,000	150	48
114	IFR	3,787,905	95,000,000	120	48
115	IFR	5,642,527	95,000,000	150	48
	Total		506,540,000		

Floating Roof
Material: Crude
Total Permitted Storage: **495,000,000** **gal/yr** (includes tank-to-tank transfers)

ID	Type	Tank Volume (gal)	Throughput (gal/yr)	Diameter	Tank Height or Length
117	IFR	2,743,229	41,096,596	110	48
118	IFR	2,220,637	33,267,591	100	48
119	IFR	1,434,161	21,485,314	80	48
120	IFR	1,430,858	21,435,831	80	48
121	IFR	5,105,286	76,482,815	150	48
114	IFR	3,787,905	56,746,995	120	48
115	IFR	5,642,527	84,531,278	150	48
31	IFR	3,801,825	56,955,532	125	45
32	IFR	3,801,825	56,955,532	125	45
39	IFR	3,073,373	46,042,517	125	45
	Total	33,041,626	495,000,000		

Floating Roof
Material: Distillate
Total Throughput through IFRs **1,529,000,000** **gal/yr**

ID	Type	Tank Volume (gal)	Calculated Throughput (gal/yr)	Diameter	Tank Height or Length
117	IFR	2,743,229	126,942,819	110	48
118	IFR	2,220,637	102,759,894	100	48
119	IFR	1,434,161	66,365,746	80	48
120	IFR	1,430,858	66,212,900	80	48
121	IFR	5,105,286	236,246,918	150	48
114	IFR	3,787,905	175,285,161	120	48
115	IFR	5,642,527	261,107,725	150	48
31	IFR	3,801,825	175,929,309	125	45
32	IFR	3,801,825	175,929,309	125	45
39	IFR	3,073,373	142,220,220	125	45
	Total	**33,041,626**			

Fixed Roof
Material: Distillate
Total Throughput through VFRs **400,000,000** **gal/yr**

ID	Type	Tank Volume (gal)	Calculated Throughput (gal/yr)	Diameter	Tank Height or Length
28	FRT	3,829,140	80,699,334	125	45
29	FRT	3,829,140	80,699,334	125	45
64	FRT	3,690,540	77,778,331	125	45
33	FRT	3,801,825	80,123,668	125	45
30	FRT	3,829,140	80,699,334	125	45
	Total	**18,979,785**	400,000,000		

Horizontal Tank
Material:
Permitted Material Throughput: **NA** gallons/yr

ID	Type	Tank Volume (gal)	Calculated Throughput * (gal/yr)	Diameter	Tank Height or Length
A-1	HT	10,800	129,600	10.5	18.5
A-4	HT	7,200	86,400	8	21.3
A-5	HT	900	10,800	4	10.8
A-6	HT	450	5,400	4	5.4
A-7	HT	7,221	86,652	8	21.3
A-Generic	HT	7,200	86,400	8	21.3
A-Exxon	HT	3,600	43,200	8	10.5
SA	HT	7,200	86,400	8	21.3
A-Red Dye	HT	248	2,976	3.2	5.0
A-Red Dye 2	HT	450	5,400	5	5.5
WHFO	HT	250	3,000	4	2.7
W-3	HT	6,300	75,600	8	18.5
D-Fire Pump	HT	250	3,000	4	2.7
R-Fire Pump	HT	125	1,500	2.5	4.1
GAFO	HT	900	10,800	4	9.6
	Total =	**53,094**	637,128		

*assume 12 turnovers per year.

Floating Roof - PCW Tank
Material:

ID	Type	Tank Volume (gal)	Calculated Throughput (gal/yr)	Diameter	Tank Height or Length
130	IFR	1,449,252	1,449,252	75	48
	Total	**1,449,252**			

TRUCK LOADING OF REFINED PRODUCT - 2 MG/L WITH VAC ASSIST

Refined Product Throughput at the Rack (MM gal)	**879.3**
VRU Emission Rating (mg/liter)	**2**
(VRU Emission Rating is guaranteed by the manufacturer of the VRU and verified with a Performance Stack Test every 5 years.)	
Tank-Truck Loss Factor (mg/liter)*	**0**
Overall Emission Rate (mg/liter)**	**2**

Total VOCs Emission Calculation (No fugitives included given presence of assist at truck loading rack):

Emissions (lbs), Total VOCs = Refined Product Throughput at Rack (gallons) * 3.785 liters/gallon * Overall Emission Rate (mg/liter) * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = 879,300,000 gal * 3.785 L/gal * 2 mg/L * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs =	**14674.5**
Emissions (tons), Total VOCs =	**7.3**

* Tank-truck Loss Factor is 0 mg/L as a result of a Vacuum Assist System installed at the Truck Loading Rack.

** Overall Emission Rate is the sum of the VRU Emission Rating and the Tank Truck Loss Factor.

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

Distillate Throughput at the Rack (MM gal) **DISTILLATE TRUCK LOADING IS ACCOUNTED FOR UNDER THE REFINED PRODUCT TRUCK LOADING**

Uncontrolled Loading Emission Factor (mg/l)

(AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Table 5.2-5.)

Distillate Loading Rack Loss (lb/year)

Total VOCs Emission Calculation:

Emissions (lbs), Total VOCs = Distillate Throughput at Rack (gallons) * 3.785 liters/gallon * Overall Emission Rate (mg/liter) * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = 175,900,000 gal * 3.785 L/gal * 10 mg/L * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = **DISTILLATE TRUCK LOADING IS ACCOUNTED FOR UNDER THE REFINED PRODUCT TRUCK LOADING**

* Overall Emission Rate is the sum of the VRU Emission Rating and the Tank Truck Loss Factor.

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

TRUCK LOADING OF BIODIESEL

FOR METHANOL EMISSIONS CALCULATION ONLY

Refined Product Throughput at the Rack (M	**879.3**
Emission Factor (lb/1000 gallons)*	**0.00255**
Emission Factor (mg/l)	**0.31**
Tank-Truck Loss Factor (mg/liter)	**0**
Overall Emission Rate (mg/liter)**	**0.31**

Total VOCs Emission Calculation (No fugitives included given presence of assist at truck loading rack):

Emissions (lbs), Total VOCs = Refined Product Throughput at Rack (gallons) * 3.785 liters/gallon * Overall Emission Rate (mg/liter) * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = 879,300,000 gal * 3.785 L/gal * 0.32 mg/L * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs =	**2241.9**
Emissions (tons), Total VOCs =	**1.1**

* Emission Factor Calculation, from AP-42 Chapter 5, Equation 1

Loading loss (lb/1000 gallons) = 12.46 * Saturation Factor * True Vapor Pressure of Liquid in psia * Vapor Molecular Weight (lb/lb-mole)/ Temperature of bulk liquid loaded, °R

Loading loss (lb/1000 gallons) = 12.46 * 0.6 * 0.0054 psia * 32.1 lb/lb-mole/ 508.22 °R = 0.00255 lb/1000 gallons

Saturation Factor is from AP-42 Section 5.2 Table 5.2-1 for submerged loading of a tank truck under dedicated normal service.

True vapor pressure is based on conservative estimate of fuel oil no. 2.

Temperature is based on average ambient temperature in Albany, NY (508.2°R based on AP-42 Section 7.1 Table 7.1-7).

** Overall Emission Rate is the sum of the Emission Factor and the Tank Truck Loss Factor.

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

RAIL LOADING OF REFINED PRODUCT - 2 MG/L WITH VAC ASSIST

Refined Product Throughput at the Rack (MM gal)	**300.0**
VRU Emission Rating (mg/liter)	**2**
(VRU Emission Rating is guaranteed by the manufacturer of the VRU and verified with a Performance Stack Test every 5 years.)	
Tank-Truck Loss Factor (mg/liter)*	**-**
Overall Emission Rate (mg/liter)**	**2**

Total VOCs Emission Calculation:

Emissions (lbs), Total VOCs = Refined Product Throughput at Rack (gallons) * 3.785 liters/gallon * Overall Emission Rate (mg/liter) * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = 300,000,000 gal * 3.785 L/gal * 2 mg/L * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs =	**5006.6**
Emissions (tons), Total VOCs =	**2.5**

* Tank-truck Loss Factor is 0 mg/L as a result of a Vacuum Assist System installed at the Truck Loading Rack.

** Overall Emission Rate is the sum of the VRU Emission Rating and the Tank Truck Loss Factor.

Emission Factor = 6.323389515 lb/1000 gal Emissions =(Emission Factor * Throughput * 10 1,897,016.85 lb

948.51 tons

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

Distillate Throughput at the Rail (MM gal) **DISTILLATE RAIL LOADING IS ACCOUNTED FOR UNDER THE REFINED PRODUCT RAIL LOADING**

Uncontrolled Bottom Loading Emission Factor (mg/l)
(AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Section 5.2, Table 5.2-5.)

Distillate Loading Rack Loss (lb/year)

Total VOCs Emission Calculation:

Emissions (lbs), Total VOCs = Distillate Throughput at Rack (gallons) * 3.785 liters/gallon * Overall Emission Rate (mg/liter) * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = **DISTILLATE RAIL LOADING IS ACCOUNTED FOR UNDER THE REFINED PRODUCT RAIL LOADING**

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

RAIL LOADING OF BIODIESEL

FOR METHANOL EMISSIONS CALCULATION ONLY

Refined Product Throughput at the Rack (MM ga	**300.0**
Emission Factor (lb/1000 gallons)*	**0.00255**
Emission Factor (mg/l)	**0.31**
Tank-Truck Loss Factor (mg/liter)	**0**
Overall Emission Rate (mg/liter)**	**0.306**

Total VOCs Emission Calculation (No fugitives included given presence of assist at truck loading rack):

Emissions (lbs), Total VOCs = Refined Product Throughput at Rack (gallons) * 3.785 liters/gallon * Overall Emission Rate (mg/liter) * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs = 300,000,000 gal * 3.785 L/gal * 0.32 mg/L * 2.2046 lbs/Kg * 1 Kg / 1,000,000 mg

Emissions (lbs), Total VOCs =	**764.9**
Emissions (tons), Total VOCs =	**0.4**

* Emission Factor Calculation, from AP-42 Chapter 5, Equation 1

Loading loss (lb/1000 gallons) = 12.46 * Saturation Factor * True Vapor Pressure of Liquid in psia * Vapor Molecular Weight (lb/lb-mole)/ Temperature of bulk liquid loaded, °R

Loading loss (lb/1000 gallons) = 12.46 * 0.6 * 0.0054 psia * 32.1 lb/lb-mole/ 508.22 °R = 0.00255 lb/1000 gallons

Saturation Factor is from AP-42 Section 5.2 Table 5.2-1 for submerged loading of a rail tank car under dedicated normal service.

True vapor pressure is based on conservative estimate of fuel oil no. 2.

Temperature is based on average ambient temperature in Albany, NY (508.2°R based on AP-42 Section 7.1 Table 7.1-7).

** Overall Emission Rate is the sum of the Emission Factor and the Tank Truck Loss Factor.

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

EMISSIONS FROM MARINE LOADING OF REFINED PRODUCT (AS GASOLINE):

ALTERNATIVE OPERATING SCENARIO (OS#1) - MARINE LOADING AT 2 MG/L WITH VAC ASSIST

Throughput: 369 Mmgal

For combustion emissions assumed 900 Mmgal of throughput
Loading rack emissions (pounds) for combustion calcs: 3,510,000

Control Device Emission Rate: 2 mg/L equal to: 0.0167 lbs/1000 gallons

Loading into an Uncleaned Barge:

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Loading Rack Emissions (lb/yr)	0% Remaining after 100% goes to VCU	100% to VCU	2 mg/L from VCU	Total Emissions (lbs)	Total Emissions (tons)
3.9000	369	1,439,100	0	1,439,100	6,159	6,159	3.08

* Emission Factor from Section 5.2 Table 5.2-2 in AP-42 for an Uncleaned Barge previously loaded with a Volatile Liquid

Max Emissions Per Hour:

25,000 barrels / hr
1,050,000 gal / hr

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Loading Rack Emissions (lb/hr)	0% Remaining after 100% goes to VCU	100% to VCU	2 mg/L from VCU	Total Emissions (lbs/hr)	Total Emissions (tons/hr)
3.9000	1.05	4095	0	4095	18	18	0.01

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

EMISSIONS FROM MARINE LOADING OF BLENDSTOCK

ALTERNATIVE OPERATING SCENARIO (OS#1) - MARINE LOADING AT 2 MG/L WITH VAC ASSIST

Throughput: 380 Mmgal

Control Device Emission Rate: 2 mg/L equal to: 0.0167 lbs/1000 gallons

Loading into an Uncleaned Barge:

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Loading Rack Emissions (lb/yr)	0% Remaining after 100% goes to VCU	100% to VCU	2 mg/L from VCU	Total Emissions (lbs)	Total Emissions (tons)
3.9000	380	1,482,000	0	1,482,000	6,343	6,343	3.17

* Emission Factor from Section 5.2 Table 5.2-2 in AP-42 for an Uncleaned Barge previously loaded with a Volatile Liquid

Max Emissions Per Hour:

25,000 barrels / hr
1,050,000 gal / hr

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Loading Rack Emissions (lb/hr)	0% Remaining after 100% goes to VCU	100% to VCU	2 mg/L from VCU	Total Emissions (lbs/hr)	Total Emissions (tons/hr)
3.9000	1.05	4095	0	4095	18	18	0.01

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

EMISSIONS FROM MARINE LOADING OF BIODIESEL

FOR METHANOL EMISSIONS CALCULATION ONLY

Throughput: 369 Mmgal

Loading into a Submerged Barge:

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Uncontrolled Emissions (lb/yr)
0.0021	369	784

Max Emissions Per Hour:

25,000 barrels / hr

1,050,000 gal / hr

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Uncontrolled Emissions (lb/yr)
0.0021	1.05	2

* Emission Factor Calculation, from AP-42 Section 5.1, Equation 1

Loading loss (lb/1000 gallons) = 12.46 * Saturation Factor * True Vapor Pressure of Liquid in psia * Vapor Molecular Weight (lb/lb-mole)/ Temperature of bulk liquid loaded, °R

Loading loss (lb/1000 gallons) = 12.46 * 0.5 * 0.0054 psia * 32.1 lb/lb-mole/ 508.22 °R = 0.0021 lb/1000 gallons

Saturation Factor is from AP-42 Section 5.2 Table 5.2-1 for submerged loading of a barge. True vapor pressure is based on conservative estimate of fuel oil no. 2. Temperature is based on average ambient temperature in Albany, NY (508.22°R based on AP-42 Section 7.1 Table 7.1-7).

EMISSIONS FROM MARINE LOADING OF CRUDE OIL:

ALTERNATIVE OPERATING SCENARIO (CRD#1) - MARINE LOADING AT 2 MG/L WITH VAC ASSIST

Throughput: 450 Mmgal

Control Device Emission Rate: 2 mg/L equal to: 0.0167 lbs/1000 gallons

Loading into an Uncleaned Barge:

Emission Factor* (lb/1000 gal)	Throughput (Mmgal)	Loading Rack Emissions (lb/yr)	0% Remaining after 100% goes to VCU	100% to VCU	2 mg/L from VCU	Total Emissions (lbs)	Total Emissions (tons)
1.7975	450	808,865	0	808,865	7,511	7,511	3.76

* Emission Factor calculated below, per AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Section 5.2, Equation 2.

Max Emissions Per Hour:

25,000 barrels / hr
1,050,000 gal / hr

Emission Factor CL (lb/1000 gal)	Throughput (Mmgal)	Loading Rack Emissions (lb/hr)	0% Remaining after 100% goes to VCU	100% to VCU	2 mg/L from VCU	Total Emissions (lbs/hr)	Total Emissions (tons/hr)
1.7975	1.05	1887	0	1887	18	18	0.01

Emission Factor Calculation from AP-42:

CL	=	Ca	+	Cg
1.7975		0.86		0.94

Cg Formula Inputs:

Vapor Pressure	12.5	(from Global data)
Molecular Weight	50	(from AP-42 Section 7.1 Table 7.1-2)
Vapor Growth Factor	1.02	(from AP-42 Section 5.2)
Temperature *R	508.5	(from AP-42 Section 7.1)

The temperature used in the Emission Factor calculation was updated for Albany, NY for latest AP-42 (June 2020).

The calculated crude emission factor is lower than the gasoline emission factor of 3.9 lb/1000 gallons.

where:

CL = Total loading loss, lb/1,000 gal of crude oil loaded.

Ca = Arrival emission factor (from Section 5.2 Table 5.2-3), contributed by vapors in the empty compartment before loading, lb/1,000 gal of crude oil loaded.

Cg = Calculated emission factor (from Section 5.2 Equation 3), contributed by evaporation during loading, lb/1,000 gal loaded.

CRUDE ALTERNATIVE SCENARIO CRD#2 ASSUMES SAME RATIOS AS GASOLINE SCENARIO TO BE CONSERVATIVE.

NOTE: Loading emission calculations were performed in accordance with guidance in AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. Section 5.2

Total Blendstock and Refined Prod **1,928,300,000**
Blendstock Loading, gal/yr **380,000,000**
Refined Product Loading, gal/yr * **1,548,300,000**
Crude Loading, gal/yr **450,000,000**

	Refined Product Loading***			Blendstock Loading****	Total of Blendstock and Refined Product Loading	Crude Loading*****	Total	
	Truck	Rail	Marine	Marine		Marine	lb/yr	Tons/yr
Total VOC lb/yr	14,674	5,007	6,159	6,343	32,183	7,511	39,693	19.85
hexane	62	21	26	300	408	21	430	0.21
benzene	67	23	28	29	148	19	167	0.08
2,2,4-TMP	76	26	32	33	166	2	168	0.08
toluene	352	120	148	152	772	9	781	0.39
ethylbenzene	43	15	18	19	94	1	95	0.05
xylenes	833	284	350	360	1,827	3	1,830	0.92
Naphthalene	5	2	2	2	12	0	12	0.01
Cumene	0.7	0	0	0.3	2	0	1.6	0.00
Methanol**	2,242	765	784	0	3,791	0	3,791	1.90
Total HAP Species	3,681	1,256	1,388	895	7,220	56	7,275	3.64
Non Hap VOC	10,994	3,751	4,771	5,447	24,963	7,455	32,418	16.21

* Distillate Loading Emissions are captured in Refined Product Loading.

** Biodiesel Only

*** Assumes worst case refined product speciation, see Loading Speciation Tab, methanol is calculated separately for biodiesel and added to refined product loading.

**** Assumes worst case of refined product and blendstock speciation, see Loading Speciation Tab

***** Assumes speciation for crude, see Loading Speciation Tab.

Refined Product loading is calculated at the allowable mg/L limit of the control device and includes the entire allowable refined product throughput at each rack. Blendstock marine loading is included as a subcap under the refined loading cap and emissions are the same as gasoline loading since it is the mg/L of the control device with no fugitives.

HAP	LIQUID WEIGHT FRACTION[3]						
	Blendstock[2]	Gasoline	Distillate	Biodiesel	Crude	Ethanol	Additive
hexane	13.60%	1.00%	0.0001%	0.00%	0.40%	0.03%	
benzene	2.00%	1.80%	0.0008%	0.00%	0.60%	0.05%	
2,2,4 TMP	4.00%	4.00%	0.00%	0.00%	0.10%	0.12%	
toluene	7.50%	7.00%	0.032%	0.00%	1.00%	0.21%	
ethylbenzene	2.00%	1.40%	0.013%	0.00%	0.40%	0.04%	23.00%
xylenes	7.00%	7.00%	0.29%	0.00%	1.40%	0.21%	77.00%
naphthalene	0.42%	0.42%	0.076%	0.00%	0.04%	0.01%	
cumene	0.50%	0.50%	0.00%	0.00%	0.00%	0.00%	
methanol[1]	0.00%	0.00%	0.00%	0.20%	0.00%	0.00%	
Ethanol	0.00%	0.00%	0.00%	0.00%	0.00%	97.00%	

HAP	VAPOR FRACTION FOR LOADING[4]							
	Blendstock[2]	Refined Product[5]	Gasoline	Distillate	Biodiesel	Crude	Ethanol	Additive
hexane	4.73%	0.42%	0.42%	0.05%	0.00%	0.28%	0.06%	
benzene	0.46%	0.46%	0.46%	0.22%	0.00%	0.26%	0.06%	
2,2,4 TMP	0.52%	0.52%	0.52%	0.00%	0.00%	0.02%	0.07%	
toluene	2.40%	2.40%	0.50%	2.40%	0.00%	0.12%	0.07%	
ethylbenzene	0.29%	0.29%	0.03%	0.29%	0.00%	0.01%	0.00%	23.00%
xylenes	5.68%	5.68%	0.13%	5.68%	0.00%	0.04%	0.02%	77.00%
naphthalene	0.036%	0.04%	0.0002%	0.04%	0.00%	0.00003%	0.00%	
cumene	0.005%	0.005%	0.005%	0.00%	0.00%	0.00%	0.00%	
methanol[1]	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	
Ethanol	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	59.82%	

[1] = Biofuels only

[2] = Blendstock is based on worst case of gasoline, distillate, and blendstock. API PUBL 4723, 2002 Edition, November 2002 - Refinery Stream Speciation is used as the source for blendstock.

[3] = Source of liquid weight fraction data for Gasoline, Distillate and Crude is API 19.4. Biodiesel speciation is based on ASTM Standard D6751 requirement for methanol in biodiesel to be less than 0.2%. Liquid weight fractions are used to calculate HAP speciation for tanks based on AP-42 Chapter 7 (see individual tank pages).

[4] = Vapor Fraction is calculated based on average speciation calculated for a year in this location (see the following pages in PTE: Gasoline Monthly Speciation, Blendstock Monthly Speciation, Distillate Monthly Speciation, Crude Monthly Speciation, and Ethanol Monthly Speciation).

[5] = Refined product is based on worst case of gasoline and distillate. Biodiesel methanol emissions are calculated separately.

Fugitive VOC Emissions

Existing Count*				Light	Heavy	Gas				
Light	Heavy	Gas		Factor (lbs/hr)	Factor (lbs/hr)	Factor (lbs/hr)	Lbs/Hr	Lbs/Year	lb/day	tpy
1,297	243	238	Valves	9.48E-05	9.48E-05	2.87E-05	0.15	1.3E+03	3.67	0.67
10	3	2	Pumps	1.19E-03	1.19E-03	1.43E-04	0.02	1.4E+02	0.38	0.07
123	28	58	Other	2.87E-04	2.87E-04	2.65E-04	0.06	5.1E+02	1.41	0.26
5,809	1,274	879	Flanges	1.76E-05	1.76E-05	9.26E-05	0.21	1.8E+03	4.95	0.90
*Includes Gas Blending Project, Butane Minor Mod, 2012 Crude Project, and Truck Rack Minor Mod							0.43	3797.49	10.40	1.90

Project Count**				Light	Heavy	Gas				
Light	Heavy	Gas		Factor (lbs/hr)	Factor (lbs/hr)	Factor (lbs/hr)	Lbs/Hr	Lbs/Year	lb/day	tpy
200	28	150	Valves	9.48E-05	9.48E-05	2.87E-05	0.03	2.3E+02	0.62	0.11
27	28	4	Pumps	1.19E-03	1.19E-03	1.43E-04	0.07	5.8E+02	1.59	0.29
10	28	58	Other	2.87E-04	2.87E-04	2.65E-04	0.03	2.3E+02	0.63	0.11
500	28	500	Flanges	1.76E-05	1.76E-05	9.26E-05	0.06	4.9E+02	1.33	0.24
**Includes Current Project ONLY							0.17	1522.54	4.17	0.76

Total Count				Light	Heavy	Gas				
Light	Heavy	Gas		Factor (lbs/hr)	Factor (lbs/hr)	Factor (lbs/hr)	Lbs/Hr	Lbs/Year	lb/day	tpy
1,497	271	388	Valves	9.48E-05	9.48E-05	2.87E-05	0.18	1.6E+03	4.29	0.78
37	31	6	Pumps	1.19E-03	1.19E-03	1.43E-04	0.08	7.2E+02	1.96	0.36
133	56	116	Other	2.87E-04	2.87E-04	2.65E-04	0.08	7.4E+02	2.04	0.37
6,309	1,302	1,379	Flanges	1.76E-05	1.76E-05	9.26E-05	0.26	2.3E+03	6.29	1.15
							0.61	5320.04	14.58	2.66

	Light Liquid Fraction	Light Liquid Lbs/Year	Heavy Liquid Fraction	Heavy Liquid Lbs/Year	Gas Fraction	Gas Lbs/Year	Total Lbs/Year	Total tpy
Total VOC	100.00%	2937.65	100.00%	890.08	100.00%	1492.30	5320.04	2.66
Hexane	13.60%	399.52	0.000%	0.00	4.73%	70.53	470.05	0.24
Benzene	2.00%	58.75	0.001%	0.01	0.46%	6.85	65.61	0.03
2,2,4-TMP	4.00%	117.51	0.000%	0.00	0.52%	7.71	125.22	0.06
Toluene	7.50%	220.32	0.032%	0.28	2.40%	35.80	256.12	0.13
Ethylbenzene	2.00%	58.75	0.013%	0.12	0.29%	4.37	63.24	0.03
Xylenes	7.00%	205.64	0.290%	2.58	5.68%	84.71	292.92	0.15
Naphthalene	0.42%	12.19	0.076%	0.67	0.04%	0.54	0.67	0.00
Cumene	0.50%	14.69	0.000%	0.00	0.01%	0.08	0.00	0.00
Methanol	N/A	N/A	0.000%	0.00	N/A	N/A	0.00	0.00
Total HAPS	37.02%	1087.37	0.41%	3.66	14.11%	210.57	1301.61	0.65
Non Hap VOC	62.99%	1850.28	99.59%	886.42	85.89%	1281.73	4018.43	2.01

Gas fraction vapor speciation based on worst case of blendstock, gasoline, and distillate, calculated as an average for the year at this location.

NOTE: Based on facility-specific equipment component counts. Emissions calculated per EPA guidance "Protocol for Equipment

Leak Emission Estimates" (USEPA, November 1995).

Estimate of Particulate Matter (PM-2.5) Emissions

Paved Roads - Emission Factor Derived from AP-42: 13.2.1 (01/11) (accounts for resuspended road material)

$$E_{ext} = [k\,(sL)^{0.91} \times (W)^{1.02}]\,(1 - P/4N)$$

Where:

	= Annual size specific emission factor extrapolated for natural mitigation (lb/VMT)		
k	= PM-2.5 multiplier (lb/VMT)	**0.00054**	lb/VMT (Table 13.2-1.1)
sL*	= Road Surface Silt Loading (g/m^2) =	**1.1**	g/m^2 (Table 13.2.1-3)
W	= Mean Vechicle Weight (tons)		
P	= Number of precipitation days per year (>0.01 in precipitation) =	**138**	days (Albany, NY data)
N	= Number of days in the averaging period =	**365**	days (Annual Average)

*Given the industrial processes listed in Table 13.2.1-3, operations at a terminal were determined to be closest to those at a corn wet

Paved Roads - Emission Factor Derived Using EPA MOVES Model (includes vehicle exhaust, brake wear, and tire wear)

Assumptions Used in Model:	
Scale:	National (utilizes data from EPA databases)
Year Selected:	2013
Months Selected:	All Months
Hours Selected:	All Hours
Time Aggregation Level:	Hourly
Geographic Bounds:	Albany County
Vehicle Selected:	Combination long-haul truck
Fuel Selected:	Diesel Fuel
Road Type:	Urban, Restricted Access
Emissions Accounted for:	Running exhaust, crankcase running exhaust, brake wear, tire wear

Calculation of Number of Tanker Trucks at Facility Per Day

10,500.00	gallons	=storage capacity of each truck
373,192,668.00	gallons	=throughput of product at the truck rack in 2013
35,542.16	trucks per year	=trucks entering the facility in 2013 (product loaded at the truck rack/storage capacity of each truck)
35,543	**trucks per year**	
97.38	trucks per day	=trucks entering the facility each day (trucks per year/365)
98	**trucks per day**	

Calculation of Average Tanker Truck Weight

80000	pounds	=loaded weight of smaller tanker trucks used (information obtained from terminal)
102000	pounds	=loaded weight of larger tanker trucks used (information obtained from terminal)
91000	pounds	=average weight of truck travelling through terminal (conservatively assume that half of the trucks are the larger trucks, conservatively assume that trucks are at their loaded weight when entering and exiting the facility)
45.5	tons	=average weight of truck traveling through terminal

Road Length - Paved Roads

18550	inches	=length of paved road traveled by trucks, determined using facility site plan
1545.83	feet	=length of paved road traveled by trucks
0.29	miles	=length of paved road traveled by trucks

Estimate of Particulate Matter (PM-2.5) Emissions

Paved Roads - Emission Factors Derived from AP-42: 13.2.1 (01/11) and EPA MOVES Model

Tanker Trucks (TT):

98	Tanker trucks per day	===>	Average weight :	45.5	tons
98				45.5	tons

Length of Paved Roads:

L(TT) = 0.29 miles Length of paved road tanker trucks travel on one way.

Emission Factors:

E(TT) = 0.026 lb/VMT Emission Factor derived from AP-42, Volume 1, Fifth Edition, Section 13.2.1 (January 2011)

E(EPA MOVES) = 4.0922E-06 lb/VMT Average hourly emission factor resulting from MOVES run

Emission Factor (total) 0.026 lb/VMT Sum of AP-42 and EPA MOVES Emission Factors

Estimate of Particulate Matter (PM-2.5) Emissions:

Tanker Truck: 98 Trips/day 1 ways

E(TT) = 0.75 lb PM-2.5/day

TOTAL =	**0.75**	**lb PM-2.5/day**
	0.14	**tons PM-2.5/year**

Unpaved Roads - Emission Factors Derived from AP-42: 13.2.2 (11/06)

Where:

= Annual size specific emission factor extrapolated for natural mitigation (lb/VMT)

s*	= Surface material silt content (%) =	**4.3**	(Table 13.2.2-1)
W	= Mean Vehicle Weight (tons)		
k	= **0.15**	lb/VMT (Table 13.2.2-2)	
a	= **0.9**	(Table 13.2.2-2)	
b	= **0.45**	(Table 13.2.2-2)	
P	= Number of precipitation days per year (>0.01 in percipitation) =	**138**	days (Albany, NY data)

content given for a taconite mining and processing plant service road in AP-42 is 4.3%.

Estimated Number of Trucks at Facility Per Day

5	trucks per day	assume one maintenance crew on site each day with one truck entering and exiting the facility approximately five times each day

Average Truck Weight

5000	lbs	average weight of a light duty pickup truck (maintenance truck)
2.5	tons	

Road Length - Unpaved Roads

1500	feet	estimated distance driven by each maintenance truck on each trip through the terminal
0.28	miles	

Estimate of Particulate Matter (PM-2.5) Emissions

Unpaved Roads - Emission Factors Derived from AP-42: 13.2.1 (11/06)

Maintenance Trucks (MT):

5	Maintenance Trucks per day	===>	Average weight =	2.5	tons
5				2.5	tons

Length of Unpaved Roads:

L(MT) = 0.28 miles Length of unpaved road maintenance trucks travel on one way.

Emission Factors:

E(MT) = 0.034 lb/VMT

Estimate of Particulate Matter (PM-2.5) Emissions:

Maintenance Truck 5 Trips/day 1 ways

E(MT) = 0.05 lb PM-2.5/day

TOTAL = 0.05 lb PM-2.5/day

0.01 tons PM-2.5/year

Estimate of Particulate Matter (PM-2.5) Emissions

Total PM-2.5 Emissions:

0.14 tons/year	total PM-2.5 emissions from tanker trucks traveling on paved roads	
0.01 tons/year	total PM-2.5 emissions from maintenance vehicles traveling on unpaved roads	
0.15 tons/year	**total fugitive PM-2.5 emissions from facility roads**	

Estimate of Particulate Matter (PM-10) Emissions

Paved Roads - Emission Factor Derived from AP-42: 13.2.1 (01/11) (accounts for resuspended road material)

$$E_{ext} = [k\,(sL)^{0.91} \times (W)^{1.02}]\,(1 - P/4N)$$

Where:

	= Annual size specific emission factor extrapolated for natural mitigation (lb/VMT)			
k	= PM-10 multiplier (lb/VMT	**0.0022**	lb/VMT (Table 13.2-1.1)	
sL*	= Road Surface Silt Loading (g/m^2) =	**1.1**	g/m^2 (Table 13.2.1-3)	
W	= Mean Vechicle Weight (tons)			
P	= Number of precipitation days per year (>0.01 in precipitation) =		**138**	days (Albany, NY data)
N	= Number of days in the averaging period =	**365**	days (Annual Average)	

*Given the industrial processes listed in Table 13.2.1-3, operations at a terminal were determined to be closest to those at a corn wet

Paved Roads - Emission Factor Derived Using EPA MOVES Model (includes vehicle exhaust, brake wear, and tire wear)

Assumptions Used in Model:	
Scale:	National (utilizes data from EPA databases)
Year Selected:	2013
Months Selected:	All Months
Hours Selected:	All Hours
Time Aggregation Level:	Hourly
Geographic Bounds:	Albany County
Vehicle Selected:	Combination long-haul truck
Fuel Selected:	Diesel Fuel
Road Type:	Urban, Restricted Access
Emissions Accounted for:	Running exhaust, crankcase running exhaust, brake wear, tire wear

Calculation of Number of Tanker Trucks at Facility Per Day

10,500.00	gallons	=storage capacity of each truck
373,192,668.00	gallons	=throughput of product at the truck rack in 2013
35,542.16	trucks per year	=trucks entering the facility in 2013 (product loaded at the truck rack/storage capacity of each truck)
35,543	**trucks per year**	
97.38	trucks per day	=trucks entering the facility each day (trucks per year/365)
98	**trucks per day**	

Calculation of Average Tanker Truck Weight

80000	pounds	=loaded weight of smaller tanker trucks used (information obtained from terminal)
102000	pounds	=loaded weight of larger tanker trucks used (information obtained from terminal)
91000	pounds	=average weight of truck travelling through terminal (conservatively assume that half of the trucks are the larger truck conservatively assume that trucks are at their loaded weight when entering and exiting)
45.5	tons	=average weight of truck traveling through terminal

Road Length - Paved Roads

18550	inches	=length of paved road traveled by trucks, determined using facility site plan
1545.83	feet	=length of paved road traveled by trucks
0.29	miles	=length of paved road traveled by trucks

Estimate of Particulate Matter (PM-10) Emissions

Paved Roads - Emission Factors Derived from AP-42: 13.2.1 (01/11) and EPA MOVES Model

Tanker Trucks (TT):

98	Tanker trucks per day	===>	Average weight :	45.5	tons	
98				45.5	tons	

Length of Paved Roads:

L(TT) = 0.29 miles Length of paved road tanker trucks travel on one way.

Emission Factors:

E(TT) =	0.107	lb/VMT	Emission Factor derived from AP-42
E(EPA MOVES) =	5.507E-06	lb/VMT	Average hourly emission factor resulting from MOVES run
Emission Factor (total)	0.107	lb/VMT	Sum of AP-42 and EPA MOVES Emission Factors

Estimate of Particulate Matter (PM-10) Emissions:

Tanker Truck: 98 Trips/day 1 ways

E(TT) = 3.06 lb PM-10/day

TOTAL =	**3.06**	**lb PM-10/day**
	0.56	**tons PM-10/year**

s,

Unpaved Roads - Emission Factors Derived from AP-42: 13.2.2 (11/06)

Where:

= Annual size specific emission factor extrapolated for natural mitigation (lb/VMT)

s = Surface material silt content for MSW Lanfills (% **4.3** (Table 13.2.2-1)

W = Mean Vehicle Weight

k = **1.5** lb/VMT (Table 13.2.2-2)

a = **0.9** (Table 13.2.2-2)

b = **0.45** (Table 13.2.2-2)

P = Number of precipitation days per year (>0.01 in percipitation) = **138** days (Albany, NY data)

*The unpaved road at the terminal was determined to have a silt content most similar to a service road. The silt

Estimated Number of Trucks at Facility Per Day

5	trucks per day	assume one maintenance crew on site each day with one truck entering and exiting the facility approximately five times each day

Average Truck Weight

5000	lbs	average weight of a light duty pickup truck (maintenance truck)
2.5	tons	

Road Length - Unpaved Roads

1500	feet	estimated distance driven by each maintenance truck on each trip through the terminal
0.28	miles	

Estimate of Particulate Matter (PM-10) Emissions

Unpaved Roads - Emission Factors Derived from AP-42: 13.2.1 (11/06)

Maintenance Trucks (MT):

5	Maintenance Trucks per day	===>	Average weight =	2.5	tons
5				2.5	tons

Length of Unpaved Roads:

L(MT) = 0.28 miles Length of unpaved road maintenance trucks travel on one way.

Emission Factors:

E(MT) = 0.341 lb/VMT

Estimate of Particulate Matter (PM-10) Emissions:

Maintenance Truck: 5 Trips/day 1 ways

E(MT) = 0.48 lb PM-10/day

TOTAL =	**0.48**	**lb PM-10/day**
	0.09	**tons PM-10/year**

Estimate of Particulate Matter (PM-10) Emissions

Total PM-10 Emissions:

0.56	tons/year	total PM-10 emissions from tanker trucks traveling on paved roads
0.09	tons/year	total PM-10 emissions from maintenance vehicles traveling on unpaved roads
0.65	**tons/year**	**total fugitive PM-10 emissions from facility roads**

Fuel Combustion Emissions

Existing Exempt Combustion Sources:

Unit ID	Product	Source	Gal/yr (Liquid	SCF/yr (Gas)	Liters/year (Gas)	MMBTU/yr
NA	Distillate	Furnace	590			–
NA	Natural Gas	Boiler (water bldg	–			54
NA	Natural Gas	Boiler (garage)	–			22
NA	Natural Gas	Boiler (office)	–			163
NA	Natural Gas	Furnace	–			120

Proposed Exempt Combustion Sources:

Unit ID	Product	Source	Gal/yr (Liquid	SCF/yr (Gas)	Liters/year (Gas)	MMBTU/yr
NA	Natural Gas	Heater (line trace	–			35,040
NA	Natural Gas	Boiler (line trace)	–			35,040
NA	Natural Gas	Boiler (tanks)	–			52,560
NA	Natural Gas	Boiler (lube bldg)	–			86,724
NA	Natural Gas	Boiler (lube bldg)	–			86,724
NA	Natural Gas	Boiler (lube bldg)	–			86,724
NA	Natural Gas	Boiler (lube bldg)	–			86,724

Existing Non-Exempt Combustion Sources:

VCUML/VCUM2/VCURR*	Natural Gas	VCU	–			150,000

*Includes natural gas used as assist gas for both marine VCUs (VCUML and VCUM2) and the rail VCU (VCURR)

Distillate Combustion Emissions:

	Combustion Emissions									
Pollutant	PM 2.5	PM10	SOx	NOx	VOC	CO	CH4	N2O	CO2	GHG**
Emission Factor - lb/1000 gal*	2.00	2.00	0.21	20.00	0.20	5.00	0.22	0.26	2.2E+04	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	1.18	1.18	0.13	11.80	0.12	2.95	0.13	0.15	13157.00	13,208.20
tons/yr	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	6.58	6.60

* Emission factors used to estimate emissions are from AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. SOx, Nox, CO, and PM Emission Factors are from Table 1.3-1. VOC and CH4 Emission Factors are from Table 1.3-3. CO2 Emission Factor is from Table 1.3-12. N2O Emission Factor is from Table 1.3-8.

** GHG Emission calculated by using the CO2 Equivalency Factor for CO2 (1), CH4 (84), and N2O (264)

Example calculation (using SOx):
= gal/yr / 1000 gal * Emission Factor
= 590 gal/yr / 1000 gal * 52.54 lb/1000 gal (SOx)
= 31.00 lb/yr

Natural Gas Combustion Emissions (from existing sources)*:

	Combustion Emissions									
Pollutant	PM2.5	PM10	SOx	NOx	VOC	CO	CH4	N2O	CO2	GHG***
Emission Factor - lb / MM BTU	0.0075	0.0075	0.00059	0.098	0.0054	0.082	0.002	0.002	117.647	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	1,120.32	1,120.32	88.45	14,741.08	810.76	12,382.51	339.04	324.30	17,689,294.12	17,803,390.06
tons/yr	0.56	0.56	0.04	7.37	0.41	6.19	0.17	0.16	8,844.65	8,901.70

*Total emissions from natural gas combustion from existing sources include emissions from the combustion of natural gas in furnaces and boilers and emissions from the combustion of natural gas used as assist gas in the VCUs.

** Emission factors used to estimate emissions are from AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Tables 1.4-1, 1.4-2, and 1.4-3, except for GHG.

** GHG Emission calculated by using the CO2 Equivalency Factor for CO2 (1), CH4 (84), and N2O (264)

Total Natural Gas Used 150,359 MMBTU/yr

Example Calculation (using SOx):
= Total Natural Gas Used * Emission Factor
= Total Natural Gas Used (150,359) MMBTU/yr * 0.00059 lb / MM BTU
= 117.86 lb/yr

Natural Gas Combustion Emissions (from proposed sources)*:

	Combustion Emissions									
Pollutant	PM2.5	PM10	SOx	NOx	VOC	CO	CH4	N2O	CO2	GHG***
Emission Factor - lb / MM BTU	0.0075	0.0075	0.00059	0.098	0.0054	0.082	0.002	0.002	117.647	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	3,498.50	3,498.50	276.20	46,032.94	2,531.81	38,667.67	1,058.76	1,012.72	55,239,529.41	55,595,824.38
tons/yr	1.75	1.75	0.14	23.02	1.27	19.33	0.53	0.51	27,619.76	27,797.91

*Total emissions from natural gas combustion from proposed sources include emissions from the combustion of natural gas in proposed boilers.
** Emission factors used to estimate emissions are from AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I, Tables 1.4-1, 1.4-2, and 1.4-3, except for GHG.
** GHG Emission calculated by using the CO2 Equivalency Factor for CO2 (1), CH4 (84), and N2O (264)

Total Natural Gas Used 469536.00 MMBTU/yr

Example Calculation (using SOx):
= Total Natural Gas Used * Emission Factor
= Total Natural Gas Used (469,536) MMBTU/yr * 0.00059 lb / MM BTU
= 276.2 lb/yr

VCU Vapor Combustion Emissions
(Emissions from Combustion of Petroleum Product Loaded)

Petroleum Vapor Combusted (lbs):

6,215,882 Total
3,510,000 at VCUML (gasoline and ethanol loading) (See Marine Loading - Refined Product Calculations.)
808,865 at VCUM2 (crude loading) (See Marine Loading - Crude Oil Calculations.)
1,897,017 at VCURR (gasoline loading) (See Rail Loading - Refined Product Calculations.)

Conversion from Petroleum Vapor Combusted in lbs to MMSCF (as Natural Gas Equivalent):

MMSCF (as Natural Gas) = Petroleum Vapor Combusted (lbs) * (21,000 BTUs / lb gasoline (high avg. for C4-C8 gases)(/ (1000 BTU/SCF) / (1,000,000)
MMSCF (as Natural Gas) combusted at VCUML 74
MMSCF (as Natural Gas) combusted at VCUM2 17
MMSCF (as Natural Gas) combusted at VCURR 40

Marine VCU Emissions from Gasoline & Ethanol Loading (Emission Unit VCUML):

	Combustion Emissions									
Pollutant	PM 2.5	PM10	SOx	NOx	VOC*	CH4	N2O	CO	CO2	GHG
Emission Factor - lbs / MM SC	7.60	7.60	197.47	150.00	NA	2.30	2.20	84.00	120,000.00	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	560.20	560.20	14,555.66	11,056.50	NA	169.53	162.16	6,191.64	8,845,200.00	8,902,251.54
tons/yr	0.28	0.28	7.28	5.53	NA	0.08	0.08	3.10	4,422.60	4,451.13

Marine VCU Emissions from Crude Oil Loading (Emission Unit VCUM2):

	Combustion Emissions									
Pollutant	PM 2.5	PM10	SOx	NOx	VOC*	CH4	N2O	CO	CO2	GHG
Emission Factor - lbs / MM SC	7.60	7.60	197.47	150.00	NA	2.30	2.20	84.00	120,000.00	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	129.09	129.09	3,354.29	2,547.92	NA	39.07	37.37	1,426.84	2,038,339.24	2,051,486.53
tons/yr	0.06	0.06	1.68	1.27	NA	0.02	0.02	0.71	1,019.17	1,025.74

Rail VCU Emissions from Gasoline & Ethanol Loading (Emission Unit VCURR):

	Combustion Emissions									
Pollutant	PM 2.5	PM10	SOx	NOx	VOC*	CH4	N2O	CO	CO2	GHG
Emission Factor - lbs / MM SC	7.60	7.60	197.47	150.00	NA	2.30	2.20	84.00	120,000.00	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	302.76	302.76	7,866.76	5,975.60	NA	91.63	87.64	3,346.34	4,780,482.47	4,811,316.58
tons/yr	0.15	0.15	3.93	2.99	NA	0.05	0.04	1.67	2,390.24	2,405.66

* These emissions are from gasoline and crude oil vapor combustion and pilot light gas. Gasoline and crude oil VOCs are already accounted for in the VCU emissions (i.e. 2 mg/l loaded or 98% efficiency).
** PM Emission Factor is from AP-42 (Table 1.4-2), as it is higher than the Emission Factor from the VCU manufacturer of zero (0). SOx Emission Factor is calculated as described below. NOx Emission Factor is from VCU manufacturer, as it is higher than the AP-42 Emission factor of 140 lbs/MMSCF (Table 1.4-1). CO Emission Factors is identical from VCU manufacturer and AP-42 (Table 1.4-1). CO2 Emission Factor is from AP-42 (Table 1.402).
** GHG Emission calculated by using the CO2 Equivalency Factor for CO2 (1), CH4 (84), and N2O (264)

Example calculation of SOx Emission Factor:

SOx Emission Factor = $y_{H2S} * (1/C) * M_{SO2} * MW_{SO2}$ (Equation from EPA Emission Inventory Improvement Program (EIIP) Document Volume 3, Ch.10: Preferred & Alternative Methods for Estimating Air Emissions from Oil and Gas Field Production & Procesing Operations, Sept. 1999, Pg 10.2-16.)

$y_{H2S, crude\ oil}$ = 0.001 (mole fraction of H2S in inlet gas (lb mole H2S/ lb mole) based on 10 ppm H2S liquid concentration)
C = 379.00 (molar volume of ideal gas at 60F and 1atm (scf/lb-mole))
M = 0.99 (molar conversion ratio from H2S to SO2 (lb-mole SO2/lb-mole H2S) (From VCU Manufacturer))
MW = 64.066 (molecular weight of SO2 (lb SO2/lb-mole SO2))

$EF_{SOX,crude\ oil}$ = 197.47 lb/ MMSCF

Total of Combustion Sources

Pollutant	PM 2.5	PM10	SOx	NOx	VOC	CH4	N2O	CO	CO2	GHG
lb/yr	5,612.06	5,612.06	26,141.49	80,365.85	3,342.69	1,698.16	1,624.36	62,017.94	88,606,002.24	89,177,477.30
tons/yr	2.81	2.81	13.07	40.18	1.67	0.85	0.81	31.01	44,303.00	44,588.74

Emergency Generators (Exempt) Updated with Part 496 emission factors

Emergency Generator Sources:

Fuel Type	Source	Gal/hr (Liquid)	SCF/hr (Gas)	Gal/hr (Gas)	MMBTU/hr*
Propane	QT100 Generator	13.9			1.26
Propane	QT100 Generator	13.9			1.26
Natural Gas	20kw NG Generator		1,020		1.02
Diesel	500kw	26.1			
Diesel	350kw	18.5			
Diesel	350kw	18.5			

*Generac Spec Sheet states, "For BTU content multiply gal/hr x 90950 (LP) or ft3/hr x 1000 (NG)."

Distillate Fired Engine Emissions:

	Pollutant									
Pollutant	PM2.5	PM10	SOx	NOx	VOC	CO	CH4	N2O	CO2	GHG**
Factor - lb/1000 gal*	2.00	2.00	0.21	20.00	0.20	5.00	0.22	0.26	2.2E+04	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	63.10	63.10	6.72	631.00	6.31	157.75	6.81	8.20	703,565.00	706,303.04
tons/yr	0.03	0.03	0.00	0.32	0.00	0.08	0.00	0.00	351.78	353.15

* Emission factors used to estimate emissions are from AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition, Volume I. SOx, Nox, CO, and PM Emission Factors are from Table 1.3-1. VOC Emission Factor is from Table 1.3-3. CO2 Emission Factor is from Table 1.3-12.

** GHG Emission calculated by using the CO2 Equivalency Factor for CO2 (1), CH4 (84), and N2O (264)

Example calculation:
= gal/yr / 1000 gal * emission factor

Natural Gas & Propane Fired Engine Emissions:

	lbs Pollutant / MM BTU									
Pollutant	PM2.5	PM10	SOx	NOx	VOC	CO	CH4	N2O	CO2	GHG**
Factor* - lb/MMBtu	0.0099	0.0099	0.0006	2.270	0.0296	3.720	0.230	0.2	110.0	CH4*84)+(N2O*264)+(CO2*1)
lb/yr	17.58	17.58	1.04	4,027.45	52.52	6,600.04	408.07	408.07	195,162.55	337,169.92
tons/yr	0.01	0.01	0.00	2.01	0.03	3.30	0.20	0.20	97.58	168.58

* Emission factors used to estimate emissions are from AP-42 Table 3.2-3. No emission factor was available for N2O so the CH4 emission factor was used.

** GHG Emission calculated by using the CO2 Equivalency Factor for CO2 (1), CH4 (84), and N2O (264)

Example Calculation of Natural Gas Usage

= Natural Gas Used 1,774 MMBTU/yr Assumes 500 hours/yr

= Natural Gas Used * Emission factor

Total of Generator Sources

Pollutant	PM2.5	PM10	SOx	NOx	VOC	CO	CH4	N2O	CO2	GHG
lb/yr	80.68	80.68	7.76	4,658.45	58.83	6,757.79	414.88	416.27	898,727.55	1,043,472.95
tons/yr	0.04	0.04	0.00	2.33	0.03	3.38	0.21	0.21	449.36	521.74

H2S Calculations

H2S Liquid Conc. (ppm)	10	
H2S Vapor Fraction	0.00118	(from AP-42)
VCUM2 VOC Emissions	3.76	tpy (from Marine Loading - Crude tab of PTE)
Facility Fugitives (light liquid)	2937.65	lbs/yr (from Facility Fugitives tab of PTE)
IFR Tank Emissions (inc. landing	96823.80	lbs/yr (from Emission Summary tab of PTE)

Point Sources

Emission Unit	Emission Rate (tpy)
VCUM2	0.004

Volume Sources (Tanks)

Emission Unit	Emission Rate (tpy)
TANKS	0.057

Area Sources (Fugitives)

Emission Unit	Emission Rate (tpy)
Facility Fugitives	0.002

Total H2S Emissions (tpy) **0.063**

Note: Hydrogen sulfide is the most prevalent of the total reduced sulfurs, and therefore all TRS is assumed to be H2S. IFR Tank Emissions are based on standing and working losses from crude tanks only.

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 117			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**160,152,189**	gal/yr
Turnovers	N	**48.97**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		Mechanical-shoe seal | Rim-mounted secondary	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

		Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	23	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			61.00 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**3,909.82**	lb/year
		1.95	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**515.08**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1258755	NA
Tank diameter	D	110.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_sW_v/D)*[1+(N_FF_C/D)]$	**LW**	**274.59**	lb/yr
Annual throughput	Q	3,813,147	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	110.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**476.06**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	61.00	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**2,644.09**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	110.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:	Gasoline
Total HAP Annual Average Emissions	130.15
Individual HAP Annual Average Emiss Eq. 40-2 $L_{T1}=Z_{V1}(L_R+L_F+L_D)+Z_{L1}L_W$	
	L_{T1}
hexane	16.544 lb/yr
benzene	19.894 lb/yr
2,2,4 TMP	27.720 lb/yr
toluene	35.128 lb/yr
ethylbenzene	4.804 lb/yr
xylenes	23.389 lb/yr
naphthalene	1.145 lb/yr
cumene	1.527 lb/yr

Vapor Weight Concentrations Eq. 40-I $Z_{Vi}=y_iM_i/M_V$

	M_i	M_V	Z_{Vi}
hexane	86.18	62	0.00380
benzene	78.11	62	0.00411
2,2,4 TMP	114.23	62	0.00460
toluene	92.14	62	0.00438
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.015782	5.779	0.00273
benzene	0.018867	5.779	0.00326
2,2,4 TMP	0.014442	5.779	0.00250
toluene	0.017017	5.779	0.00294
ethylbenzene	0.000891	5.779	0.00015
xylenes	0.003869	5.779	0.00067
naphthalene	0.000005	5.779	0.00000
cumene	0.000126	5.779	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_V)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**117**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**13,346,016**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	**2**	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**23**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	5.08	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**212.90**	lb/month
		0.11	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**26.92**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**24.88**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**138.21**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		7.602	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		0.7502	lb/month
benzene		0.9490	lb/month
TMP		1.4980	lb/month
toluene		2.1212	lb/month
ethylbenzene		0.3483	lb/month
xylenes		1.7222	lb/month
naphthalene		0.0951	lb/month
cumene		0.1185	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.5214	lb/month
benzene		0.5371	lb/month
TMP		0.5827	lb/month
toluene		0.5194	lb/month
ethylbenzene		0.0279	lb/month
xylenes		0.1204	lb/month
naphthalene		0.0001	lb/month
cumene		0.0041	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2288	lb/month
benzene		0.4119	lb/month
TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$

	M_i	M_V	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**227.29**	lb/month
		0.11	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**28.96**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**26.77**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**148.68**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		7.876	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		0.8060	lb/month
benzene		1.0102	lb/month
TMP		1.5667	lb/month
toluene		2.1869	lb/month
ethylbenzene		0.3523	lb/month
xylenes		1.7395	lb/month
naphthalene		0.0951	lb/month
cumene		0.1192	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.5772	lb/month
benzene		0.5983	lb/month
TMP		0.6515	lb/month
toluene		0.5852	lb/month
ethylbenzene		0.0319	lb/month
xylenes		0.1377	lb/month
naphthalene		0.0001	lb/month
cumene		0.0048	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2288	lb/month
benzene		0.4119	lb/month
TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month

Vapor Weight Concentrations Eq. 40-I $Z_{Vi} = y_i M_i / M_V$

	M_i	M_V	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**251.76**	lb/month
		0.13	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**32.43**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**29.97**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**166.48**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		8.728	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		0.9723	lb/month
benzene		1.1973	lb/month
2,2,4 TMP		1.7806	lb/month
toluene		2.3979	lb/month
ethylbenzene		0.3657	lb/month
xylenes		1.7979	lb/month
naphthalene		0.0952	lb/month
cumene		0.1214	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.7434	lb/month
benzene		0.7854	lb/month
2,2,4 TMP		0.8653	lb/month
toluene		0.7961	lb/month
ethylbenzene		0.0453	lb/month
xylenes		0.1962	lb/month
naphthalene		0.0002	lb/month
cumene		0.0070	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$

	M_i	M_V	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**323.80**	lb/month
		0.16	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**42.64**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**39.41**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**218.87**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.793	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.3686	lb/month
benzene		1.6463	lb/month
2,2,4 TMP		2.2967	lb/month
toluene		2.9139	lb/month
ethylbenzene		0.3994	lb/month
xylenes		1.9451	lb/month
naphthalene		0.0954	lb/month
cumene		0.1271	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1398	lb/month
benzene		1.2344	lb/month
2,2,4 TMP		1.3814	lb/month
toluene		1.3121	lb/month
ethylbenzene		0.0791	lb/month
xylenes		0.3434	lb/month
naphthalene		0.0005	lb/month
cumene		0.0127	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**278.96**	lb/month
		0.14	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**36.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**33.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**186.26**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		12.505	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.6739	lb/month
benzene		2.0067	lb/month
2,2,4 TMP		2.7215	lb/month
toluene		3.3604	lb/month
ethylbenzene		0.4309	lb/month
xylenes		2.0834	lb/month
naphthalene		0.0957	lb/month
cumene		0.1327	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.4451	lb/month
benzene		1.5948	lb/month
2,2,4 TMP		1.8062	lb/month
toluene		1.7587	lb/month
ethylbenzene		0.1106	lb/month
xylenes		0.4817	lb/month
naphthalene		0.0008	lb/month
cumene		0.0183	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**346.19**	lb/month
		0.17	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**45.81**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**42.34**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**235.16**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		15.244	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.1648	lb/month
benzene		2.5830	lb/month
2,2,4 TMP		3.3996	lb/month
toluene		4.0727	lb/month
ethylbenzene		0.4814	lb/month
xylenes		2.3051	lb/month
naphthalene		0.0962	lb/month
cumene		0.1417	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9360	lb/month
benzene		2.1711	lb/month
2,2,4 TMP		2.4843	lb/month
toluene		2.4709	lb/month
ethylbenzene		0.1610	lb/month
xylenes		0.7033	lb/month
naphthalene		0.0012	lb/month
cumene		0.0273	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**378.57**	lb/month
		0.19	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**50.40**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**46.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**258.71**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		16.626	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.4080	lb/month
benzene		2.8710	lb/month
2,2,4 TMP		3.7404	lb/month
toluene		4.4353	lb/month
ethylbenzene		0.5076	lb/month
xylenes		2.4204	lb/month
naphthalene		0.0964	lb/month
cumene		0.1464	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.1792	lb/month
benzene		2.4591	lb/month
2,2,4 TMP		2.8251	lb/month
toluene		2.8335	lb/month
ethylbenzene		0.1872	lb/month
xylenes		0.8187	lb/month
naphthalene		0.0015	lb/month
cumene		0.0320	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month
Vapor Weight Concentrations Eq. 40-/ $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**365.36**	lb/month
		0.18	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**48.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**44.85**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**249.10**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		16.058	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.3083	lb/month
benzene		2.7527	lb/month
2,2,4 TMP		3.6003	lb/month
toluene		4.2859	lb/month
ethylbenzene		0.4967	lb/month
xylenes		2.3727	lb/month
naphthalene		0.0963	lb/month
cumene		0.1445	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.0795	lb/month
benzene		2.3408	lb/month
2,2,4 TMP		2.6850	lb/month
toluene		2.6841	lb/month
ethylbenzene		0.1764	lb/month
xylenes		0.7710	lb/month
naphthalene		0.0014	lb/month
cumene		0.0300	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**456.74**	lb/month
		0.23	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**61.47**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**56.82**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**315.57**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		14.522	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.0582	lb/month
benzene		2.4427	lb/month
2,2,4 TMP		3.2239	lb/month
toluene		3.8670	lb/month
ethylbenzene		0.4647	lb/month
xylenes		2.2309	lb/month
naphthalene		0.0960	lb/month
cumene		0.1385	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.8294	lb/month
benzene		2.0308	lb/month
2,2,4 TMP		2.3086	lb/month
toluene		2.2652	lb/month
ethylbenzene		0.1443	lb/month
xylenes		0.6292	lb/month
naphthalene		0.0010	lb/month
cumene		0.0241	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.2288	lb/month
benzene		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month
toluene		1.6018	lb/month
ethylbenzene		0.3204	lb/month
xylenes		1.6018	lb/month
naphthalene		0.0950	lb/month
cumene		0.1144	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**352.22**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**310.00**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**240.33**	lb/month
		0.18	tons/month			0.16	tons/month			0.12	tons/month
Product Type		Gasoline - RVP 13.5		Product Type		Gasoline - RVP 15		Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**62.00**		Vapor Molecular weight	M_v	**60.15**		Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.63		Vapor Pressure Equation Constant A	A	11.60		Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	5015.72	°R	Vapor Pressure Equation Constant B	B	4937.93	°R	Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R	TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R	TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	510.41		TB = TAA + 0.003 as I	T_B	500.20		TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia	PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia	PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.137	NA	$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.123	NA	$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	**L_R**	**46.66**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	**L_R**	**40.68**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	**L_R**	**30.81**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.88**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c$)	**LF**	**43.13**	lb/month	$L_F = F_F P^* M_v K_c$)	**LF**	**37.60**	lb/month	$L_F = F_F P^* M_v K_c$)	**LF**	**28.48**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**239.54**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**208.84**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**158.16**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Gasoline		**Product - same as January**		Gasoline		**Product - same as January**		Gasoline	
Total HAP Monthly Emissions		11.146	lb/month	**Total HAP Monthly Emissions**		9.599	lb/month	**Total HAP Monthly Emissions**		8.131	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}				**L_{Ti}**				**L_{Ti}**	
hexane		1.4366	lb/month	**hexane**		1.1479	lb/month	**hexane**		0.8576	lb/month
benzene		1.7231	lb/month	**benzene**		1.3906	lb/month	**benzene**		1.0670	lb/month
2,2,4 TMP		2.3850	lb/month	**2,2,4 TMP**		1.9990	lb/month	**TMP**		1.6309	lb/month
toluene		3.0022	lb/month	**toluene**		2.6090	lb/month	**toluene**		2.2487	lb/month
ethylbenzene		0.4052	lb/month	**ethylbenzene**		0.3788	lb/month	**ethylbenzene**		0.3560	lb/month
xylenes		1.9704	lb/month	**xylenes**		1.8548	lb/month	**xylenes**		1.7559	lb/month
naphthalene		0.0955	lb/month	**naphthalene**		0.0953	lb/month	**naphthalene**		0.0951	lb/month
cumene		0.1281	lb/month	**cumene**		0.1235	lb/month	**cumene**		0.1198	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{Vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		1.2078	lb/month	**hexane**		0.9190	lb/month	**hexane**		0.6288	lb/month
benzene		1.3113	lb/month	**benzene**		0.9787	lb/month	**benzene**		0.6551	lb/month
2,2,4 TMP		1.4697	lb/month	**2,2,4 TMP**		1.0837	lb/month	**TMP**		0.7156	lb/month
toluene		1.4004	lb/month	**toluene**		1.0072	lb/month	**toluene**		0.6469	lb/month
ethylbenzene		0.0849	lb/month	**ethylbenzene**		0.0584	lb/month	**ethylbenzene**		0.0357	lb/month
xylenes		0.3686	lb/month	**xylenes**		0.2530	lb/month	**xylenes**		0.1541	lb/month
naphthalene		0.0005	lb/month	**naphthalene**		0.0003	lb/month	**naphthalene**		0.0002	lb/month
cumene		0.0137	lb/month	**cumene**		0.0091	lb/month	**cumene**		0.0054	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses $= Z_{Li}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.2288	lb/month	**hexane**		0.2288	lb/month	**hexane**		0.2288	lb/month
benzene		0.4119	lb/month	**benzene**		0.4119	lb/month	**benzene**		0.4119	lb/month
2,2,4 TMP		0.9153	lb/month	**2,2,4 TMP**		0.9153	lb/month	**TMP**		0.9153	lb/month
toluene		1.6018	lb/month	**toluene**		1.6018	lb/month	**toluene**		1.6018	lb/month
ethylbenzene		0.3204	lb/month	**ethylbenzene**		0.3204	lb/month	**ethylbenzene**		0.3204	lb/month
xylenes		1.6018	lb/month	**xylenes**		1.6018	lb/month	**xylenes**		1.6018	lb/month
naphthalene		0.0950	lb/month	**naphthalene**		0.0950	lb/month	**naphthalene**		0.0950	lb/month
cumene		0.1144	lb/month	**cumene**		0.1144	lb/month	**cumene**		0.1144	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentratior** $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00367	hexane	86.18	60	0.00320	hexane	86.18	60	0.00289
benzene	78.11	62	0.00398	benzene	78.11	60	0.00341	benzene	78.11	60	0.00301
2,2,4 TMP	114.23	62	0.00446	2,2,4 TMP	114.23	60	0.00377	2,2,4 TMP	114.23	60	0.00329
toluene	92.14	62	0.00425	toluene	92.14	60	0.00351	toluene	92.14	60	0.00298
ethylbenzene	106.17	62	0.00026	ethylbenzene	106.17	60	0.00020	ethylbenzene	106.17	60	0.00016
xylenes	106.17	62	0.00112	xylenes	106.17	60	0.00088	xylenes	106.17	60	0.00071
naphthalene	128.17	62	0.00000	naphthalene	128.17	60	0.00000	naphthalene	128.17	60	0.00000
cumene	120.19	62	0.00004	cumene	120.19	60	0.00003	cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VAi}(x_i)$	**P_{VA}**	**y_i**		**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**		**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.016259	6.162	0.00264	hexane	0.012679	5.675	0.00223	hexane	0.009155	4.536	0.00202
benzene	0.019475	6.162	0.00316	benzene	0.014897	5.675	0.00262	benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.014926	6.162	0.00242	2,2,4 TMP	0.011279	5.675	0.00199	2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.017633	6.162	0.00286	toluene	0.012997	5.675	0.00229	toluene	0.008810	4.536	0.00194
ethylbenzene	0.000927	6.162	0.00015	ethylbenzene	0.000654	5.675	0.00012	ethylbenzene	0.000422	4.536	0.00009
xylenes	0.004028	6.162	0.00065	xylenes	0.002834	5.675	0.00050	xylenes	0.001821	4.536	0.00040
naphthalene	0.000005	6.162	0.00000	naphthalene	0.000003	5.675	0.00000	naphthalene	0.000002	4.536	0.00000
cumene	0.000132	6.162	0.00002	cumene	0.000090	5.675	0.00002	cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068	0.01	96	86.18	0.01114	0.01	96	86.18	0.01114
benzene	0.018	92	78.11	0.02120	0.018	96	78.11	0.02212	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	92	114.23	0.03222	0.04	96	114.23	0.03362	0.04	96	114.23	0.03362
toluene	0.07	92	92.14	0.06989	0.07	96	92.14	0.07293	0.07	96	92.14	0.07293
ethylbenzene	0.014	92	106.17	0.01213	0.014	96	106.17	0.01266	0.014	96	106.17	0.01266
xylenes	0.07	92	106.17	0.06066	0.07	96	106.17	0.06329	0.07	96	106.17	0.06329
naphthalene	0.00415	92	128.17	0.00298	0.00415	96	128.17	0.00311	0.00415	96	128.17	0.00311
cumene	0.005	92	120.19	0.00383	0.005	96	120.19	0.00399	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230	6.878	1171.5	224.37	1.1382	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.9186	6.906	1211	220.79	0.6734	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.4633	6.812	1257.8	220.74	0.3355	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.2523	7.017	1377.6	222.64	0.1782	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0764	6.95	1419.3	212.61	0.0517	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0664	7.009	1462.3	215.11	0.0448	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0016	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0344	6.929	1455.8	207.2	0.0226	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.		117	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	^oR
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**160,152,189**	gal/yr
Turnovers	N	**48.97**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	23	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		61.00 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**611.66**	lb/year
		0.31	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5))^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**42.34**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	110.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$/D)*[1+(N,F$_P$/D)]	**LW**	**312.83**	lb/yr
Annual throughput	Q	3,813,147	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	110.00	ft
Constant		0.943	1,000 ft3*gal/bbl
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**39.13**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	61.00	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**217.35**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	110.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.01	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Ethanol	
Total HAP Annual Average Emissions		485.82	
Individual HAP Annual Average Emiss Eq. 40-2 L_{Ti} =Z_{vi}(L$_R$ + L$_F$ + L$_D$) + Z_{vi}L$_W$		L_{Ti}	
hexane		0.272	lb/yr
benzene		0.362	lb/yr
2,2,4 TMP		0.591	lb/yr
toluene		0.862	lb/yr
ethylbenzene		0.144	lb/yr
xylenes		0.711	lb/yr
naphthalene		0.039	lb/yr
cumene		0.049	lb/yr
ethyl alcohol (ethanol)		482.795	lb/yr

Vapor Weight Concentrations Eq. 40-6 Z_{vi} = y_iM$_i$/ M$_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 y_i = P$_i$ / P$_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 x_i = (Z_{vi}M$_v$)/M$_i$

	Z_{vi}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure P_{VAi}=(0.019337)10^(A-(B/(TLA+C)))

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**117**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**13,346,016**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**23**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	5.08 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.37**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_V	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.005	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_V K_C)/12$ months	L_R	**1.46**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_V K_C$)	**LF**	**1.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_V K_C)/12$ months	**LD**	**7.49**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.211	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		0.0147	lb/month
benzene		0.0212	lb/month
TMP		0.0390	lb/month
toluene		0.0616	lb/month
ethylbenzene		0.0113	lb/month
xylenes		0.0563	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		30.7209	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0069	lb/month
benzene		0.0071	lb/month
TMP		0.0077	lb/month
toluene		0.0069	lb/month
ethylbenzene		0.0004	lb/month
xylenes		0.0016	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		5.4334	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol (ethanol)	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**37.50**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_V	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_V K_C)/12$ months	L_R	**1.50**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_V K_C$)	**LF**	**1.50**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_V K_C)/12$ months	**LD**	**8.31**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.215	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		0.0154	lb/month
benzene		0.0219	lb/month
TMP		0.0398	lb/month
toluene		0.0624	lb/month
ethylbenzene		0.0114	lb/month
xylenes		0.0565	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		31.4166	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0075	lb/month
benzene		0.0078	lb/month
TMP		0.0085	lb/month
toluene		0.0076	lb/month
ethylbenzene		0.0004	lb/month
xylenes		0.0018	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		6.1292	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol (ethanol)	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**41.94**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_V	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.008	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_V K_C)/12$ months	L_R	**2.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_V K_C$)	**LF**	**2.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_V K_C)/12$ months	**LD**	**11.54**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.227	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		0.0179	lb/month
benzene		0.0247	lb/month
2,2,4 TMP		0.0430	lb/month
toluene		0.0655	lb/month
ethylbenzene		0.0116	lb/month
xylenes		0.0574	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		34.2265	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0100	lb/month
benzene		0.0106	lb/month
2,2,4 TMP		0.0117	lb/month
toluene		0.0108	lb/month
ethylbenzene		0.0006	lb/month
xylenes		0.0026	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		8.9390	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol (ethanol)	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2781

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**50.76**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.50**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**3.23**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**17.96**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.252	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_B + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0225	lb/month
benzene		0.0300	lb/month
2,2,4 TMP		0.0491	lb/month
toluene		0.0717	lb/month
ethylbenzene		0.0120	lb/month
xylenes		0.0592	lb/month
naphthalene		0.0033	lb/month
cumene		0.0041	lb/month
ethyl alcohol (ethanol)		40.0854	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_B + L_F + L_D)$			
		Standing losses	
hexane		0.0147	lb/month
benzene		0.0159	lb/month
2,2,4 TMP		0.0178	lb/month
toluene		0.0169	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0044	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		14.7979	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**61.01**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**4.95**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**4.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**25.41**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.280	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_B + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0277	lb/month
benzene		0.0360	lb/month
2,2,4 TMP		0.0561	lb/month
toluene		0.0789	lb/month
ethylbenzene		0.0125	lb/month
xylenes		0.0614	lb/month
naphthalene		0.0033	lb/month
cumene		0.0042	lb/month
ethyl alcohol (ethanol)		47.2044	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_B + L_F + L_D)$			
		Standing losses	
hexane		0.0198	lb/month
benzene		0.0219	lb/month
2,2,4 TMP		0.0248	lb/month
toluene		0.0241	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0066	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		21.9170	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**73.41**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**6.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**6.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**34.43**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.313	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_B + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0335	lb/month
benzene		0.0429	lb/month
2,2,4 TMP		0.0643	lb/month
toluene		0.0876	lb/month
ethylbenzene		0.0131	lb/month
xylenes		0.0641	lb/month
naphthalene		0.0033	lb/month
cumene		0.0043	lb/month
ethyl alcohol (ethanol)		56.1040	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_B + L_F + L_D)$			
		Standing losses	
hexane		0.0257	lb/month
benzene		0.0288	lb/month
2,2,4 TMP		0.0330	lb/month
toluene		0.0328	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0093	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		30.8165	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**79.48**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**7.57**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**7.00**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**38.85**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.329	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0363	lb/month
benzene		0.0462	lb/month
2,2,4 TMP		0.0682	lb/month
toluene		0.0918	lb/month
ethylbenzene		0.0134	lb/month
xylenes		0.0655	lb/month
naphthalene		0.0033	lb/month
cumene		0.0043	lb/month
ethyl alcohol (ethanol)		60.5529	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0285	lb/month
benzene		0.0322	lb/month
2,2,4 TMP		0.0370	lb/month
toluene		0.0371	lb/month
ethylbenzene		0.0024	lb/month
xylenes		0.0107	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		35.2654	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.66022

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol (ethanol)	1.085703	1.551	0.70020

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0554

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**77.00**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temper	T_{AX}	539.70	°R
Average daily minimum ambient temper	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**7.22**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**6.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**37.04**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.323	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0352	lb/month
benzene		0.0449	lb/month
2,2,4 TMP		0.0666	lb/month
toluene		0.0901	lb/month
ethylbenzene		0.0133	lb/month
xylenes		0.0649	lb/month
naphthalene		0.0033	lb/month
cumene		0.0043	lb/month
ethyl alcohol (ethanol)		58.7275	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0274	lb/month
benzene		0.0308	lb/month
2,2,4 TMP		0.0353	lb/month
toluene		0.0353	lb/month
ethylbenzene		0.0023	lb/month
xylenes		0.0101	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		33.4400	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65659

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol (ethanol)	1.032134	1.482	0.69635

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0033

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**65.05**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**5.52**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**5.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**28.36**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.291	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0296	lb/month
benzene		0.0383	lb/month
2,2,4 TMP		0.0588	lb/month
toluene		0.0817	lb/month
ethylbenzene		0.0127	lb/month
xylenes		0.0622	lb/month
naphthalene		0.0033	lb/month
cumene		0.0042	lb/month
ethyl alcohol (ethanol)		50.0782	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0218	lb/month
benzene		0.0242	lb/month
2,2,4 TMP		0.0275	lb/month
toluene		0.0270	lb/month
ethylbenzene		0.0017	lb/month
xylenes		0.0075	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		24.7907	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.63591

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol (ethanol)	0.774645	1.149	0.67442

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0014	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.7530

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**51.88**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.66**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**3.38**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**18.77**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.255	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		0.0231	lb/month
benzene		0.0307	lb/month
2,2,4 TMP		0.0499	lb/month
toluene		0.0725	lb/month
ethylbenzene		0.0120	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0033	lb/month
cumene		0.0041	lb/month
ethyl alcohol (ethanol)		40.8497	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0153	lb/month
benzene		0.0166	lb/month
2,2,4 TMP		0.0186	lb/month
toluene		0.0177	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0047	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		15.5623	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**44.33**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**2.59**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**2.39**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**13.28**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.234	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		0.0192	lb/month
benzene		0.0262	lb/month
2,2,4 TMP		0.0447	lb/month
toluene		0.0672	lb/month
ethylbenzene		0.0117	lb/month
xylenes		0.0579	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		35.7817	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0113	lb/month
benzene		0.0121	lb/month
2,2,4 TMP		0.0134	lb/month
toluene		0.0124	lb/month
ethylbenzene		0.0007	lb/month
xylenes		0.0031	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		10.4942	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
2,2,4 TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**38.54**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	317,762.28	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**1.77**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**26.07**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**1.63**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**9.07**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.218	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		0.0160	lb/month
benzene		0.0226	lb/month
TMP		0.0405	lb/month
toluene		0.0631	lb/month
ethylbenzene		0.0114	lb/month
xylenes		0.0567	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		32.0664	lb/month
Individual HAP Monthly Emi Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0081	lb/month
benzene		0.0085	lb/month
TMP		0.0093	lb/month
toluene		0.0084	lb/month
ethylbenzene		0.0005	lb/month
xylenes		0.0020	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		6.7790	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0078	lb/month
benzene		0.0141	lb/month
TMP		0.0313	lb/month
toluene		0.0547	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		25.2874	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 117			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Component (Average RVP 14.33)	
Vapor Molecular weight	M_v	**61**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.61**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4971.67**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**14.33**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**42,180,000**	gal/yr
Turnovers	N	**12.90**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
			Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	23	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			61.00 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**4,188.94**	lb/year
		2.09	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	6.459	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.146	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**583.29**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_V/D)*[1+(N_FF_C/D)]$	**LW**	**72.32**	lb/yr
Annual throughput	Q	1,004,286	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	110.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**539.10**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	61.00	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.15	
Average vapor molecular weight	Mv	60.67	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**2,994.23**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	110.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.15	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.67	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			blendstock
Total HAP Annual Average Emissions				278.64
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				204.150 lb/yr
benzene				18.648 lb/yr
2,2,4 TMP				20.223 lb/yr
toluene				23.072 lb/yr
ethylbenzene				2.866 lb/yr
xylenes				9.378 lb/yr
naphthalene				0.306 lb/yr
cumene				0.521 lb/yr

Vapor Weight Concentrations Eq. 40-t $Z_{Vi}=y_iM_i/M_V$

		M_i	M_V	Z_{Vi}
hexane	86.18	61		0.04720
benzene	78.11	61		0.00418
2,2,4 TMP	114.23	61		0.00421
toluene	92.14	61		0.00429
ethylbenzene	106.17	61		0.00034
xylenes	106.17	61		0.00105
naphthalene	128.17	61		0.00000
cumene	120.19	61		0.00004

Vapor Mole Fraction Eq. 40-5 $y_i=P_i/P_{VA}$

	$P_i=P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.214637	6.459	0.03323
benzene	0.020964	6.459	0.00325
2,2,4 TMP	0.014442	6.459	0.00224
toluene	0.018233	6.459	0.00282
ethylbenzene	0.001273	6.459	0.00020
xylenes	0.003869	6.459	0.00060
naphthalene	0.000005	6.459	0.00000
cumene	0.000126	6.459	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i=(Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**117**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**14.33**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**3,515,000**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	23	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	5.08	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**185.58**	lb/month
		0.09	tons/month
Product Type — Component (Average RVP 14.33)			
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	3.831	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.076	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**25.44**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**23.51**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**130.60**	lb/month
HAPS Speciation			
Product - select from list		blendstock	
Total HAP Monthly Emissions		10.766	lb/month
Individual HAP Monthly Emissions — Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		7.5508	lb/month
benzene		0.6871	lb/month
TMP		0.7942	lb/month
toluene		0.9802	lb/month
ethylbenzene		0.1584	lb/month
xylenes		0.5362	lb/month
naphthalene		0.0251	lb/month
cumene		0.0341	lb/month
Individual HAP Monthly Emissions — Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		6.7312	lb/month
benzene		0.5665	lb/month
TMP		0.5531	lb/month
toluene		0.5282	lb/month
ethylbenzene		0.0379	lb/month
xylenes		0.1143	lb/month
naphthalene		0.0001	lb/month
cumene		0.0039	lb/month
Individual HAP Monthly Emissions — Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.03749
benzene	78.11	61	0.00316
2,2,4 TMP	114.23	61	0.00308
toluene	92.14	61	0.00294
ethylbenzene	106.17	61	0.00021
xylenes	106.17	61	0.00064
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.101104	3.831	0.02639
benzene	0.009388	3.831	0.00245
2,2,4 TMP	0.006268	3.831	0.00164
toluene	0.007421	3.831	0.00194
ethylbenzene	0.000462	3.831	0.00012
xylenes	0.001393	3.831	0.00036
naphthalene	0.0000012	3.831	0.00000
cumene	0.0000423	3.831	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**199.12**	lb/month
		0.10	tons/month
Product Type — Component (Average RVP 14.33)			
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.076	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.082	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**27.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**25.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**140.45**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		11.699	lb/month
Individual HAP Monthly Emissions — Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		8.2659	lb/month
benzene		0.7511	lb/month
TMP		0.8590	lb/month
toluene		1.0467	lb/month
ethylbenzene		0.1638	lb/month
xylenes		0.5525	lb/month
naphthalene		0.0252	lb/month
cumene		0.0347	lb/month
Individual HAP Monthly Emissions — Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		7.4462	lb/month
benzene		0.6306	lb/month
TMP		0.6180	lb/month
toluene		0.5947	lb/month
ethylbenzene		0.0432	lb/month
xylenes		0.1306	lb/month
naphthalene		0.0001	lb/month
cumene		0.0045	lb/month
Individual HAP Monthly Emissions — Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.03856
benzene	78.11	61	0.00327
2,2,4 TMP	114.23	61	0.00320
toluene	92.14	61	0.00308
ethylbenzene	106.17	61	0.00022
xylenes	106.17	61	0.00068
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.110658	4.076	0.02715
benzene	0.010339	4.076	0.00254
2,2,4 TMP	0.006928	4.076	0.00170
toluene	0.008266	4.076	0.00203
ethylbenzene	0.000521	4.076	0.00013
xylenes	0.001576	4.076	0.00039
naphthalene	0.000001	4.076	0.00000
cumene	0.000048	4.076	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**250.11**	lb/month
		0.13	tons/month
Product Type — Component (Average RVP 14.33)			
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.952	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.104	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**34.58**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**31.96**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**177.53**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		15.404	lb/month
Individual HAP Monthly Emissions — Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		11.0886	lb/month
benzene		1.0068	lb/month
2,2,4 TMP		1.1199	lb/month
toluene		1.3183	lb/month
ethylbenzene		0.1863	lb/month
xylenes		0.6211	lb/month
naphthalene		0.0253	lb/month
cumene		0.0372	lb/month
Individual HAP Monthly Emissions — Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		10.2690	lb/month
benzene		0.8863	lb/month
2,2,4 TMP		0.8789	lb/month
toluene		0.8663	lb/month
ethylbenzene		0.0658	lb/month
xylenes		0.1992	lb/month
naphthalene		0.0002	lb/month
cumene		0.0071	lb/month
Individual HAP Monthly Emissions — Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.04207
benzene	78.11	61	0.00363
2,2,4 TMP	114.23	61	0.00360
toluene	92.14	61	0.00355
ethylbenzene	106.17	61	0.00027
xylenes	106.17	61	0.00082
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.146679	4.952	0.02962
benzene	0.013968	4.952	0.00282
2,2,4 TMP	0.009471	4.952	0.00191
toluene	0.011574	4.952	0.00234
ethylbenzene	0.000763	4.952	0.00015
xylenes	0.002310	4.952	0.00047
naphthalene	0.000002	4.952	0.00000
cumene	0.000073	4.952	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**346.73**	lb/month
		0.17	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.426	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.145	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**48.27**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**44.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**247.81**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		23.069	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		16.8666	lb/month
benzene		1.5404	lb/month
2,2,4 TMP		1.6711	lb/month
toluene		1.9073	lb/month
ethylbenzene		0.2375	lb/month
xylenes		0.7773	lb/month
naphthalene		0.0255	lb/month
cumene		0.0433	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		16.0470	lb/month
benzene		1.4199	lb/month
2,2,4 TMP		1.4300	lb/month
toluene		1.4554	lb/month
ethylbenzene		0.1169	lb/month
xylenes		0.3555	lb/month
naphthalene		0.0005	lb/month
cumene		0.0131	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	61	0.04710
benzene	78.11	61	0.00417
2,2,4 TMP	114.23	61	0.00420
toluene	92.14	61	0.00427
ethylbenzene	106.17	61	0.00034
xylenes	106.17	61	0.00104
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.213074	6.426	0.03316
benzene	0.020801	6.426	0.00324
2,2,4 TMP	0.014325	6.426	0.00223
toluene	0.018074	6.426	0.00281
ethylbenzene	0.001260	6.426	0.00020
xylenes	0.003831	6.426	0.00060
naphthalene	0.000004	6.426	0.00000
cumene	0.000125	6.426	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**458.69**	lb/month
		0.23	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.870	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.192	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**64.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**59.28**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**329.24**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		32.672	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		24.0312	lb/month
benzene		2.2135	lb/month
2,2,4 TMP		2.3744	lb/month
toluene		2.6775	lb/month
ethylbenzene		0.3071	lb/month
xylenes		0.9908	lb/month
naphthalene		0.0259	lb/month
cumene		0.0517	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		23.2116	lb/month
benzene		2.0929	lb/month
2,2,4 TMP		2.1333	lb/month
toluene		2.2255	lb/month
ethylbenzene		0.1866	lb/month
xylenes		0.5689	lb/month
naphthalene		0.0009	lb/month
cumene		0.0216	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	61	0.05128
benzene	78.11	61	0.00462
2,2,4 TMP	114.23	61	0.00471
toluene	92.14	61	0.00492
ethylbenzene	106.17	61	0.00041
xylenes	106.17	61	0.00126
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.284116	7.870	0.03610
benzene	0.028265	7.870	0.00359
2,2,4 TMP	0.019700	7.870	0.00250
toluene	0.025479	7.870	0.00324
ethylbenzene	0.001854	7.870	0.00024
xylenes	0.005652	7.870	0.00072
naphthalene	0.000007	7.870	0.00000
cumene	0.000189	7.870	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**601.65**	lb/month
		0.30	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.377	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.253	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**84.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**78.00**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**433.23**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		45.632	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		33.6237	lb/month
benzene		3.1261	lb/month
2,2,4 TMP		3.3362	lb/month
toluene		3.7504	lb/month
ethylbenzene		0.4071	lb/month
xylenes		1.2981	lb/month
naphthalene		0.0265	lb/month
cumene		0.0641	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		32.8041	lb/month
benzene		3.0056	lb/month
2,2,4 TMP		3.0952	lb/month
toluene		3.2984	lb/month
ethylbenzene		0.2866	lb/month
xylenes		0.8763	lb/month
naphthalene		0.0015	lb/month
cumene		0.0340	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	61	0.05508
benzene	78.11	61	0.00505
2,2,4 TMP	114.23	61	0.00520
toluene	92.14	61	0.00554
ethylbenzene	106.17	61	0.00048
xylenes	106.17	61	0.00147
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.363565	9.377	0.03877
benzene	0.036752	9.377	0.00392
2,2,4 TMP	0.025880	9.377	0.00276
toluene	0.034191	9.377	0.00365
ethylbenzene	0.002578	9.377	0.00027
xylenes	0.007883	9.377	0.00084
naphthalene	0.000011	9.377	0.00000
cumene	0.000270	9.377	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**677.32**	lb/month
		0.34	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.046	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.285	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**95.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**87.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**488.27**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		52.694	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		38.8271	lb/month
benzene		3.6245	lb/month
2,2,4 TMP		3.8641	lb/month
toluene		4.3453	lb/month
ethylbenzene		0.4635	lb/month
xylenes		1.4718	lb/month
naphthalene		0.0269	lb/month
cumene		0.0712	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		38.0075	lb/month
benzene		3.5040	lb/month
2,2,4 TMP		3.6230	lb/month
toluene		3.8933	lb/month
ethylbenzene		0.3430	lb/month
xylenes		1.0499	lb/month
naphthalene		0.0019	lb/month
cumene		0.0410	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.05662
benzene	78.11	61	0.00522
2,2,4 TMP	114.23	61	0.00540
toluene	92.14	61	0.00580
ethylbenzene	106.17	61	0.00051
xylenes	106.17	61	0.00156
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.400431	10.046	0.03986
benzene	0.040731	10.046	0.00405
2,2,4 TMP	0.028797	10.046	0.00287
toluene	0.038365	10.046	0.00382
ethylbenzene	0.002933	10.046	0.00029
xylenes	0.008979	10.046	0.00089
naphthalene	0.000013	10.046	0.00000
cumene	0.000310	10.046	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**645.80**	lb/month
		0.32	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is know	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.777	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.272	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**90.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**83.78**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**465.34**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		49.740	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		36.6521	lb/month
benzene		3.4160	lb/month
2,2,4 TMP		3.6433	lb/month
toluene		4.0958	lb/month
ethylbenzene		0.4398	lb/month
xylenes		1.3987	lb/month
naphthalene		0.0267	lb/month
cumene		0.0682	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		35.8324	lb/month
benzene		3.2954	lb/month
2,2,4 TMP		3.4020	lb/month
toluene		3.6438	lb/month
ethylbenzene		0.3193	lb/month
xylenes		0.9769	lb/month
naphthalene		0.0017	lb/month
cumene		0.0381	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40 2 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.05601
benzene	78.11	61	0.00515
2,2,4 TMP	114.23	61	0.00532
toluene	92.14	61	0.00570
ethylbenzene	106.17	61	0.00050
xylenes	106.17	61	0.00153
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.385503	9.777	0.03943
benzene	0.039117	9.777	0.00400
2,2,4 TMP	0.027613	9.777	0.00282
toluene	0.036666	9.777	0.00375
ethylbenzene	0.002788	9.777	0.00029
xylenes	0.008531	9.777	0.00087
naphthalene	0.000013	9.777	0.00000
cumene	0.000294	9.777	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**504.04**	lb/month
		0.25	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.386	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.211	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**70.56**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**65.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**362.23**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		36.716	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		27.0317	lb/month
benzene		2.4978	lb/month
2,2,4 TMP		2.6733	lb/month
toluene		3.0090	lb/month
ethylbenzene		0.3377	lb/month
xylenes		1.0847	lb/month
naphthalene		0.0261	lb/month
cumene		0.0555	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		26.2121	lb/month
benzene		2.3773	lb/month
2,2,4 TMP		2.4322	lb/month
toluene		2.5570	lb/month
ethylbenzene		0.2172	lb/month
xylenes		0.6629	lb/month
naphthalene		0.0011	lb/month
cumene		0.0253	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.05263
benzene	78.11	61	0.00477
2,2,4 TMP	114.23	61	0.00488
toluene	92.14	61	0.00513
ethylbenzene	106.17	61	0.00044
xylenes	106.17	61	0.00133
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.310724	8.386	0.03705
benzene	0.031093	8.386	0.00371
2,2,4 TMP	0.021752	8.386	0.00259
toluene	0.028350	8.386	0.00338
ethylbenzene	0.002090	8.386	0.00025
xylenes	0.006378	8.386	0.00076
naphthalene	0.000009	8.386	0.00000
cumene	0.000215	8.386	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**358.87**	lb/month
		0.18	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	^oR
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	T_{LA}	**511.10**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.595	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.150	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**49.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	L_W	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**46.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**256.64**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		24.079	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		17.6230	lb/month
benzene		1.6110	lb/month
2,2,4 TMP		1.7445	lb/month
toluene		1.9869	lb/month
ethylbenzene		0.2445	lb/month
xylenes		0.7990	lb/month
naphthalene		0.0255	lb/month
cumene		0.0441	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		16.8034	lb/month
benzene		1.4904	lb/month
2,2,4 TMP		1.5034	lb/month
toluene		1.5349	lb/month
ethylbenzene		0.1240	lb/month
xylenes		0.3771	lb/month
naphthalene		0.0005	lb/month
cumene		0.0140	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.04762
benzene	78.11	61	0.00422
2,2,4 TMP	114.23	61	0.00426
toluene	92.14	61	0.00435
ethylbenzene	106.17	61	0.00035
xylenes	106.17	61	0.00107
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.221121	6.595	0.03353
benzene	0.021639	6.595	0.00328
2,2,4 TMP	0.014926	6.595	0.00226
toluene	0.018892	6.595	0.00286
ethylbenzene	0.001325	6.595	0.00020
xylenes	0.004028	6.595	0.00061
naphthalene	0.000005	6.595	0.00000
cumene	0.000132	6.595	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**276.64**	lb/month
		0.14	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	^oR
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	T_{LA}	**500.61**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.380	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.115	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**38.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	L_W	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**35.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**196.83**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		17.435	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		12.6265	lb/month
benzene		1.1477	lb/month
2,2,4 TMP		1.2647	lb/month
toluene		1.4714	lb/month
ethylbenzene		0.1994	lb/month
xylenes		0.6609	lb/month
naphthalene		0.0253	lb/month
cumene		0.0387	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		11.8069	lb/month
benzene		1.0272	lb/month
2,2,4 TMP		1.0237	lb/month
toluene		1.0194	lb/month
ethylbenzene		0.0788	lb/month
xylenes		0.2390	lb/month
naphthalene		0.0003	lb/month
cumene		0.0086	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
2,2,4 TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.04363
benzene	78.11	61	0.00380
2,2,4 TMP	114.23	61	0.00378
toluene	92.14	61	0.00377
ethylbenzene	106.17	61	0.00029
xylenes	106.17	61	0.00088
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.165254	5.380	0.03071
benzene	0.015863	5.380	0.00295
2,2,4 TMP	0.010809	5.380	0.00201
toluene	0.013345	5.380	0.00248
ethylbenzene	0.000895	5.380	0.00017
xylenes	0.002715	5.380	0.00050
naphthalene	0.000003	5.380	0.00000
cumene	0.000086	5.380	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**211.38**	lb/month
		0.11	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	^oR
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	T_{LA}	**489.49**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.294	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.087	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**29.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	L_W	**6.03**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**26.89**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**149.36**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		12.563	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		8.9265	lb/month
benzene		0.8106	lb/month
TMP		0.9194	lb/month
toluene		1.1090	lb/month
ethylbenzene		0.1689	lb/month
xylenes		0.5680	lb/month
naphthalene		0.0252	lb/month
cumene		0.0352	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		8.1069	lb/month
benzene		0.6900	lb/month
TMP		0.6784	lb/month
toluene		0.6570	lb/month
ethylbenzene		0.0483	lb/month
xylenes		0.1461	lb/month
naphthalene		0.0002	lb/month
cumene		0.0051	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.8196	lb/month
benzene		0.1205	lb/month
TMP		0.2411	lb/month
toluene		0.4520	lb/month
ethylbenzene		0.1205	lb/month
xylenes		0.4219	lb/month
naphthalene		0.0250	lb/month
cumene		0.0301	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.03948
benzene	78.11	61	0.00336
2,2,4 TMP	114.23	61	0.00330
toluene	92.14	61	0.00320
ethylbenzene	106.17	61	0.00024
xylenes	106.17	61	0.00071
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.119325	4.294	0.02779
benzene	0.011206	4.294	0.00261
2,2,4 TMP	0.007533	4.294	0.00175
toluene	0.009046	4.294	0.00211
ethylbenzene	0.000577	4.294	0.00013
xylenes	0.001746	4.294	0.00041
naphthalene	0.000002	4.294	0.00000
cumene	0.000054	4.294	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 117			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**41,096,596**	gal/yr
Turnovers	N	**12.57**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	23	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		61.00	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**2,439.05**	lb/year
		1.22	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**294.96**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**357.34**	lb/yr
Annual throughput	Q	978,490	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	110.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**272.61**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	61.00	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**1,514.13**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	110.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			Crude Oil	
Total HAP Annual Average Emissions				29.27	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}	
hexane				7.295	lb/yr
benzene				7.441	lb/yr
2,2,4 TMP				0.802	lb/yr
toluene				5.989	lb/yr
ethylbenzene				1.721	lb/yr
xylenes				5.889	lb/yr
naphthalene				0.132	lb/yr
cumene				0.000	lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_V$					
		M_i	**M_V**	**Z_{Vi}**	
hexane	86.18	50		0.00282	
benzene	78.11	50		0.00254	
2,2,4 TMP	114.23	50		0.00021	
toluene	92.14	50		0.00116	
ethylbenzene	106.17	50		0.00014	
xylenes	106.17	50		0.00043	
naphthalene	128.17	50		0.00000	
cumene	120.19	50		0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$					
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**	
hexane	0.014204		8.688	0.00163	
benzene	0.014150		8.688	0.00163	
2,2,4 TMP	0.000812		8.688	0.00009	
toluene	0.005470		8.688	0.00063	
ethylbenzene	0.000573		8.688	0.00007	
xylenes	0.001741		8.688	0.00020	
naphthalene	0.000001		8.688	0.00000	
cumene	0.000000		8.688	-	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$					
	Z_{Li}	**M_L**		**M_i**	**X_i**
hexane	0.004	207		86.18	0.00961
benzene	0.006	207		78.11	0.01590
2,2,4 TMP	0.001	207		114.23	0.00181
toluene	0.01	207		92.14	0.02247
ethylbenzene	0.004	207		106.17	0.00780
xylenes	0.014	207		106.17	0.02730
naphthalene	0.0	207		128.17	0.00059
cumene	0.0	207		120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$					
	A	**B**	**C**	**P_{VAi}**	
hexane	6.878	1171.5	224.37	1.4784	
benzene	6.906	1211	220.79	0.8899	
2,2,4 TMP	6.812	1257.8	220.74	0.4483	
toluene	7.017	1377.6	222.64	0.2435	
ethylbenzene	6.95	1419.3	212.61	0.0734	
xylenes	7.009	1462.3	215.11	0.0638	
naphthalene	7.146	1831.6	211.82	0.0015	
cumene	6.929	1455.8	207.2	0.0330	

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**117**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**3,424,716**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	23	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	5.08	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**123.51**	lb/month
		0.06	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**13.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**12.28**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**68.18**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		1.643	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.3123	lb/month
benzene		0.3445	lb/month
TMP		0.0433	lb/month
toluene		0.3665	lb/month
ethylbenzene		0.1265	lb/month
xylenes		0.4392	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.1932	lb/month
benzene		0.1659	lb/month
TMP		0.0135	lb/month
toluene		0.0687	lb/month
ethylbenzene		0.0074	lb/month
xylenes		0.0223	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**130.03**	lb/month
		0.07	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**14.20**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**13.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**72.92**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		1.699	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.3338	lb/month
benzene		0.3641	lb/month
TMP		0.0449	lb/month
toluene		0.3755	lb/month
ethylbenzene		0.1276	lb/month
xylenes		0.4425	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.2147	lb/month
benzene		0.1854	lb/month
TMP		0.0151	lb/month
toluene		0.0777	lb/month
ethylbenzene		0.0085	lb/month
xylenes		0.0256	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-*l* $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**154.62**	lb/month
		0.08	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**17.69**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**16.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**90.81**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		1.927	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.4198	lb/month
benzene		0.4434	lb/month
2,2,4 TMP		0.0517	lb/month
toluene		0.4128	lb/month
ethylbenzene		0.1322	lb/month
xylenes		0.4566	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.3007	lb/month
benzene		0.2647	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.1150	lb/month
ethylbenzene		0.0131	lb/month
xylenes		0.0397	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**202.08**	lb/month
		0.10	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**24.41**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**22.56**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**125.32**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.426	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.6032	lb/month
benzene		0.6155	lb/month
2,2,4 TMP		0.0664	lb/month
toluene		0.4968	lb/month
ethylbenzene		0.1431	lb/month
xylenes		0.4898	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4841	lb/month
benzene		0.4369	lb/month
2,2,4 TMP		0.0367	lb/month
toluene		0.1990	lb/month
ethylbenzene		0.0240	lb/month
xylenes		0.0729	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**259.82**	lb/month
		0.13	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**32.60**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**30.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**167.32**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.100	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.8455	lb/month
benzene		0.8468	lb/month
2,2,4 TMP		0.0865	lb/month
toluene		0.6135	lb/month
ethylbenzene		0.1588	lb/month
xylenes		0.5380	lb/month
naphthalene		0.0111	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7264	lb/month
benzene		0.6681	lb/month
2,2,4 TMP		0.0567	lb/month
toluene		0.3157	lb/month
ethylbenzene		0.0397	lb/month
xylenes		0.1211	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**341.37**	lb/month
		0.17	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**44.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**40.81**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**226.64**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.118	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.2054	lb/month
benzene		1.1939	lb/month
2,2,4 TMP		0.1169	lb/month
toluene		0.7929	lb/month
ethylbenzene		0.1836	lb/month
xylenes		0.6142	lb/month
naphthalene		0.0111	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0863	lb/month
benzene		1.0152	lb/month
2,2,4 TMP		0.0871	lb/month
toluene		0.4952	lb/month
ethylbenzene		0.0645	lb/month
xylenes		0.1973	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**390.54**	lb/month
		0.20	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**51.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**47.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**262.40**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.747	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.4261	lb/month
benzene		1.4078	lb/month
2,2,4 TMP		0.1357	lb/month
toluene		0.9047	lb/month
ethylbenzene		0.1993	lb/month
xylenes		0.6624	lb/month
naphthalene		0.0112	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3070	lb/month
benzene		1.2291	lb/month
2,2,4 TMP		0.1059	lb/month
toluene		0.6070	lb/month
ethylbenzene		0.0802	lb/month
xylenes		0.2455	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**369.37**	lb/month
		0.18	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**48.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**44.47**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**247.01**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.476	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.3310	lb/month
benzene		1.3155	lb/month
2,2,4 TMP		0.1276	lb/month
toluene		0.8565	lb/month
ethylbenzene		0.1925	lb/month
xylenes		0.6416	lb/month
naphthalene		0.0111	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2119	lb/month
benzene		1.1369	lb/month
2,2,4 TMP		0.0978	lb/month
toluene		0.5587	lb/month
ethylbenzene		0.0734	lb/month
xylenes		0.2247	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**284.51**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**36.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**33.36**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**185.28**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.403	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.9530	lb/month
benzene		0.9501	lb/month
2,2,4 TMP		0.0955	lb/month
toluene		0.6666	lb/month
ethylbenzene		0.1661	lb/month
xylenes		0.5603	lb/month
naphthalene		0.0111	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.8339	lb/month
benzene		0.7714	lb/month
2,2,4 TMP		0.0658	lb/month
toluene		0.3688	lb/month
ethylbenzene		0.0470	lb/month
xylenes		0.1434	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**208.17**	lb/month
		0.10	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.843	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.230	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**25.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**23.36**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**129.75**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.494	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.6279	lb/month
benzene		0.6390	lb/month
2,2,4 TMP		0.0685	lb/month
toluene		0.5085	lb/month
ethylbenzene		0.1446	lb/month
xylenes		0.4945	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.5088	lb/month
benzene		0.4603	lb/month
2,2,4 TMP		0.0387	lb/month
toluene		0.2107	lb/month
ethylbenzene		0.0255	lb/month
xylenes		0.0776	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00285
benzene	78.11	50	0.00258
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00118
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00044
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAI}(X_i)$	**P_{VA}**	**y_i**
hexane	0.014633	8.843	0.00165
benzene	0.014607	8.843	0.00165
2,2,4 TMP	0.000840	8.843	0.00009
toluene	0.005668	8.843	0.00064
ethylbenzene	0.000596	8.843	0.00007
xylenes	0.001813	8.843	0.00020
naphthalene	0.000001	8.843	0.00000
cumene	0.000000	8.843	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**167.51**	lb/month
		0.08	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.448	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.177	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**19.52**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**18.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**100.18**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.056	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.4677	lb/month
benzene		0.4880	lb/month
2,2,4 TMP		0.0555	lb/month
toluene		0.4342	lb/month
ethylbenzene		0.1349	lb/month
xylenes		0.4649	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.3486	lb/month
benzene		0.3093	lb/month
2,2,4 TMP		0.0257	lb/month
toluene		0.1364	lb/month
ethylbenzene		0.0158	lb/month
xylenes		0.0480	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
2,2,4 TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00253
benzene	78.11	50	0.00225
2,2,4 TMP	114.23	50	0.00019
toluene	92.14	50	0.00099
ethylbenzene	106.17	50	0.00011
xylenes	106.17	50	0.00035
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAI}(X_i)$	**P_{VA}**	**y_i**
hexane	0.010936	7.448	0.00147
benzene	0.010707	7.448	0.00144
2,2,4 TMP	0.000608	7.448	0.00008
toluene	0.004003	7.448	0.00054
ethylbenzene	0.000403	7.448	0.00005
xylenes	0.001222	7.448	0.00016
naphthalene	0.000001	7.448	0.00000
cumene	0.000000	7.448	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**135.93**	lb/month
		0.07	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	81,540.87	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.158	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**15.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**29.78**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**13.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**77.21**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		1.752	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.3537	lb/month
benzene		0.3823	lb/month
TMP		0.0465	lb/month
toluene		0.3840	lb/month
ethylbenzene		0.1286	lb/month
xylenes		0.4456	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.2346	lb/month
benzene		0.2037	lb/month
TMP		0.0167	lb/month
toluene		0.0862	lb/month
ethylbenzene		0.0095	lb/month
xylenes		0.0287	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1191	lb/month
benzene		0.1787	lb/month
TMP		0.0298	lb/month
toluene		0.2978	lb/month
ethylbenzene		0.1191	lb/month
xylenes		0.4169	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00221
benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAI}(X_i)$	**P_{VA}**	**y_i**
hexane	0.007897	6.158	0.00128
benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.002714	6.158	0.00044
ethylbenzene	0.000260	6.158	0.00004
xylenes	0.000785	6.158	0.00013
naphthalene	0.000000	6.158	0.00000
cumene	0.000000	6.158	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA *Input data in Green. Select Cells in Red to open the drop down selection list.*	Symbol		Units
Tank No. 117			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**126,942,819**	gal/yr
Turnovers	N	**38.81**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	23	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			61.00 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**280.82**	lb/year
		0.14	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.69**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Shell height	Hs	**48.00**	ft
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	110.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_L/D)*[1+(N_FF_C/D)]$	**LW**	**275.95**	lb/yr
Annual throughput	Q	3,022,448	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	110.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**0.64**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	61.00	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**3.54**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	110.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:			Diesel	
Total HAP Annual Average Emissions			1.56	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$			L_{TI}	
hexane			0.003	lb/yr
benzene			0.013	lb/yr
2,2,4 TMP			0.000	lb/yr
toluene			0.206	lb/yr
ethylbenzene			0.050	lb/yr
xylenes			1.079	lb/yr
naphthalene			0.210	lb/yr
cumene			0.000	lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$				
		M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00046	
benzene	78.11	130	0.00220	
2,2,4 TMP	114.23	130	0.00000	
toluene	92.14	130	0.02408	
ethylbenzene	106.17	130	0.00295	
xylenes	106.17	130	0.05712	
naphthalene	128.17	130	0.00036	
cumene	120.19	130	0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069	
benzene	0.000017	0.005	0.00366	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000159	0.005	0.03394	
ethylbenzene	0.000017	0.005	0.00361	
xylenes	0.000328	0.005	0.06994	
naphthalene	0.000002	0.005	0.00036	
cumene	0.000000	0.005	-	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
		A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**117**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**10,578,568**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	23	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	5.08	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.15**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	L_W	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.12**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.108	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0001	lb/month
benzene		0.0006	lb/month
TMP		0.0000	lb/month
toluene		0.0113	lb/month
ethylbenzene		0.0034	lb/month
xylenes		0.0750	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0001	lb/month
benzene		0.0004	lb/month
TMP		0.0000	lb/month
toluene		0.0040	lb/month
ethylbenzene		0.0004	lb/month
xylenes		0.0084	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.17**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	L_W	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.13**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.110	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0001	lb/month
benzene		0.0006	lb/month
TMP		0.0000	lb/month
toluene		0.0118	lb/month
ethylbenzene		0.0035	lb/month
xylenes		0.0761	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0001	lb/month
benzene		0.0004	lb/month
TMP		0.0000	lb/month
toluene		0.0044	lb/month
ethylbenzene		0.0005	lb/month
xylenes		0.0094	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.25**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	L_W	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.18**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.116	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0001	lb/month
benzene		0.0008	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0136	lb/month
ethylbenzene		0.0037	lb/month
xylenes		0.0805	lb/month
naphthalene		0.0175	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0001	lb/month
benzene		0.0006	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0062	lb/month
ethylbenzene		0.0007	lb/month
xylenes		0.0138	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.40**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	**L_R**	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.29**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.130	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0170	lb/month
ethylbenzene		0.0042	lb/month
xylenes		0.0897	lb/month
naphthalene		0.0175	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0097	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0230	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.57**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	**L_R**	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.42**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.146	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0014	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0210	lb/month
ethylbenzene		0.0047	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0176	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0012	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0137	lb/month
ethylbenzene		0.0017	lb/month
xylenes		0.0339	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.79**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.58**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.165	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0017	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0257	lb/month
ethylbenzene		0.0054	lb/month
xylenes		0.1140	lb/month
naphthalene		0.0178	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0016	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0183	lb/month
ethylbenzene		0.0024	lb/month
xylenes		0.0473	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.89**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.13**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.65**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.174	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0279	lb/month
ethylbenzene		0.0057	lb/month
xylenes		0.1205	lb/month
naphthalene		0.0178	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0017	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0206	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0538	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02294
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06008
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00322
2,2,4 TMP	0.000000	0.010	-
toluene	0.000335	0.010	0.03237
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000760	0.010	0.07356
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$	**LT**	**23.85**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.62**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.170	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0270	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.1178	lb/month
naphthalene		0.0178	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0017	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0197	lb/month
ethylbenzene		0.0026	lb/month
xylenes		0.0512	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00195
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02302
ethylbenzene	106.17	130	0.00307
xylenes	106.17	130	0.05992
naphthalene	128.17	130	0.00047
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00059
benzene	0.000032	0.010	0.00325
2,2,4 TMP	0.000000	0.010	-
toluene	0.000320	0.010	0.03248
ethylbenzene	0.000037	0.010	0.00376
xylenes	0.000722	0.010	0.07337
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.64**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.47**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.152	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0226	lb/month
ethylbenzene		0.0050	lb/month
xylenes		0.1049	lb/month
naphthalene		0.0177	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0152	lb/month
ethylbenzene		0.0020	lb/month
xylenes		0.0382	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.42**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.31**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.131	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0175	lb/month
ethylbenzene		0.0042	lb/month
xylenes		0.0908	lb/month
naphthalene		0.0175	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0101	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0242	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00219
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05728
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00364
2,2,4 TMP	0.000000	0.005	-
toluene	0.000165	0.005	0.03388
ethylbenzene	0.000018	0.005	0.00362
xylenes	0.000341	0.005	0.07014
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.29**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.21**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.120	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0145	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0830	lb/month
naphthalene		0.0175	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0001	lb/month
benzene		0.0007	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0072	lb/month
ethylbenzene		0.0008	lb/month
xylenes		0.0163	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00049
benzene	78.11	130	0.00231
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02443
ethylbenzene	106.17	130	0.00288
xylenes	106.17	130	0.05562
naphthalene	128.17	130	0.00031
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.003	0.00074
benzene	0.000013	0.003	0.00384
2,2,4 TMP	0.000000	0.003	-
toluene	0.000116	0.003	0.03447
ethylbenzene	0.000012	0.003	0.00352
xylenes	0.000230	0.003	0.06810
naphthalene	0.000001	0.003	0.00032
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.19**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**23.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.14**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.111	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0001	lb/month
benzene		0.0007	lb/month
TMP		0.0000	lb/month
toluene		0.0122	lb/month
ethylbenzene		0.0035	lb/month
xylenes		0.0772	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0001	lb/month
benzene		0.0005	lb/month
TMP		0.0000	lb/month
toluene		0.0048	lb/month
ethylbenzene		0.0005	lb/month
xylenes		0.0105	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0074	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0667	lb/month
naphthalene		0.0174	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00053
benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.002	-
toluene	0.000079	0.002	0.03500
ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000148	0.002	0.06558
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		117	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**126,942,819**	gal/yr
Turnovers	N	**38.81**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal		Rim-mounted secondary	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	23	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		61.00 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**284.92**	lb/year
		0.14	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.17**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	110.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$ID)/[1+(N,F$_E$/D)]	**LW**	**283.72**	lb/yr
Annual throughput	Q	3,022,448	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	110.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**0.16**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	61.00	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:		biodiesel	
Total HAP Annual Average Emissions			10.78	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_C) + Z_{Li}L_{WF}$			L_{Ti}	
hexane			0.000	lb/yr
benzene			0.000	lb/yr
2,2,4 TMP			0.000	lb/yr
toluene			0.000	lb/yr
ethylbenzene			0.000	lb/yr
xylenes			0.000	lb/yr
naphthalene			0.000	lb/yr
cumene			5.392	lb/yr
methanol			5.392	lb/yr
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$				
		M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.01644	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
		$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.018811	0.005	4.01644	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$				
		Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$				
		A	**B**	**C**	**P_{VA}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**117**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**110.00**	ft
Throughput	Q	**10,578,568**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	

Internal floating roof design data				
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**				
Rim Seal Fit (Average or Tight fitting)		**Average**		
Number of fixed roof support columns	Nc	**0.00**	NA	
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.10**	ft	
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr	
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr	
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr	
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph	
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA	
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2	
Deck Design Data		**Bolted**		
Deck Seam (choose Welded or Bolted)		**Continuous sheet**		
Select Deck Construction Type		**5**		
If bolted continuous sheet or panel, enter width		**0**		
If bolted panel, also enter length		**0.20**		
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	ft/ft^2	

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**23**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	**F_F**	5.08 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.68**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	LF	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.03**	lb/month

HAPS Speciation — Product - select from list — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.2120	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.1647	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.69**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	LF	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.03**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.2306	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.1833	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.71**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	LF	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.05**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.3031	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.2558	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.74**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.07**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4458	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3986	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.01842	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.018648	0.005	4.01842	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.79**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6089	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5616	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.93734	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.007	-	
benzene	0.000000	0.007	-	
2,2,4 TMP	0.000000	0.007	-	
toluene	0.000000	0.007	-	
ethylbenzene	0.000000	0.007	-	
xylenes	0.000000	0.007	-	
naphthalene	0.000000	0.007	-	
cumene	0.000000	0.007	-	
methanol	0.026274	0.007	3.93734	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.84**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.14**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8013	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7541	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0473	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.86270	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.009	-	
benzene	0.000000	0.009	-	
2,2,4 TMP	0.000000	0.009	-	
toluene	0.000000	0.009	-	
ethylbenzene	0.000000	0.009	-	
xylenes	0.000000	0.009	-	
naphthalene	0.000000	0.009	-	
cumene	0.000000	0.009	-	
methanol	0.035276	0.009	3.86270	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July				MONTH August				MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.86**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**23.85**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**23.80**	lb/month
		0.01	tons/month			0.01	tons/month			0.01	tons/month
Product Type		Biodiesel		Product Type		Biodiesel		Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month	Monthly Throughput (only change if actual is know	Q_{month}	251,870.67	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR	Vapor Pressure Equation Constant B	B	8907.00	^oR	Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day	Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day	Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR	TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR	TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR	Average daily maximum ambient temper	T_{AX}	539.70	^oR	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR	Average daily minimum ambient temper	T_{AN}	520.60	^oR	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	532.75		TB = TAA + 0.003 as I	T_B	531.38		TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.03**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.03**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.03**	lb/month	$L_F = F_F P^*M_v K_c)$	**LF**	**0.03**	lb/month	$L_F = F_F P^*M_v K_c)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.16**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.15**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.12**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		biodiesel		**Product - same as January**		biodiesel		**Product - same as January**		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}				L_{Ti}				L_{Ti}	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		0.8938	lb/month	**methanol**		0.8561	lb/month	**methanol**		0.6722	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}((L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}((L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}((L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		0.8465	lb/month	**methanol**		0.8088	lb/month	**methanol**		0.6249	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		0.0473	lb/month	**methanol**		0.0473	lb/month	**methanol**		0.0473	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-** $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**		**M_i**	**M_v**	**Z_{vi}**		**M_i**	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000	hexane	86.18	32	0.00000	hexane	86.18	32	0.00000
benzene	78.11	32	0.00000	benzene	78.11	32	0.00000	benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000	toluene	92.14	32	0.00000	toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000	cumene	120.19	32	0.00000	cumene	120.19	32	0.00000
methanol	32.04	32	3.83221	methanol	32.04	32	3.84429	methanol	32.04	32	3.91078
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(X_i)$	**P_{vA}**	**y_i**		**$P_i = P_{vA}(X_i)$**	**P_{vA}**	**y_i**		**$P_i = P_{vA}(X_i)$**	**P_{vA}**	**y_i**
hexane	0.000000	0.010	-	hexane	0.000000	0.010	-	hexane	0.000000	0.007	-
benzene	0.000000	0.010	-	benzene	0.000000	0.010	-	benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.010	-	toluene	0.000000	0.010	-	toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.010	-	xylenes	0.000000	0.010	-	xylenes	0.000000	0.007	-
naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.007	-
cumene	0.000000	0.010	-	cumene	0.000000	0.010	-	cumene	0.000000	0.007	-
methanol	0.039600	0.010	3.83221	methanol	0.037838	0.010	3.84429	methanol	0.029238	0.007	3.91078
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581	6.878	1171.5	224.37	2.6553	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.7291	6.906	1211	220.79	1.6605	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.8939	6.812	1257.8	220.74	0.8571	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.5123	7.017	1377.6	222.64	0.4896	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1692	6.95	1419.3	212.61	0.1609	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1480	7.009	1462.3	215.11	0.1406	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0045	7.146	1831.6	211.82	0.0042	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0810	6.929	1455.8	207.2	0.0767	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	2.2869	8.079	1581.3	239.65	2.1852	8.079	1581.3	239.65	1.6885

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.75**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.08**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4638	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4165	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.00835

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.019489	0.005	4.00835

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_v M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.72**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.05**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3420	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2947	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0473	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.08439

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.013788	0.003	4.08439

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_v M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.69**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	251,870.67	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.04**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2477	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2004	lb/month
Individual HAP Monthly Emi Working losses $= Z_i L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0473	lb/month

Vapor Weight Concentrations $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16083

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009376	0.002	4.16083

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_v M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 118			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**129,642,796**	gal/yr
Turnovers	N	**47.96**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	80	1.2
Legs (IFR type)	IFR type, Adjustable	58	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			642.60 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**7,912.99**	lb/year
		3.96	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**468.26**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_VW_V/D)*[1+(N_FF_C/D)]$	**LW**	**244.51**	lb/yr
Annual throughput	Q	3,086,733	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	100.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**5,015.03**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	642.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**2,185.20**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	100.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Gasoline
Total HAP Annual Average Emissions		195.63
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		
		L_{TI}
	hexane	31.553 lb/yr
	benzene	35.940 lb/yr
	2,2,4 TMP	45.085 lb/yr
	toluene	50.671 lb/yr
	ethylbenzene	5.447 lb/yr
	xylenes	25.907 lb/yr
	naphthalene	1.027 lb/yr
	cumene	1.547 lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	62	0.00380
benzene	78.11	62	0.00411
2,2,4 TMP	114.23	62	0.00460
toluene	92.14	62	0.00438
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.015782	5.779	0.00273
benzene	0.018867	5.779	0.00326
2,2,4 TMP	0.014442	5.779	0.00250
toluene	0.017017	5.779	0.00294
ethylbenzene	0.000891	5.779	0.00015
xylenes	0.003869	5.779	0.00067
naphthalene	0.000005	5.779	0.00000
cumene	0.000126	5.779	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**118**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**10,803,566**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**80**	1.2	
Legs (IFR type) — IFR type, Adjustable	**58**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	53.55	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**421.22**	lb/month
		0.21	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**24.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**262.14**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**114.22**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		9.589	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		1.3036	lb/month
benzene		1.4998	lb/month
TMP		2.1803	lb/month
toluene		2.5219	lb/month
ethylbenzene		0.3441	lb/month
xylenes		1.6803	lb/month
naphthalene		0.0848	lb/month
cumene		0.1106	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.0999	lb/month
benzene		1.1331	lb/month
TMP		1.2291	lb/month
toluene		1.0957	lb/month
ethylbenzene		0.0589	lb/month
xylenes		0.2540	lb/month
naphthalene		0.0003	lb/month
cumene		0.0087	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2038	lb/month
benzene		0.3668	lb/month
TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**451.57**	lb/month
		0.23	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**26.33**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**281.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**122.87**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.166	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		1.4214	lb/month
benzene		1.6288	lb/month
TMP		2.1803	lb/month
toluene		2.6607	lb/month
ethylbenzene		0.3525	lb/month
xylenes		1.7167	lb/month
naphthalene		0.0849	lb/month
cumene		0.1119	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.2176	lb/month
benzene		1.2621	lb/month
TMP		1.3742	lb/month
toluene		1.2344	lb/month
ethylbenzene		0.0673	lb/month
xylenes		0.2905	lb/month
naphthalene		0.0003	lb/month
cumene		0.0101	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2038	lb/month
benzene		0.3668	lb/month
TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**503.20**	lb/month
		0.25	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**29.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**315.75**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**137.58**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		11.964	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		1.7720	lb/month
benzene		2.0235	lb/month
2,2,4 TMP		2.6404	lb/month
toluene		3.1057	lb/month
ethylbenzene		0.3809	lb/month
xylenes		1.8401	lb/month
naphthalene		0.0851	lb/month
cumene		0.1166	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.5683	lb/month
benzene		1.6567	lb/month
2,2,4 TMP		1.8254	lb/month
toluene		1.6794	lb/month
ethylbenzene		0.0956	lb/month
xylenes		0.4138	lb/month
naphthalene		0.0005	lb/month
cumene		0.0147	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**655.15**	lb/month
		0.33	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ος I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**38.76**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**415.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**180.89**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		16.319	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.6081	lb/month
benzene		2.9707	lb/month
2,2,4 TMP		3.7290	lb/month
toluene		4.1942	lb/month
ethylbenzene		0.4520	lb/month
xylenes		2.1506	lb/month
naphthalene		0.0856	lb/month
cumene		0.1286	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4044	lb/month
benzene		2.6040	lb/month
2,2,4 TMP		2.9140	lb/month
toluene		2.7679	lb/month
ethylbenzene		0.1668	lb/month
xylenes		0.7243	lb/month
naphthalene		0.0010	lb/month
cumene		0.0267	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**560.56**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ος I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**32.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**353.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**153.93**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		19.932	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.2521	lb/month
benzene		3.7311	lb/month
2,2,4 TMP		4.6253	lb/month
toluene		5.1362	lb/month
ethylbenzene		0.5185	lb/month
xylenes		2.4424	lb/month
naphthalene		0.0862	lb/month
cumene		0.1404	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.0483	lb/month
benzene		3.3643	lb/month
2,2,4 TMP		3.8103	lb/month
toluene		3.7099	lb/month
ethylbenzene		0.2333	lb/month
xylenes		1.0161	lb/month
naphthalene		0.0016	lb/month
cumene		0.0385	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**702.39**	lb/month
		0.35	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ος I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**41.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**446.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**194.35**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		25.710	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.2877	lb/month
benzene		4.9467	lb/month
2,2,4 TMP		6.0556	lb/month
toluene		6.6387	lb/month
ethylbenzene		0.6249	lb/month
xylenes		2.9099	lb/month
naphthalene		0.0871	lb/month
cumene		0.1594	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.0840	lb/month
benzene		4.5800	lb/month
2,2,4 TMP		5.2406	lb/month
toluene		5.2124	lb/month
ethylbenzene		0.3397	lb/month
xylenes		1.4836	lb/month
naphthalene		0.0026	lb/month
cumene		0.0575	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**770.70**	lb/month
		0.39	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^D P^* M_v K_c)/12$ months	L_R	**45.82**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v) / D]^* [1+(N_c F_c / D)]$	L_W	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**490.70**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**213.81**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		28.623	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		4.8007	lb/month
benzene		5.5542	lb/month
2,2,4 TMP		6.7745	lb/month
toluene		7.4035	lb/month
ethylbenzene		0.6802	lb/month
xylenes		3.1533	lb/month
naphthalene		0.0877	lb/month
cumene		0.1694	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.5970	lb/month
benzene		5.1874	lb/month
2,2,4 TMP		5.9595	lb/month
toluene		5.9773	lb/month
ethylbenzene		0.3949	lb/month
xylenes		1.7270	lb/month
naphthalene		0.0031	lb/month
cumene		0.0675	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li} M_i)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$	**LT**	**742.82**	lb/month
		0.37	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^D P^* M_v K_c)/12$ months	L_R	**44.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v) / D]^* [1+(N_c F_c / D)]$	L_W	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**472.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**205.87**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		27.425	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		4.5904	lb/month
benzene		5.3047	lb/month
2,2,4 TMP		6.4790	lb/month
toluene		7.0885	lb/month
ethylbenzene		0.6573	lb/month
xylenes		3.0527	lb/month
naphthalene		0.0874	lb/month
cumene		0.1653	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.3866	lb/month
benzene		4.9380	lb/month
2,2,4 TMP		5.6640	lb/month
toluene		5.6622	lb/month
ethylbenzene		0.3721	lb/month
xylenes		1.6264	lb/month
naphthalene		0.0029	lb/month
cumene		0.0634	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li} M_i)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**935.60**	lb/month
		0.47	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^D P^* M_v K_c)/12$ months	L_R	**55.89**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v) / D]^* [1+(N_c F_c / D)]$	L_W	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**598.54**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**260.80**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		24.186	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		4.0628	lb/month
benzene		4.6507	lb/month
2,2,4 TMP		5.6850	lb/month
toluene		6.2047	lb/month
ethylbenzene		0.5897	lb/month
xylenes		2.7535	lb/month
naphthalene		0.0867	lb/month
cumene		0.1526	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.8591	lb/month
benzene		4.2840	lb/month
2,2,4 TMP		4.8700	lb/month
toluene		4.7784	lb/month
ethylbenzene		0.3044	lb/month
xylenes		1.3272	lb/month
naphthalene		0.0022	lb/month
cumene		0.0507	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li} M_i)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**715.10**	lb/month
		0.36	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**42.42**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**454.34**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**197.97**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.065	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.7516	lb/month
benzene		3.1329	lb/month
2,2,4 TMP		3.9153	lb/month
toluene		4.3805	lb/month
ethylbenzene		0.4643	lb/month
xylenes		2.2039	lb/month
naphthalene		0.0857	lb/month
cumene		0.1307	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.5478	lb/month
benzene		2.7661	lb/month
2,2,4 TMP		3.1002	lb/month
toluene		2.9542	lb/month
ethylbenzene		0.1790	lb/month
xylenes		0.7776	lb/month
naphthalene		0.0011	lb/month
cumene		0.0288	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00367
benzene	78.11	62	0.00398
2,2,4 TMP	114.23	62	0.00446
toluene	92.14	62	0.00425
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00112
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.016259	6.162	0.00264
benzene	0.019475	6.162	0.00316
2,2,4 TMP	0.014926	6.162	0.00242
toluene	0.017633	6.162	0.00286
ethylbenzene	0.000927	6.162	0.00015
xylenes	0.004028	6.162	0.00065
naphthalene	0.000005	6.162	0.00000
cumene	0.000132	6.162	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**626.05**	lb/month
		0.31	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**36.98**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**396.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**172.59**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		13.801	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.1425	lb/month
benzene		2.4313	lb/month
2,2,4 TMP		3.1010	lb/month
toluene		3.5509	lb/month
ethylbenzene		0.4085	lb/month
xylenes		1.9600	lb/month
naphthalene		0.0852	lb/month
cumene		0.1211	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9387	lb/month
benzene		2.0645	lb/month
2,2,4 TMP		2.2860	lb/month
toluene		2.1246	lb/month
ethylbenzene		0.1232	lb/month
xylenes		0.5338	lb/month
naphthalene		0.0007	lb/month
cumene		0.0192	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
2,2,4 TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00320
benzene	78.11	60	0.00341
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00351
ethylbenzene	106.17	60	0.00020
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.012679	5.675	0.00223
benzene	0.014897	5.675	0.00262
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.012997	5.675	0.00229
ethylbenzene	0.000654	5.675	0.00012
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**479.07**	lb/month
		0.24	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**28.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**299.98**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**130.71**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.705	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.5302	lb/month
benzene		1.7487	lb/month
TMP		2.3246	lb/month
toluene		2.7909	lb/month
ethylbenzene		0.3605	lb/month
xylenes		1.7514	lb/month
naphthalene		0.0849	lb/month
cumene		0.1132	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3265	lb/month
benzene		1.3820	lb/month
TMP		1.5095	lb/month
toluene		1.3646	lb/month
ethylbenzene		0.0753	lb/month
xylenes		0.3251	lb/month
naphthalene		0.0004	lb/month
cumene		0.0113	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2038	lb/month
benzene		0.3668	lb/month
TMP		0.8150	lb/month
toluene		1.4263	lb/month
ethylbenzene		0.2853	lb/month
xylenes		1.4263	lb/month
naphthalene		0.0846	lb/month
cumene		0.1019	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00289
benzene	78.11	60	0.00301
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.009155	4.536	0.00202
benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.008810	4.536	0.00194
ethylbenzene	0.000422	4.536	0.00009
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.	118		
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**129,642,796**	gal/yr
Turnovers	N	**47.96**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0)	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	Type	Qty	Loss Factor Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	80	1.2
Legs (IFR type)	IFR type, Adjustable	58	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		642.60 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**908.94**	lb/year
		0.45	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5))^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**38.49**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	100.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_v$W$_L$/D)*[1+(N,F$_p$/D)]	**LW**	**278.56**	lb/yr
Annual throughput	Q	3,086,733	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	100.00	ft
Constant		0.943	1,000 ft3*gal/ft
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**412.25**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	642.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: Ethanol

Total HAP Annual Average Emissions			652.28
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R+L_F+L_D)+Z_{vL}L_W$			L_{Ti}
hexane			0.459 lb/yr
benzene			0.557 lb/yr
2,2,4 TMP			0.790 lb/yr
toluene			1.018 lb/yr
ethylbenzene			0.143 lb/yr
xylenes			0.698 lb/yr
naphthalene			0.035 lb/yr
cumene			0.046 lb/yr
ethyl alcohol (ethanol)			648.534 lb/yr

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**118**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**10,803,566**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**1**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**1**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**80**	1.2
Legs (IFR type)	IFR type, Adjustable	**58**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**1**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	**F_F**	53.55 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**44.94**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.005	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**1.33**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**14.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**6.19**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.225	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$	L_{TI}		
hexane		0.0215	lb/month
benzene		0.0275	lb/month
TMP		0.0441	lb/month
toluene		0.0632	lb/month
ethylbenzene		0.0105	lb/month
xylenes		0.0521	lb/month
naphthalene		0.0029	lb/month
cumene		0.0036	lb/month
ethyl alcohol {ethanol}		33.9789	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0145	lb/month
benzene		0.0150	lb/month
TMP		0.0162	lb/month
toluene		0.0145	lb/month
ethylbenzene		0.0008	lb/month
xylenes		0.0034	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		11.4618	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$	**Working losses**		
hexane		0.0070	lb/month
benzene		0.0125	lb/month
TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		22.5171	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol {ethanol}	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**47.33**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**1.47**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**15.77**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**6.87**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.232	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$	L_{TI}		
hexane		0.0229	lb/month
benzene		0.0290	lb/month
TMP		0.0458	lb/month
toluene		0.0649	lb/month
ethylbenzene		0.0106	lb/month
xylenes		0.0525	lb/month
naphthalene		0.0029	lb/month
cumene		0.0036	lb/month
ethyl alcohol {ethanol}		35.4465	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0159	lb/month
benzene		0.0165	lb/month
TMP		0.0180	lb/month
toluene		0.0161	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0038	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		12.9294	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$	**Working losses**		
hexane		0.0070	lb/month
benzene		0.0125	lb/month
TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		22.5171	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol {ethanol}	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**56.69**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.008	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**2.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**21.89**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**9.54**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.259	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$	L_{TI}		
hexane		0.0281	lb/month
benzene		0.0349	lb/month
2,2,4 TMP		0.0525	lb/month
toluene		0.0714	lb/month
ethylbenzene		0.0110	lb/month
xylenes		0.0543	lb/month
naphthalene		0.0029	lb/month
cumene		0.0037	lb/month
ethyl alcohol {ethanol}		41.3739	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0212	lb/month
benzene		0.0224	lb/month
2,2,4 TMP		0.0247	lb/month
toluene		0.0227	lb/month
ethylbenzene		0.0013	lb/month
xylenes		0.0056	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol {ethanol}		18.8567	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$	**Working losses**		
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		22.5171	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol {ethanol}	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2781

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**75.29**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^*M_vK_c)/12$ months	L_R	**3.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**34.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**14.84**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.311	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0380	lb/month
benzene		0.0462	lb/month
2,2,4 TMP		0.0655	lb/month
toluene		0.0845	lb/month
ethylbenzene		0.0119	lb/month
xylenes		0.0581	lb/month
naphthalene		0.0029	lb/month
cumene		0.0038	lb/month
ethyl alcohol (ethanol)		53.7332	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0311	lb/month
benzene		0.0336	lb/month
2,2,4 TMP		0.0376	lb/month
toluene		0.0358	lb/month
ethylbenzene		0.0022	lb/month
xylenes		0.0094	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		31.2161	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol (ethanol)		22.5171	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**96.92**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^*M_vK_c)/12$ months	L_R	**4.50**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**48.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**21.00**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.370	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0488	lb/month
benzene		0.0587	lb/month
2,2,4 TMP		0.0802	lb/month
toluene		0.0997	lb/month
ethylbenzene		0.0130	lb/month
xylenes		0.0627	lb/month
naphthalene		0.0029	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		68.7508	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0419	lb/month
benzene		0.0462	lb/month
2,2,4 TMP		0.0523	lb/month
toluene		0.0509	lb/month
ethylbenzene		0.0032	lb/month
xylenes		0.0140	lb/month
naphthalene		0.0000	lb/month
cumene		0.0005	lb/month
ethyl alcohol (ethanol)		46.2337	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol (ethanol)		22.5171	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**123.07**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^*M_vK_c)/12$ months	L_R	**6.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**65.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**28.46**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.440	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0612	lb/month
benzene		0.0734	lb/month
2,2,4 TMP		0.0975	lb/month
toluene		0.1180	lb/month
ethylbenzene		0.0143	lb/month
xylenes		0.0685	lb/month
naphthalene		0.0029	lb/month
cumene		0.0042	lb/month
ethyl alcohol (ethanol)		87.5242	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0543	lb/month
benzene		0.0608	lb/month
2,2,4 TMP		0.0696	lb/month
toluene		0.0692	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.0197	lb/month
naphthalene		0.0000	lb/month
cumene		0.0008	lb/month
ethyl alcohol (ethanol)		65.0071	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol (ethanol)		22.5171	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**135.89**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**6.88**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**73.69**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**32.11**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.474	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0671	lb/month
benzene		0.0804	lb/month
2,2,4 TMP		0.1058	lb/month
toluene		0.1269	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0713	lb/month
naphthalene		0.0029	lb/month
cumene		0.0044	lb/month
ethyl alcohol {ethanol}		96.9091	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0601	lb/month
benzene		0.0679	lb/month
2,2,4 TMP		0.0780	lb/month
toluene		0.0782	lb/month
ethylbenzene		0.0052	lb/month
xylenes		0.0226	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol {ethanol}		74.3920	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		22.5171	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol {ethanol}	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{vai}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**130.65**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temper	T_{AX}	539.70	°R
Average daily minimum ambient temper	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**6.56**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**70.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**30.61**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.460	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0647	lb/month
benzene		0.0775	lb/month
2,2,4 TMP		0.1024	lb/month
toluene		0.1233	lb/month
ethylbenzene		0.0146	lb/month
xylenes		0.0702	lb/month
naphthalene		0.0029	lb/month
cumene		0.0043	lb/month
ethyl alcohol {ethanol}		93.0585	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0577	lb/month
benzene		0.0650	lb/month
2,2,4 TMP		0.0746	lb/month
toluene		0.0745	lb/month
ethylbenzene		0.0049	lb/month
xylenes		0.0214	lb/month
naphthalene		0.0000	lb/month
cumene		0.0008	lb/month
ethyl alcohol {ethanol}		70.5413	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		22.5171	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol {ethanol}	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{vai}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**105.45**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**5.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**53.78**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**23.43**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.393	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0529	lb/month
benzene		0.0636	lb/month
2,2,4 TMP		0.0859	lb/month
toluene		0.1057	lb/month
ethylbenzene		0.0134	lb/month
xylenes		0.0646	lb/month
naphthalene		0.0029	lb/month
cumene		0.0041	lb/month
ethyl alcohol {ethanol}		74.8129	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0460	lb/month
benzene		0.0510	lb/month
2,2,4 TMP		0.0580	lb/month
toluene		0.0569	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0158	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol {ethanol}		52.2958	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		22.5171	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol {ethanol}	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{vai}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.7530

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**77.65**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**35.60**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**15.51**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.317	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0392	lb/month
benzene		0.0476	lb/month
2,2,4 TMP		0.0671	lb/month
toluene		0.0862	lb/month
ethylbenzene		0.0120	lb/month
xylenes		0.0586	lb/month
naphthalene		0.0029	lb/month
cumene		0.0038	lb/month
ethyl alcohol (ethanol)		55.3456	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0323	lb/month
benzene		0.0350	lb/month
2,2,4 TMP		0.0393	lb/month
toluene		0.0374	lb/month
ethylbenzene		0.0023	lb/month
xylenes		0.0098	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		32.8284	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol (ethanol)		22.5171	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**61.72**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**2.35**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**25.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**10.97**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.273	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0309	lb/month
benzene		0.0380	lb/month
2,2,4 TMP		0.0561	lb/month
toluene		0.0750	lb/month
ethylbenzene		0.0113	lb/month
xylenes		0.0553	lb/month
naphthalene		0.0029	lb/month
cumene		0.0037	lb/month
ethyl alcohol (ethanol)		44.6546	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0239	lb/month
benzene		0.0255	lb/month
2,2,4 TMP		0.0282	lb/month
toluene		0.0262	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0066	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		22.1375	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol (ethanol)		22.5171	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**49.53**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	257,227.77	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**1.61**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**23.21**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**17.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**7.50**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.239	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0241	lb/month
benzene		0.0304	lb/month
TMP		0.0474	lb/month
toluene		0.0664	lb/month
ethylbenzene		0.0107	lb/month
xylenes		0.0530	lb/month
naphthalene		0.0029	lb/month
cumene		0.0036	lb/month
ethyl alcohol (ethanol)		36.8173	lb/month
Individual HAP Monthly Emi Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0172	lb/month
benzene		0.0179	lb/month
TMP		0.0195	lb/month
toluene		0.0177	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0042	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		14.3002	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0070	lb/month
benzene		0.0125	lb/month
TMP		0.0279	lb/month
toluene		0.0487	lb/month
ethylbenzene		0.0097	lb/month
xylenes		0.0487	lb/month
naphthalene		0.0029	lb/month
cumene		0.0035	lb/month
ethyl alcohol (ethanol)		22.5171	lb/month
Vapor Weight Concentratior $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 118			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**33,267,591**	gal/yr
Turnovers	N	**12.31**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	80	1.2	
Legs (IFR type)	IFR type, Adjustable	58	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		642.60	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**4,709.53**	lb/year
		2.35	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**268.15**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_c/D)]$	**LW**	**318.20**	lb/yr
Annual throughput	Q	792,086	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	100.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,871.84**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	642.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1,251.35**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	100.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			Crude Oil	
Total HAP Annual Average Emissions				44.59	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$				L_{TI}	
hexane				13.647	lb/yr
benzene				13.082	lb/yr
2,2,4 TMP				1.256	lb/yr
toluene				8.277	lb/yr
ethylbenzene				1.887	lb/yr
xylenes				6.323	lb/yr
naphthalene				0.118	lb/yr
cumene				0.000	lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{VI}= y_iM_i / M_V$					
	M_i	**M_V**		**Z_{VI}**	
hexane	86.18	50		0.00282	
benzene	78.11	50		0.00254	
2,2,4 TMP	114.23	50		0.00021	
toluene	92.14	50		0.00116	
ethylbenzene	106.17	50		0.00014	
xylenes	106.17	50		0.00043	
naphthalene	128.17	50		0.00000	
cumene	120.19	50		0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$					
	$P_i = P_{VA}(x_i)$			**P_{VA}**	**y_i**
hexane	0.014204			8.688	0.00163
benzene	0.014150			8.688	0.00163
2,2,4 TMP	0.000812			8.688	0.00009
toluene	0.005470			8.688	0.00063
ethylbenzene	0.000573			8.688	0.00007
xylenes	0.001741			8.688	0.00020
naphthalene	0.000001			8.688	0.00000
cumene	0.000000			8.688	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$					
	Z_{Li}	**M_L**		**M_i**	**X_i**
hexane	0.004	207		86.18	0.00961
benzene	0.006	207		78.11	0.01590
2,2,4 TMP	0.001	207		114.23	0.00181
toluene	0.01	207		92.14	0.02247
ethylbenzene	0.004	207		106.17	0.00780
xylenes	0.014	207		106.17	0.02730
naphthalene	0.0	207		128.17	0.00059
cumene	0.0	207		120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$					
	A	**B**	**C**	**P_{VAi}**	
hexane	6.878	1171.5	224.37	1.4784	
benzene	6.906	1211	220.79	0.8899	
2,2,4 TMP	6.812	1257.8	220.74	0.4483	
toluene	7.017	1377.6	222.64	0.2435	
ethylbenzene	6.95	1419.3	212.61	0.0734	
xylenes	7.009	1462.3	215.11	0.0638	
naphthalene	7.146	1831.6	211.82	0.0015	
cumene	6.929	1455.8	207.2	0.0330	

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**118**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**2,772,299**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**80**	1.2	
Legs (IFR type) — IFR type, Adjustable	**58**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	53.55	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**224.24**	lb/month
		0.11	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**12.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_FF_F/D)]$	L_W	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**129.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**56.34**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		2.038	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.5136	lb/month
benzene		0.5090	lb/month
TMP		0.0550	lb/month
toluene		0.4102	lb/month
ethylbenzene		0.1217	lb/month
xylenes		0.4183	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4076	lb/month
benzene		0.3499	lb/month
TMP		0.0285	lb/month
toluene		0.1450	lb/month
ethylbenzene		0.0156	lb/month
xylenes		0.0471	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**237.99**	lb/month
		0.12	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**12.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_FF_F/D)]$	L_W	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**138.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**60.26**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.156	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.5589	lb/month
benzene		0.5502	lb/month
TMP		0.0585	lb/month
toluene		0.4291	lb/month
ethylbenzene		0.1239	lb/month
xylenes		0.4252	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4528	lb/month
benzene		0.3911	lb/month
TMP		0.0319	lb/month
toluene		0.1639	lb/month
ethylbenzene		0.0179	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**289.87**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**16.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_FF_F/D)]$	L_W	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**172.23**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**75.05**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.637	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.7404	lb/month
benzene		0.7176	lb/month
2,2,4 TMP		0.0727	lb/month
toluene		0.5078	lb/month
ethylbenzene		0.1337	lb/month
xylenes		0.4549	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.6344	lb/month
benzene		0.5585	lb/month
2,2,4 TMP		0.0461	lb/month
toluene		0.2426	lb/month
ethylbenzene		0.0276	lb/month
xylenes		0.0837	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**389.98**	lb/month
		0.19	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**22.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**237.70**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**103.57**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.688	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1272	lb/month
benzene		1.0807	lb/month
2,2,4 TMP		0.1039	lb/month
toluene		0.6850	lb/month
ethylbenzene		0.1567	lb/month
xylenes		0.5250	lb/month
naphthalene		0.0099	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0211	lb/month
benzene		0.9216	lb/month
2,2,4 TMP		0.0773	lb/month
toluene		0.4198	lb/month
ethylbenzene		0.0506	lb/month
xylenes		0.1538	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**511.79**	lb/month
		0.26	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**29.63**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**317.36**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**138.28**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.111	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.6384	lb/month
benzene		1.5684	lb/month
2,2,4 TMP		1.1462	lb/month
toluene		0.9312	lb/month
ethylbenzene		0.1898	lb/month
xylenes		0.6266	lb/month
naphthalene		0.0099	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.5324	lb/month
benzene		1.4093	lb/month
2,2,4 TMP		0.1197	lb/month
toluene		0.6661	lb/month
ethylbenzene		0.0838	lb/month
xylenes		0.2554	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**683.82**	lb/month
		0.34	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**40.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**429.86**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**187.30**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		7.258	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.3976	lb/month
benzene		2.3006	lb/month
2,2,4 TMP		0.2103	lb/month
toluene		1.3097	lb/month
ethylbenzene		0.2422	lb/month
xylenes		0.7875	lb/month
naphthalene		0.0101	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.2915	lb/month
benzene		2.1415	lb/month
2,2,4 TMP		0.1838	lb/month
toluene		1.0445	lb/month
ethylbenzene		0.1361	lb/month
xylenes		0.4162	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**787.53**	lb/month
		0.39	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**46.47**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_FF_r/D)]$	**L_W**	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**497.69**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**216.86**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		8.585	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.8632	lb/month
benzene		2.7518	lb/month
2,2,4 TMP		0.2499	lb/month
toluene		1.5455	lb/month
ethylbenzene		0.2753	lb/month
xylenes		0.8891	lb/month
naphthalene		0.0102	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.7572	lb/month
benzene		2.5927	lb/month
2,2,4 TMP		0.2234	lb/month
toluene		1.2804	lb/month
ethylbenzene		0.1692	lb/month
xylenes		0.5179	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$	**LT**	**742.89**	lb/month
		0.37	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**43.74**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_FF_r/D)]$	**L_W**	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**468.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**204.14**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		8.013	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.6626	lb/month
benzene		2.5573	lb/month
2,2,4 TMP		0.2328	lb/month
toluene		1.4437	lb/month
ethylbenzene		0.2610	lb/month
xylenes		0.8452	lb/month
naphthalene		0.0101	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.5565	lb/month
benzene		2.3982	lb/month
2,2,4 TMP		0.2063	lb/month
toluene		1.1785	lb/month
ethylbenzene		0.1549	lb/month
xylenes		0.4739	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**563.86**	lb/month
		0.28	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**32.81**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_FF_r/D)]$	**L_W**	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**351.41**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**153.12**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.749	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		1.8652	lb/month
benzene		1.7864	lb/month
2,2,4 TMP		0.1653	lb/month
toluene		1.0431	lb/month
ethylbenzene		0.2052	lb/month
xylenes		0.6737	lb/month
naphthalene		0.0100	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7591	lb/month
benzene		1.6273	lb/month
2,2,4 TMP		0.1387	lb/month
toluene		0.7779	lb/month
ethylbenzene		0.0991	lb/month
xylenes		0.3025	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**402.82**	lb/month
		0.20	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	8.843	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	P*	0.230	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**22.98**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	L_W	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**246.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**107.23**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.832	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1794	lb/month
benzene		1.1302	lb/month
2,2,4 TMP		0.1081	lb/month
toluene		0.7096	lb/month
ethylbenzene		0.1599	lb/month
xylenes		0.5350	lb/month
naphthalene		0.0099	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0733	lb/month
benzene		0.9711	lb/month
2,2,4 TMP		0.0816	lb/month
toluene		0.4445	lb/month
ethylbenzene		0.0539	lb/month
xylenes		0.1638	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00285
benzene	78.11	50	0.00258
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00118
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00044
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	P_{VA}	y_i
hexane	0.014633	8.843	0.00165
benzene	0.014607	8.843	0.00165
2,2,4 TMP	0.000840	8.843	0.00009
toluene	0.005668	8.843	0.00064
ethylbenzene	0.000596	8.843	0.00007
xylenes	0.001813	8.843	0.00020
naphthalene	0.000001	8.843	0.00000
cumene	0.000000	8.843	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**317.06**	lb/month
		0.16	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	7.448	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	P*	0.177	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**17.74**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	L_W	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**190.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**82.79**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.908	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.8413	lb/month
benzene		0.8116	lb/month
2,2,4 TMP		0.0807	lb/month
toluene		0.5529	lb/month
ethylbenzene		0.1394	lb/month
xylenes		0.4724	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7353	lb/month
benzene		0.6525	lb/month
2,2,4 TMP		0.0542	lb/month
toluene		0.2878	lb/month
ethylbenzene		0.0334	lb/month
xylenes		0.1012	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
2,2,4 TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00253
benzene	78.11	50	0.00225
2,2,4 TMP	114.23	50	0.00019
toluene	92.14	50	0.00099
ethylbenzene	106.17	50	0.00011
xylenes	106.17	50	0.00035
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	P_{VA}	y_i
hexane	0.010936	7.448	0.00147
benzene	0.010707	7.448	0.00144
2,2,4 TMP	0.000608	7.448	0.00008
toluene	0.004003	7.448	0.00054
ethylbenzene	0.000403	7.448	0.00005
xylenes	0.001222	7.448	0.00016
naphthalene	0.000001	7.448	0.00000
cumene	0.000000	7.448	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**250.44**	lb/month
		0.13	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	66,007.13	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.158	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	P*	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**13.67**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	L_W	**26.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**146.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**63.81**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.266	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.6009	lb/month
benzene		0.5887	lb/month
TMP		0.0617	lb/month
toluene		0.4470	lb/month
ethylbenzene		0.1261	lb/month
xylenes		0.4319	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4949	lb/month
benzene		0.4296	lb/month
TMP		0.0352	lb/month
toluene		0.1818	lb/month
ethylbenzene		0.0201	lb/month
xylenes		0.0606	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1061	lb/month
benzene		0.1591	lb/month
TMP		0.0265	lb/month
toluene		0.2652	lb/month
ethylbenzene		0.1061	lb/month
xylenes		0.3712	lb/month
naphthalene		0.0098	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00221
benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	P_{VA}	y_i
hexane	0.007897	6.158	0.00128
benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.002714	6.158	0.00044
ethylbenzene	0.000260	6.158	0.00004
xylenes	0.000785	6.158	0.00013
naphthalene	0.000000	6.158	0.00000
cumene	0.000000	6.158	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

	Symbol		Units
Tank No. 118			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**102,759,894**	gal/yr
Turnovers	N	**38.02**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	80	1.2	
Legs (IFR type) — IFR type, Adjustable	58	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		642.60	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**256.00**	lb/year
		0.13	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.63**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	100.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**245.72**	lb/yr
Annual throughput	Q	2,446,664	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	100.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**6.72**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	642.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**2.93**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	100.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:	Diesel	
Total HAP Annual Average Emissions	1.91	
Individual HAP Annual Average Emist Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		
	L_{TI}	
hexane	0.005	lb/yr
benzene	0.025	lb/yr
2,2,4 TMP	0.000	lb/yr
toluene	0.326	lb/yr
ethylbenzene	0.062	lb/yr
xylenes	1.300	lb/yr
naphthalene	0.190	lb/yr
cumene	0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02408
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05712
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000159	0.005	0.03394
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000328	0.005	0.06994
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**118**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**8,563,324**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**80**	1.2	
Legs (IFR type) — IFR type, Adjustable	**58**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	53.55	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**20.81**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_FF_F/D)]$	L_W	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2P^*M_vK_c)/12$ months	**LD**	**0.10**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.112	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0149	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0770	lb/month
naphthalene		0.0156	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0002	lb/month
benzene		0.0008	lb/month
TMP		0.0000	lb/month
toluene		0.0084	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0176	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**20.85**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_FF_F/D)]$	L_W	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.25**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2P^*M_vK_c)/12$ months	**LD**	**0.11**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.116	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0159	lb/month
ethylbenzene		0.0037	lb/month
xylenes		0.0793	lb/month
naphthalene		0.0156	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0199	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.01**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_FF_F/D)]$	L_W	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2P^*M_vK_c)/12$ months	**LD**	**0.15**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.130	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0003	lb/month
benzene		0.0014	lb/month
TMP		0.0000	lb/month
toluene		0.0196	lb/month
ethylbenzene		0.0042	lb/month
xylenes		0.0886	lb/month
naphthalene		0.0156	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0003	lb/month
benzene		0.0013	lb/month
TMP		0.0000	lb/month
toluene		0.0131	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0292	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.33**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ss I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.56**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.24**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.158	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0270	lb/month
ethylbenzene		0.0052	lb/month
xylenes		0.1078	lb/month
naphthalene		0.0158	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0204	lb/month
ethylbenzene		0.0025	lb/month
xylenes		0.0485	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.70**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ss I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.80**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.35**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.192	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0354	lb/month
ethylbenzene		0.0063	lb/month
xylenes		0.1309	lb/month
naphthalene		0.0160	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0025	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0288	lb/month
ethylbenzene		0.0037	lb/month
xylenes		0.0715	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**22.15**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ss I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**1.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.48**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.232	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0007	lb/month
benzene		0.0035	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0452	lb/month
ethylbenzene		0.0078	lb/month
xylenes		0.1591	lb/month
naphthalene		0.0163	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0033	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0387	lb/month
ethylbenzene		0.0051	lb/month
xylenes		0.0997	lb/month
naphthalene		0.0008	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**22.37**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**1.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**0.54**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.252	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0008	lb/month
benzene		0.0038	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0499	lb/month
ethylbenzene		0.0085	lb/month
xylenes		0.1730	lb/month
naphthalene		0.0164	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0434	lb/month
ethylbenzene		0.0058	lb/month
xylenes		0.1136	lb/month
naphthalene		0.0009	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	**M_v**	**Z_{vi}**	
hexane	86.18	130	0.00039	
benzene	78.11	130	0.00194	
2,2,4 TMP	114.23	130	0.00000	
toluene	92.14	130	0.02294	
ethylbenzene	106.17	130	0.00308	
xylenes	106.17	130	0.06008	
naphthalene	128.17	130	0.00048	
cumene	120.19	130	0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**	
hexane	0.000006	0.010	0.00058	
benzene	0.000033	0.010	0.00322	
2,2,4 TMP	0.000000	0.010	-	
toluene	0.000335	0.010	0.03237	
ethylbenzene	0.000039	0.010	0.00377	
xylenes	0.000760	0.010	0.07356	
naphthalene	0.000005	0.010	0.00048	
cumene	0.000000	0.010	-	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**22.28**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**1.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**0.51**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.244	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0480	lb/month
ethylbenzene		0.0082	lb/month
xylenes		0.1673	lb/month
naphthalene		0.0163	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0035	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0415	lb/month
ethylbenzene		0.0055	lb/month
xylenes		0.1079	lb/month
naphthalene		0.0008	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$				
	M_i	**M_v**	**Z_{vi}**	
hexane	86.18	130	0.00039	
benzene	78.11	130	0.00195	
2,2,4 TMP	114.23	130	0.00000	
toluene	92.14	130	0.02302	
ethylbenzene	106.17	130	0.00307	
xylenes	106.17	130	0.05992	
naphthalene	128.17	130	0.00047	
cumene	120.19	130	0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**	
hexane	0.000006	0.010	0.00059	
benzene	0.000032	0.010	0.00325	
2,2,4 TMP	0.000000	0.010	-	
toluene	0.000320	0.010	0.03248	
ethylbenzene	0.000037	0.010	0.00376	
xylenes	0.000722	0.010	0.07337	
naphthalene	0.000005	0.010	0.00048	
cumene	0.000000	0.010	-	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.84**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.89**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**0.39**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.205	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0006	lb/month
benzene		0.0030	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0386	lb/month
ethylbenzene		0.0068	lb/month
xylenes		0.1401	lb/month
naphthalene		0.0161	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0028	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0321	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0807	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	**M_v**	**Z_{vi}**	
hexane	86.18	130	0.00041	
benzene	78.11	130	0.00204	
2,2,4 TMP	114.23	130	0.00000	
toluene	92.14	130	0.02343	
ethylbenzene	106.17	130	0.00303	
xylenes	106.17	130	0.05899	
naphthalene	128.17	130	0.00042	
cumene	120.19	130	0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**	
hexane	0.000005	0.007	0.00062	
benzene	0.000025	0.007	0.00340	
2,2,4 TMP	0.000000	0.007	-	
toluene	0.000247	0.007	0.03306	
ethylbenzene	0.000028	0.007	0.00371	
xylenes	0.000540	0.007	0.07223	
naphthalene	0.000003	0.007	0.00043	
cumene	0.000000	0.007	-	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.37**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.25**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.162	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0021	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0279	lb/month
ethylbenzene		0.0053	lb/month
xylenes		0.1103	lb/month
naphthalene		0.0158	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0214	lb/month
ethylbenzene		0.0026	lb/month
xylenes		0.0509	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00219
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05728
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00364
2,2,4 TMP	0.000000	0.005	-
toluene	0.000165	0.005	0.03388
ethylbenzene	0.000018	0.005	0.00362
xylenes	0.000341	0.005	0.07014
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.09**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.40**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.18**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.137	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0016	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0216	lb/month
ethylbenzene		0.0044	lb/month
xylenes		0.0937	lb/month
naphthalene		0.0157	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0014	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0151	lb/month
ethylbenzene		0.0018	lb/month
xylenes		0.0343	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00049
benzene	78.11	130	0.00231
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02443
ethylbenzene	106.17	130	0.00288
xylenes	106.17	130	0.05562
naphthalene	128.17	130	0.00031
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.003	0.00074
benzene	0.000013	0.003	0.00384
2,2,4 TMP	0.000000	0.003	-
toluene	0.000116	0.003	0.03447
ethylbenzene	0.000012	0.003	0.00352
xylenes	0.000230	0.003	0.06810
naphthalene	0.000001	0.003	0.00032
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**20.89**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**20.48**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.12**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.119	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0012	lb/month
TMP		0.0000	lb/month
toluene		0.0168	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0815	lb/month
naphthalene		0.0156	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0102	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0221	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0594	lb/month
naphthalene		0.0155	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00053
benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.002	-
toluene	0.000079	0.002	0.03500
ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000148	0.002	0.06558
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		118	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**102,759,894**	gal/yr
Turnovers	N	**38.02**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	80	1.2
Legs (IFR type)	IFR type, Adjustable	58	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		642.60 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**255.17**	lb/year
		0.13	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.15**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	100.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$/D)[1+(N.F$_P$/D)]	**LW**	**252.64**	lb/yr
Annual throughput	Q	2,446,664	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	100.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1.66**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	642.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:		biodiesel	
Total HAP Annual Average Emissions		21.36	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_{WF}$			
		L_{Ti}	
hexane		0.000	lb/yr
benzene		0.000	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.000	lb/yr
ethylbenzene		0.000	lb/yr
xylenes		0.000	lb/yr
naphthalene		0.000	lb/yr
cumene		10.682	lb/yr
methanol		10.682	lb/yr

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01644

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018811	0.005	4.01644

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**118**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**100.00**	ft
Throughput	Q	**8,563,324**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD		

Deck Fitting Data		Qty	Kf (Table 7.1-12)
		Loss Factor	
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**1**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**1**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**80**	1.2
Legs (IFR type)	IFR type, Adjustable	**58**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**1**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	**F_F**	53.55 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.14**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.02**	lb/month

HAPS Speciation — Product - select from list — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vl}(L_R + L_F + L_D) + Z_{Ll}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.3896	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vl}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.3475	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Ll}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0421	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.15**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.03**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vl}(L_R + L_F + L_D) + Z_{Ll}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.4287	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vl}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.3866	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Ll}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0421	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.18**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.04**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vl}(L_R + L_F + L_D) + Z_{Ll}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.5817	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vl}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.5396	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Ll}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.5396	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**21.26**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.14**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.06**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8429	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8407	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01842
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018648	0.005	4.01842
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{vAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**21.35**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.09**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2268	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1846	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.93734
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.026274	0.007	3.93734
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{vAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1079
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**21.47**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.12**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.6328	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.5907	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.86270
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000000	0.009	-
benzene	0.000000	0.009	-
2,2,4 TMP	0.000000	0.009	-
toluene	0.000000	0.009	-
ethylbenzene	0.000000	0.009	-
xylenes	0.000000	0.009	-
naphthalene	0.000000	0.009	-
cumene	0.000000	0.009	-
methanol	0.035276	0.009	3.86270
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{vAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.52**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + $K_{Rb}V^n$)D)P* $M_v K_c$)/12 months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D]*[1+(N$_c$F$_c$/D)]	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	LF	**0.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.13**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.8278	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7857	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.83221

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.039600	0.010	3.83221

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
methanol	8.079	1581.3	239.65	2.2869

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.50**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is know	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + $K_{Rb}V^n$)D)P* $M_v K_c$)/12 month	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D]*[1+(N$_c$F$_c$/D)]	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	LF	**0.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.13**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7484	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7063	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.84429

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.037838	0.010	3.84429

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
methanol	8.079	1581.3	239.65	2.1852

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**21.39**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + $K_{Rb}V^n$)D)P* $M_v K_c$)/12 months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D]*[1+(N$_c$F$_c$/D)]	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	LF	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.10**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3604	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3183	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.91078

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.029238	0.007	3.91078

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	1.6885

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**21.27**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.14**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.06**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9208	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8787	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.00835
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.019489	0.005	4.00835
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**21.21**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.04**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6637	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6216	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.08439
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.013788	0.003	4.08439
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**21.15**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	203,888.68	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**21.05**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.03**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4648	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4227	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0421	lb/month
Vapor Weight Concentration $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16083
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009376	0.002	4.16083
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

	Symbol		Units
Tank No. 119			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**83,727,616**	gal/yr
Turnovers	N	**48.40**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		Mechanical-shoe seal | Primary only	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.300**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**8,860.14**	lb/year
		4.43	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**3,621.19**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	5.80	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.30	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_f/D)]$	**LW**	**197.39**	lb/yr
Annual throughput	Q	1,993,515	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**3,643.04**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**1,398.53**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

		Product - select from list:		Gasoline	
Total HAP Annual Average Emissions				203.17	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}	
		hexane		34.855	lb/yr
		benzene		39.181	lb/yr
		2,2,4 TMP		47.778	lb/yr
		toluene		51.724	lb/yr
		ethylbenzene		5.050	lb/yr
		xylenes		23.748	lb/yr
		naphthalene		0.833	lb/yr
		cumene		1.354	lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_V$					
		M_i	**M_V**	**Z_{Vi}**	
	hexane	86.18	62	0.00380	
	benzene	78.11	62	0.00411	
	2,2,4 TMP	114.23	62	0.00460	
	toluene	92.14	62	0.00438	
	ethylbenzene	106.17	62	0.00026	
	xylenes	106.17	62	0.00115	
	naphthalene	128.17	62	0.00000	
	cumene	120.19	62	0.00004	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$					
		$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**
	hexane	0.015782		5.779	0.00273
	benzene	0.018867		5.779	0.00326
	2,2,4 TMP	0.014442		5.779	0.00250
	toluene	0.017017		5.779	0.00294
	ethylbenzene	0.000891		5.779	0.00015
	xylenes	0.003869		5.779	0.00067
	naphthalene	0.000005		5.779	0.00000
	cumene	0.000126		5.779	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$					
		Z_{Li}	**M_L**	**M_i**	**X_i**
	hexane	0.01	92	86.18	0.01068
	benzene	0.018	92	78.11	0.02120
	2,2,4 TMP	0.04	92	114.23	0.03222
	toluene	0.07	92	92.14	0.06989
	ethylbenzene	0.014	92	106.17	0.01213
	xylenes	0.07	92	106.17	0.06066
	naphthalene	0.0	92	128.17	0.00298
	cumene	0.0	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$					
		A	**B**	**C**	**P_{VAi}**
	hexane	6.878	1171.5	224.37	1.4784
	benzene	6.906	1211	220.79	0.8899
	2,2,4 TMP	6.812	1257.8	220.74	0.4483
	toluene	7.017	1377.6	222.64	0.2435
	ethylbenzene	6.95	1419.3	212.61	0.0734
	xylenes	7.009	1462.3	215.11	0.0638
	naphthalene	7.146	1831.6	211.82	0.0015
	cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**119**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**6,977,301**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Primary only**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.3**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**469.26**	lb/month
		0.23	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**189.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**190.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**73.10**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		9.314	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.4070	lb/month
benzene		1.5761	lb/month
TMP		2.2064	lb/month
toluene		2.3891	lb/month
ethylbenzene		0.2968	lb/month
xylenes		1.4383	lb/month
naphthalene		0.0686	lb/month
cumene		0.0921	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2425	lb/month
benzene		1.2800	lb/month
TMP		1.3885	lb/month
toluene		1.2377	lb/month
ethylbenzene		0.0665	lb/month
xylenes		0.2869	lb/month
naphthalene		0.0003	lb/month
cumene		0.0098	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**503.55**	lb/month
		0.25	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**203.62**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**204.85**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**78.64**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		9.966	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.5400	lb/month
benzene		1.7218	lb/month
TMP		2.4545	lb/month
toluene		2.5459	lb/month
ethylbenzene		0.3063	lb/month
xylenes		1.4795	lb/month
naphthalene		0.0686	lb/month
cumene		0.0936	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3755	lb/month
benzene		1.4257	lb/month
TMP		1.5524	lb/month
toluene		1.3944	lb/month
ethylbenzene		0.0760	lb/month
xylenes		0.3281	lb/month
naphthalene		0.0004	lb/month
cumene		0.0114	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**561.87**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**228.00**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**229.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**88.05**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		11.997	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.9361	lb/month
benzene		2.1676	lb/month
2,2,4 TMP		2.7200	lb/month
toluene		3.0485	lb/month
ethylbenzene		0.3383	lb/month
xylenes		1.6189	lb/month
naphthalene		0.0688	lb/month
cumene		0.0989	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7716	lb/month
benzene		1.8716	lb/month
2,2,4 TMP		2.0620	lb/month
toluene		1.8971	lb/month
ethylbenzene		0.1080	lb/month
xylenes		0.4675	lb/month
naphthalene		0.0006	lb/month
cumene		0.0167	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**733.53**	lb/month
		0.37	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**299.75**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**301.56**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**115.77**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		16.917	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.8806	lb/month
benzene		3.2377	lb/month
2,2,4 TMP		3.9498	lb/month
toluene		4.2782	lb/month
ethylbenzene		0.4187	lb/month
xylenes		1.9697	lb/month
naphthalene		0.0694	lb/month
cumene		0.1125	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.7161	lb/month
benzene		2.9416	lb/month
2,2,4 TMP		3.2918	lb/month
toluene		3.1268	lb/month
ethylbenzene		0.1884	lb/month
xylenes		0.8182	lb/month
naphthalene		0.0012	lb/month
cumene		0.0302	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**626.67**	lb/month
		0.31	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**255.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**256.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**98.52**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.998	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.6080	lb/month
benzene		4.0966	lb/month
2,2,4 TMP		4.9622	lb/month
toluene		5.3423	lb/month
ethylbenzene		0.4938	lb/month
xylenes		2.2993	lb/month
naphthalene		0.0701	lb/month
cumene		0.1258	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.4436	lb/month
benzene		3.8005	lb/month
2,2,4 TMP		4.3043	lb/month
toluene		4.1909	lb/month
ethylbenzene		0.2635	lb/month
xylenes		1.1478	lb/month
naphthalene		0.0018	lb/month
cumene		0.0435	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**786.89**	lb/month
		0.39	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**322.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**324.00**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**124.38**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		27.525	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.7780	lb/month
benzene		5.4699	lb/month
2,2,4 TMP		6.5780	lb/month
toluene		7.0396	lb/month
ethylbenzene		0.6140	lb/month
xylenes		2.8274	lb/month
naphthalene		0.0712	lb/month
cumene		0.1472	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.6135	lb/month
benzene		5.1738	lb/month
2,2,4 TMP		5.9200	lb/month
toluene		5.8882	lb/month
ethylbenzene		0.3837	lb/month
xylenes		1.6760	lb/month
naphthalene		0.0029	lb/month
cumene		0.0650	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**864.06**	lb/month
		0.43	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**354.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**356.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**136.84**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		30.816	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		5.3575	lb/month
benzene		6.1561	lb/month
2,2,4 TMP		7.3902	lb/month
toluene		7.9037	lb/month
ethylbenzene		0.6764	lb/month
xylenes		3.1023	lb/month
naphthalene		0.0718	lb/month
cumene		0.1585	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.1930	lb/month
benzene		5.8600	lb/month
2,2,4 TMP		6.7322	lb/month
toluene		6.7522	lb/month
ethylbenzene		0.4461	lb/month
xylenes		1.9509	lb/month
naphthalene		0.0035	lb/month
cumene		0.0763	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**832.56**	lb/month
		0.42	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**341.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**343.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**131.75**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		29.463	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		5.1199	lb/month
benzene		5.8743	lb/month
2,2,4 TMP		7.0563	lb/month
toluene		7.5477	lb/month
ethylbenzene		0.6506	lb/month
xylenes		2.9887	lb/month
naphthalene		0.0715	lb/month
cumene		0.1538	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.9554	lb/month
benzene		5.5782	lb/month
2,2,4 TMP		6.3984	lb/month
toluene		6.3963	lb/month
ethylbenzene		0.4203	lb/month
xylenes		1.8372	lb/month
naphthalene		0.0033	lb/month
cumene		0.0716	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,050.34**	lb/month
		0.53	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**432.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**434.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**166.91**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		25.803	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		4.5239	lb/month
benzene		5.1355	lb/month
2,2,4 TMP		6.1593	lb/month
toluene		6.5494	lb/month
ethylbenzene		0.5742	lb/month
xylenes		2.6508	lb/month
naphthalene		0.0707	lb/month
cumene		0.1396	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.3594	lb/month
benzene		4.8394	lb/month
2,2,4 TMP		5.5014	lb/month
toluene		5.3980	lb/month
ethylbenzene		0.3439	lb/month
xylenes		1.4993	lb/month
naphthalene		0.0024	lb/month
cumene		0.0573	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**801.25**	lb/month
		0.40	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**328.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**330.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**126.70**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.759	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.0427	lb/month
benzene		3.4208	lb/month
2,2,4 TMP		4.1602	lb/month
toluene		4.4886	lb/month
ethylbenzene		0.4325	lb/month
xylenes		2.0299	lb/month
naphthalene		0.0695	lb/month
cumene		0.1148	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.8782	lb/month
benzene		3.1247	lb/month
2,2,4 TMP		3.5022	lb/month
toluene		3.3372	lb/month
ethylbenzene		0.2022	lb/month
xylenes		0.8785	lb/month
naphthalene		0.0013	lb/month
cumene		0.0325	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00367
benzene	78.11	62	0.00398
2,2,4 TMP	114.23	62	0.00446
toluene	92.14	62	0.00425
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00112
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.016259	6.162	0.00264
benzene	0.019475	6.162	0.00316
2,2,4 TMP	0.014926	6.162	0.00242
toluene	0.017633	6.162	0.00286
ethylbenzene	0.000927	6.162	0.00015
xylenes	0.004028	6.162	0.00065
naphthalene	0.000005	6.162	0.00000
cumene	0.000132	6.162	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**700.66**	lb/month
		0.35	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**286.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**287.74**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**110.46**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		14.072	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.3546	lb/month
benzene		2.6283	lb/month
2,2,4 TMP		3.2403	lb/month
toluene		3.5516	lb/month
ethylbenzene		0.3695	lb/month
xylenes		1.7544	lb/month
naphthalene		0.0690	lb/month
cumene		0.1040	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.1901	lb/month
benzene		2.3322	lb/month
2,2,4 TMP		2.5824	lb/month
toluene		2.4001	lb/month
ethylbenzene		0.1392	lb/month
xylenes		0.6030	lb/month
naphthalene		0.0008	lb/month
cumene		0.0217	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
2,2,4 TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00320
benzene	78.11	60	0.00341
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00351
ethylbenzene	106.17	60	0.00020
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.012679	5.675	0.00223
benzene	0.014897	5.675	0.00262
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.012997	5.675	0.00229
ethylbenzene	0.000654	5.675	0.00012
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**534.62**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**216.60**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.45**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**217.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**83.65**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.574	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.6630	lb/month
benzene		1.8572	lb/month
TMP		2.3632	lb/month
toluene		2.6930	lb/month
ethylbenzene		0.3153	lb/month
xylenes		1.5187	lb/month
naphthalene		0.0687	lb/month
cumene		0.0951	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.4985	lb/month
benzene		1.5611	lb/month
TMP		1.7053	lb/month
toluene		1.5416	lb/month
ethylbenzene		0.0850	lb/month
xylenes		0.3673	lb/month
naphthalene		0.0004	lb/month
cumene		0.0128	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1645	lb/month
benzene		0.2961	lb/month
TMP		0.6580	lb/month
toluene		1.1514	lb/month
ethylbenzene		0.2303	lb/month
xylenes		1.1514	lb/month
naphthalene		0.0683	lb/month
cumene		0.0822	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00289
benzene	78.11	60	0.00301
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.009155	4.536	0.00202
benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.008810	4.536	0.00194
ethylbenzene	0.000422	4.536	0.00009
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

*Input data in Green. **Select Cells in** Red **to open the drop down selection list.***

	Symbol		Units
Tank No.	119		
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	^oR
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**83,727,616**	gal/yr
Turnovers	N	**48.40**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type,		Mechanical-shoe seal | Primary only	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0)	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.300**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**936.99**	lb/year
		0.47	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5))^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**297.67**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	5.80	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.30	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	2.10	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_L$W$_L$/D)*[1+(N,F$_P$/D)]	**LW**	**224.88**	lb/yr
Annual throughput	Q	1,993,515	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/ft2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**299.47**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Ethanol	
Total HAP Annual Average Emissions		649.13	
Individual HAP Annual Average Emiss Eq. 40-2 L_{Ti} =Z_{vi}(L$_R$ + L$_F$ + L$_D$) + Z_{vi}L$_W$			
		L_{Ti}	
hexane		0.492	lb/yr
benzene		0.581	lb/yr
2,2,4 TMP		0.784	lb/yr
toluene		0.961	lb/yr
ethylbenzene		0.124	lb/yr
xylenes		0.600	lb/yr
naphthalene		0.028	lb/yr
cumene		0.038	lb/yr
ethyl alcohol (ethanol)		645.516	lb/yr

Vapor Weight Concentrations Eq. 40-6 Z_{vi} = y_iM$_i$/ M$_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 y_i = P$_i$ / P$_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 x_i = (Z_{vi}M$_v$)/M$_i$

	Z_{vi}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure P_{VAi}=(0.019337)10^(A-(B/(TLA+C)))

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**119**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**6,977,301**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Primary only**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.3**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	**2**	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**43.28**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.005	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**10.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**10.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**3.96**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.203	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$	L_{TI}		
hexane		0.0220	lb/month
benzene		0.0270	lb/month
TMP		0.0408	lb/month
toluene		0.0557	lb/month
ethylbenzene		0.0087	lb/month
xylenes		0.0431	lb/month
naphthalene		0.0023	lb/month
cumene		0.0029	lb/month
ethyl alcohol {ethanol}		31.1257	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0164	lb/month
benzene		0.0169	lb/month
TMP		0.0183	lb/month
toluene		0.0163	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0038	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		12.9478	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$	**Working losses**		
hexane		0.0056	lb/month
benzene		0.0101	lb/month
TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1779	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol {ethanol}	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**45.98**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**11.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**11.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**4.40**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.210	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$	L_{TI}		
hexane		0.0236	lb/month
benzene		0.0287	lb/month
TMP		0.0428	lb/month
toluene		0.0576	lb/month
ethylbenzene		0.0089	lb/month
xylenes		0.0436	lb/month
naphthalene		0.0023	lb/month
cumene		0.0030	lb/month
ethyl alcohol {ethanol}		32.7837	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0180	lb/month
benzene		0.0186	lb/month
TMP		0.0203	lb/month
toluene		0.0182	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0043	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		14.6058	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$	**Working losses**		
hexane		0.0056	lb/month
benzene		0.0101	lb/month
TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1779	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol {ethanol}	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**56.55**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.008	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**15.81**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**15.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**6.10**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.241	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$	L_{TI}		
hexane		0.0296	lb/month
benzene		0.0354	lb/month
2,2,4 TMP		0.0503	lb/month
toluene		0.0650	lb/month
ethylbenzene		0.0093	lb/month
xylenes		0.0457	lb/month
naphthalene		0.0023	lb/month
cumene		0.0030	lb/month
ethyl alcohol {ethanol}		39.4795	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0239	lb/month
benzene		0.0253	lb/month
2,2,4 TMP		0.0279	lb/month
toluene		0.0256	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0063	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol {ethanol}		21.3016	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$	**Working losses**		
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1779	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol {ethanol}	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2781

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**77.57**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**24.59**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**24.74**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**9.50**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.299	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_B + L_F + L_D) + Z_vL_W$		L_{Ti}	
hexane		0.0407	lb/month
benzene		0.0481	lb/month
2,2,4 TMP		0.0650	lb/month
toluene		0.0797	lb/month
ethylbenzene		0.0103	lb/month
xylenes		0.0499	lb/month
naphthalene		0.0023	lb/month
cumene		0.0032	lb/month
ethyl alcohol (ethanol)		53.4413	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_B + L_F + L_D)$		**Standing losses**	
hexane		0.0351	lb/month
benzene		0.0380	lb/month
2,2,4 TMP		0.0425	lb/month
toluene		0.0404	lb/month
ethylbenzene		0.0024	lb/month
xylenes		0.0106	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		35.2635	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1779	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**102.00**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**34.80**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**35.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**13.44**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.366	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_B + L_F + L_D) + Z_vL_W$		L_{Ti}	
hexane		0.0529	lb/month
benzene		0.0623	lb/month
2,2,4 TMP		0.0816	lb/month
toluene		0.0969	lb/month
ethylbenzene		0.0115	lb/month
xylenes		0.0551	lb/month
naphthalene		0.0024	lb/month
cumene		0.0034	lb/month
ethyl alcohol (ethanol)		70.4060	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_B + L_F + L_D)$		**Standing losses**	
hexane		0.0473	lb/month
benzene		0.0522	lb/month
2,2,4 TMP		0.0591	lb/month
toluene		0.0575	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0158	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol (ethanol)		52.2281	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1779	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**131.55**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**47.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**47.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**18.21**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.445	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_B + L_F + L_D) + Z_vL_W$		L_{Ti}	
hexane		0.0669	lb/month
benzene		0.0788	lb/month
2,2,4 TMP		0.1011	lb/month
toluene		0.1176	lb/month
ethylbenzene		0.0130	lb/month
xylenes		0.0616	lb/month
naphthalene		0.0024	lb/month
cumene		0.0037	lb/month
ethyl alcohol (ethanol)		91.6136	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_B + L_F + L_D)$		**Standing losses**	
hexane		0.0613	lb/month
benzene		0.0687	lb/month
2,2,4 TMP		0.0786	lb/month
toluene		0.0782	lb/month
ethylbenzene		0.0051	lb/month
xylenes		0.0223	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol (ethanol)		73.4357	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1779	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**146.03**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**53.21**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**53.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**20.55**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.483	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0735	lb/month
benzene		0.0868	lb/month
2,2,4 TMP		0.1105	lb/month
toluene		0.1277	lb/month
ethylbenzene		0.0137	lb/month
xylenes		0.0649	lb/month
naphthalene		0.0024	lb/month
cumene		0.0038	lb/month
ethyl alcohol {ethanol}		102.2153	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0679	lb/month
benzene		0.0766	lb/month
2,2,4 TMP		0.0881	lb/month
toluene		0.0883	lb/month
ethylbenzene		0.0058	lb/month
xylenes		0.0255	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol {ethanol}		84.0374	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1779	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol {ethanol}	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**140.11**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**50.73**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**51.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**19.59**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.468	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0708	lb/month
benzene		0.0835	lb/month
2,2,4 TMP		0.1067	lb/month
toluene		0.1235	lb/month
ethylbenzene		0.0134	lb/month
xylenes		0.0635	lb/month
naphthalene		0.0024	lb/month
cumene		0.0038	lb/month
ethyl alcohol {ethanol}		97.8653	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0652	lb/month
benzene		0.0734	lb/month
2,2,4 TMP		0.0842	lb/month
toluene		0.0842	lb/month
ethylbenzene		0.0055	lb/month
xylenes		0.0242	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol {ethanol}		79.6874	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1779	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol {ethanol}	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**111.64**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**38.83**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**39.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**15.00**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.392	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0576	lb/month
benzene		0.0678	lb/month
2,2,4 TMP		0.0880	lb/month
toluene		0.1037	lb/month
ethylbenzene		0.0120	lb/month
xylenes		0.0572	lb/month
naphthalene		0.0024	lb/month
cumene		0.0035	lb/month
ethyl alcohol {ethanol}		77.2541	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0519	lb/month
benzene		0.0576	lb/month
2,2,4 TMP		0.0655	lb/month
toluene		0.0643	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0179	lb/month
naphthalene		0.0000	lb/month
cumene		0.0007	lb/month
ethyl alcohol {ethanol}		59.0762	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1779	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol {ethanol}	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.7530

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**80.24**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^* M_v K_c)/12$ months	L_R	**25.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**25.86**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**9.93**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.307	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0421	lb/month
benzene		0.0497	lb/month
2,2,4 TMP		0.0668	lb/month
toluene		0.0816	lb/month
ethylbenzene		0.0104	lb/month
xylenes		0.0505	lb/month
naphthalene		0.0023	lb/month
cumene		0.0032	lb/month
ethyl alcohol (ethanol)		55.2627	lb/month
Individual HAP Monthly Emissions **Standing losses = $Z_{vi}(L_R + L_F + L_D)$**			
		Standing losses	
hexane		0.0365	lb/month
benzene		0.0396	lb/month
2,2,4 TMP		0.0444	lb/month
toluene		0.0423	lb/month
ethylbenzene		0.0026	lb/month
xylenes		0.0111	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		37.0848	lb/month
Individual HAP Monthly Emissions **Working losses = $Z_{Li}L_W$**			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1779	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**62.24**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^* M_v K_c)/12$ months	L_R	**18.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**18.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**7.02**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.257	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0327	lb/month
benzene		0.0389	lb/month
2,2,4 TMP		0.0544	lb/month
toluene		0.0690	lb/month
ethylbenzene		0.0096	lb/month
xylenes		0.0468	lb/month
naphthalene		0.0023	lb/month
cumene		0.0031	lb/month
ethyl alcohol (ethanol)		43.1856	lb/month
Individual HAP Monthly Emissions **Standing losses = $Z_{vi}(L_R + L_F + L_D)$**			
		Standing losses	
hexane		0.0270	lb/month
benzene		0.0288	lb/month
2,2,4 TMP		0.0319	lb/month
toluene		0.0296	lb/month
ethylbenzene		0.0017	lb/month
xylenes		0.0074	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		25.0077	lb/month
Individual HAP Monthly Emissions **Working losses = $Z_{Li}L_W$**			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1779	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0021	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**48.47**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	166,126.22	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^* M_v K_c)/12$ months	L_R	**12.43**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.74**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**12.50**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**4.80**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.218	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0250	lb/month
benzene		0.0303	lb/month
TMP		0.0446	lb/month
toluene		0.0593	lb/month
ethylbenzene		0.0090	lb/month
xylenes		0.0441	lb/month
naphthalene		0.0023	lb/month
cumene		0.0030	lb/month
ethyl alcohol (ethanol)		34.3322	lb/month
Individual HAP Monthly Emi **Standing losses = $Z_{vi}(L_R + L_F + L_D)$**			
		Standing losses	
hexane		0.0194	lb/month
benzene		0.0202	lb/month
TMP		0.0221	lb/month
toluene		0.0200	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0048	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		16.1543	lb/month
Individual HAP Monthly Emi **Working losses = $Z_{Li}L_W$**			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
TMP		0.0225	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0394	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1779	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 119			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Component (Average RVP 14.33)	
Vapor Molecular weight	M_v	**61**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.61**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4971.67**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**14.33**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**42,180,000**	gal/yr
Turnovers	N	**24.38**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		Mechanical-shoe seal | Primary only	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.300**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	52	1.2	
Legs (IFR type)	IFR type, Adjustable	40	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		466.80	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**9,909.34**	lb/year
		4.95	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	6.459	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.146	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**4,100.72**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	5.80	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.30	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_V/D)*[1+(N_FF_C/D)]$	**LW**	**99.44**	lb/yr
Annual throughput	Q	1,004,286	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**4,125.46**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.15	
Average vapor molecular weight	Mv	60.67	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1,583.73**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.15	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.67	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

			Product - select from list:	blendstock
Total HAP Annual Average Emissions				637.38
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				476.575 lb/yr
benzene				42.980 lb/yr
2,2,4 TMP				45.275 lb/yr
toluene				49.513 lb/yr
ethylbenzene				5.371 lb/yr
xylenes				17.244 lb/yr
naphthalene				0.427 lb/yr
cumene				0.877 lb/yr
Vapor Weight Concentrations Eq. 40-t $Z_{Vi}=y_iM_i/M_V$				
		M_i	**M_V**	**Z_{Vi}**
hexane	86.18	61		0.04720
benzene	78.11	61		0.00418
2,2,4 TMP	114.23	61		0.00421
toluene	92.14	61		0.00429
ethylbenzene	106.17	61		0.00034
xylenes	106.17	61		0.00105
naphthalene	128.17	61		0.00000
cumene	120.19	61		0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
		$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.214637	6.459		0.03323
benzene	0.020964	6.459		0.00325
2,2,4 TMP	0.014442	6.459		0.00224
toluene	0.018233	6.459		0.00282
ethylbenzene	0.001273	6.459		0.00020
xylenes	0.003869	6.459		0.00060
naphthalene	0.000005	6.459		0.00000
cumene	0.000126	6.459		0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$				
		Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92		86.18	0.14518
benzene	0.02	92		78.11	0.02356
2,2,4 TMP	0.04	92		114.23	0.03222
toluene	0.075	92		92.14	0.07489
ethylbenzene	0.02	92		106.17	0.01733
xylenes	0.07	92		106.17	0.06066
naphthalene	0.0	92		128.17	0.00298
cumene	0.0	92		120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
		A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5		224.37	1.4784
benzene	6.906	1211		220.79	0.8899
2,2,4 TMP	6.812	1257.8		220.74	0.4483
toluene	7.017	1377.6		222.64	0.2435
ethylbenzene	6.95	1419.3		212.61	0.0734
xylenes	7.009	1462.3		215.11	0.0638
naphthalene	7.146	1831.6		211.82	0.0015
cumene	6.929	1455.8		207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**119**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**14.33**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**3,515,000**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Primary only**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.3**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**436.17**	lb/month
		0.22	tons/month
Product Type — Component (Average RVP 14.33)			
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	3.831	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.076	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**178.86**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_F/D)]$	L_W	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**179.94**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**69.08**	lb/month
HAPS Speciation			
Product - select from list		blendstock	
Total HAP Monthly Emissions		23.407	lb/month
Individual HAP Monthly Emissions — **Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$**			
		L_{Ti}	
hexane		17.1674	lb/month
benzene		1.5158	lb/month
TMP		1.6495	lb/month
toluene		1.8803	lb/month
ethylbenzene		0.2559	lb/month
xylenes		0.8524	lb/month
naphthalene		0.0347	lb/month
cumene		0.0508	lb/month
Individual HAP Monthly Emissions — **Standing losses $= Z_{Vi}(L_R + L_F + L_D)$**			
		Standing losses	
hexane		16.0404	lb/month
benzene		1.3500	lb/month
TMP		1.3180	lb/month
toluene		1.2588	lb/month
ethylbenzene		0.0902	lb/month
xylenes		0.2724	lb/month
naphthalene		0.0003	lb/month
cumene		0.0093	lb/month
Individual HAP Monthly Emissions — **Working losses $= Z_{Li}L_W$**			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.03749
benzene	78.11	61	0.00316
2,2,4 TMP	114.23	61	0.00308
toluene	92.14	61	0.00294
ethylbenzene	106.17	61	0.00021
xylenes	106.17	61	0.00064
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.101104	3.831	0.02639
benzene	0.009388	3.831	0.00245
2,2,4 TMP	0.006268	3.831	0.00164
toluene	0.007421	3.831	0.00194
ethylbenzene	0.000462	3.831	0.00012
xylenes	0.001393	3.831	0.00036
naphthalene	0.000001	3.831	0.00000
cumene	0.000042	3.831	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**468.44**	lb/month
		0.23	tons/month
Product Type — Component (Average RVP 14.33)			
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.076	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.082	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**192.35**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_F/D)]$	L_W	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**193.51**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**74.29**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		25.629	lb/month
Individual HAP Monthly Emissions — **Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$**			
		L_{Ti}	
hexane		18.8713	lb/month
benzene		1.6684	lb/month
TMP		1.8040	lb/month
toluene		2.0387	lb/month
ethylbenzene		0.2687	lb/month
xylenes		0.8913	lb/month
naphthalene		0.0347	lb/month
cumene		0.0522	lb/month
Individual HAP Monthly Emissions — **Standing losses $= Z_{Vi}(L_R + L_F + L_D)$**			
		Standing losses	
hexane		17.7443	lb/month
benzene		1.5026	lb/month
TMP		1.4726	lb/month
toluene		1.4172	lb/month
ethylbenzene		0.1030	lb/month
xylenes		0.3112	lb/month
naphthalene		0.0003	lb/month
cumene		0.0108	lb/month
Individual HAP Monthly Emissions — **Working losses $= Z_{Li}L_W$**			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.03856
benzene	78.11	61	0.00327
2,2,4 TMP	114.23	61	0.00320
toluene	92.14	61	0.00308
ethylbenzene	106.17	61	0.00022
xylenes	106.17	61	0.00068
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.110658	4.076	0.02715
benzene	0.010339	4.076	0.00254
2,2,4 TMP	0.006928	4.076	0.00170
toluene	0.008266	4.076	0.00203
ethylbenzene	0.000521	4.076	0.00013
xylenes	0.001576	4.076	0.00039
naphthalene	0.000001	4.076	0.00000
cumene	0.000048	4.076	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**589.94**	lb/month
		0.29	tons/month
Product Type — Component (Average RVP 14.33)			
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.952	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.104	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**243.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_F/D)]$	L_W	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**244.61**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**93.90**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		34.458	lb/month
Individual HAP Monthly Emissions — **Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$**			
		L_{Ti}	
hexane		25.5980	lb/month
benzene		2.2778	lb/month
2,2,4 TMP		2.4258	lb/month
toluene		2.6859	lb/month
ethylbenzene		0.3225	lb/month
xylenes		1.0549	lb/month
naphthalene		0.0350	lb/month
cumene		0.0583	lb/month
Individual HAP Monthly Emissions — **Standing losses $= Z_{Vi}(L_R + L_F + L_D)$**			
		Standing losses	
hexane		24.4710	lb/month
benzene		2.1121	lb/month
2,2,4 TMP		2.0943	lb/month
toluene		2.0644	lb/month
ethylbenzene		0.1567	lb/month
xylenes		0.4748	lb/month
naphthalene		0.0006	lb/month
cumene		0.0169	lb/month
Individual HAP Monthly Emissions — **Working losses $= Z_{Li}L_W$**			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.04207
benzene	78.11	61	0.00363
2,2,4 TMP	114.23	61	0.00360
toluene	92.14	61	0.00355
ethylbenzene	106.17	61	0.00027
xylenes	106.17	61	0.00082
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.146679	4.952	0.02962
benzene	0.013968	4.952	0.00282
2,2,4 TMP	0.009471	4.952	0.00191
toluene	0.011574	4.952	0.00234
ethylbenzene	0.000763	4.952	0.00015
xylenes	0.002310	4.952	0.00047
naphthalene	0.000002	4.952	0.00000
cumene	0.000073	4.952	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**820.18**	lb/month
		0.41	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.426	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.145	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**339.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**341.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**131.07**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		52.725	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		39.3669	lb/month
benzene		3.5493	lb/month
2,2,4 TMP		3.7392	lb/month
toluene		4.0896	lb/month
ethylbenzene		0.4444	lb/month
xylenes		1.4271	lb/month
naphthalene		0.0356	lb/month
cumene		0.0727	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		38.2400	lb/month
benzene		3.3835	lb/month
2,2,4 TMP		3.4077	lb/month
toluene		3.4681	lb/month
ethylbenzene		0.2786	lb/month
xylenes		0.8470	lb/month
naphthalene		0.0012	lb/month
cumene		0.0313	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.04710
benzene	78.11	61	0.00417
2,2,4 TMP	114.23	61	0.00420
toluene	92.14	61	0.00427
ethylbenzene	106.17	61	0.00034
xylenes	106.17	61	0.00104
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.213074	6.426	0.03316
benzene	0.020801	6.426	0.00324
2,2,4 TMP	0.014325	6.426	0.00223
toluene	0.018074	6.426	0.00281
ethylbenzene	0.001260	6.426	0.00020
xylenes	0.003831	6.426	0.00060
naphthalene	0.000004	6.426	0.00000
cumene	0.000125	6.426	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,086.97**	lb/month
		0.54	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.870	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.192	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**450.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**453.63**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**174.14**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		75.609	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		56.4401	lb/month
benzene		5.1532	lb/month
2,2,4 TMP		5.4152	lb/month
toluene		5.9249	lb/month
ethylbenzene		0.6103	lb/month
xylenes		1.9357	lb/month
naphthalene		0.0365	lb/month
cumene		0.0928	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		55.3131	lb/month
benzene		4.9875	lb/month
2,2,4 TMP		5.0837	lb/month
toluene		5.3034	lb/month
ethylbenzene		0.4446	lb/month
xylenes		1.3557	lb/month
naphthalene		0.0021	lb/month
cumene		0.0514	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.05128
benzene	78.11	61	0.00462
2,2,4 TMP	114.23	61	0.00471
toluene	92.14	61	0.00492
ethylbenzene	106.17	61	0.00041
xylenes	106.17	61	0.00126
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.284116	7.870	0.03610
benzene	0.028265	7.870	0.00359
2,2,4 TMP	0.019700	7.870	0.00250
toluene	0.025479	7.870	0.00324
ethylbenzene	0.001854	7.870	0.00024
xylenes	0.005652	7.870	0.00072
naphthalene	0.000007	7.870	0.00000
cumene	0.000189	7.870	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,427.65**	lb/month
		0.71	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.377	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.253	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**593.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**596.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**229.14**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		106.493	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		79.2991	lb/month
benzene		7.3280	lb/month
2,2,4 TMP		7.7072	lb/month
toluene		8.4816	lb/month
ethylbenzene		0.8487	lb/month
xylenes		2.6682	lb/month
naphthalene		0.0380	lb/month
cumene		0.1224	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		78.1721	lb/month
benzene		7.1622	lb/month
2,2,4 TMP		7.3758	lb/month
toluene		7.8601	lb/month
ethylbenzene		0.6829	lb/month
xylenes		2.0881	lb/month
naphthalene		0.0036	lb/month
cumene		0.0809	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.05508
benzene	78.11	61	0.00505
2,2,4 TMP	114.23	61	0.00520
toluene	92.14	61	0.00554
ethylbenzene	106.17	61	0.00048
xylenes	106.17	61	0.00147
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.363565	9.377	0.03877
benzene	0.036752	9.377	0.00392
2,2,4 TMP	0.025880	9.377	0.00276
toluene	0.034191	9.377	0.00365
ethylbenzene	0.002578	9.377	0.00027
xylenes	0.007883	9.377	0.00084
naphthalene	0.000011	9.377	0.00000
cumene	0.000270	9.377	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,607.98**	lb/month
		0.80	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.046	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.285	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**668.70**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**672.73**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**258.26**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		123.322	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		91.6986	lb/month
benzene		8.5158	lb/month
2,2,4 TMP		8.9651	lb/month
toluene		9.8993	lb/month
ethylbenzene		0.9831	lb/month
xylenes		3.0820	lb/month
naphthalene		0.0389	lb/month
cumene		0.1392	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		90.5717	lb/month
benzene		8.3500	lb/month
2,2,4 TMP		8.6336	lb/month
toluene		9.2778	lb/month
ethylbenzene		0.8173	lb/month
xylenes		2.5019	lb/month
naphthalene		0.0045	lb/month
cumene		0.0978	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.05662
benzene	78.11	61	0.00522
2,2,4 TMP	114.23	61	0.00540
toluene	92.14	61	0.00580
ethylbenzene	106.17	61	0.00051
xylenes	106.17	61	0.00156
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00006

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.400431	10.046	0.03986
benzene	0.040731	10.046	0.00405
2,2,4 TMP	0.028797	10.046	0.00287
toluene	0.038365	10.046	0.00382
ethylbenzene	0.002933	10.046	0.00029
xylenes	0.008979	10.046	0.00089
naphthalene	0.000013	10.046	0.00000
cumene	0.000310	10.046	0.00003

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,532.87**	lb/month
		0.77	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is know	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.777	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.272	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**637.31**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**641.15**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**246.13**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		116.282	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		86.5156	lb/month
benzene		8.0187	lb/month
2,2,4 TMP		8.4383	lb/month
toluene		9.3046	lb/month
ethylbenzene		0.9265	lb/month
xylenes		2.9079	lb/month
naphthalene		0.0385	lb/month
cumene		0.1321	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		85.3886	lb/month
benzene		7.8530	lb/month
2,2,4 TMP		8.1069	lb/month
toluene		8.6831	lb/month
ethylbenzene		0.7608	lb/month
xylenes		2.3278	lb/month
naphthalene		0.0041	lb/month
cumene		0.0907	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.05601
benzene	78.11	61	0.00515
2,2,4 TMP	114.23	61	0.00532
toluene	92.14	61	0.00570
ethylbenzene	106.17	61	0.00050
xylenes	106.17	61	0.00153
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00006

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.385503	9.777	0.03943
benzene	0.039117	9.777	0.00400
2,2,4 TMP	0.027613	9.777	0.00282
toluene	0.036666	9.777	0.00375
ethylbenzene	0.002788	9.777	0.00029
xylenes	0.008531	9.777	0.00087
naphthalene	0.000013	9.777	0.00000
cumene	0.000294	9.777	0.00003

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,195.05**	lb/month
		0.60	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.386	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.211	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**496.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**499.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**191.59**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		85.245	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		63.5902	lb/month
benzene		5.8308	lb/month
2,2,4 TMP		6.1275	lb/month
toluene		6.7148	lb/month
ethylbenzene		0.6833	lb/month
xylenes		2.1597	lb/month
naphthalene		0.0370	lb/month
cumene		0.1018	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		62.4633	lb/month
benzene		5.6651	lb/month
2,2,4 TMP		5.7960	lb/month
toluene		6.0933	lb/month
ethylbenzene		0.5175	lb/month
xylenes		1.5796	lb/month
naphthalene		0.0026	lb/month
cumene		0.0604	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	61	0.05263
benzene	78.11	61	0.00477
2,2,4 TMP	114.23	61	0.00488
toluene	92.14	61	0.00513
ethylbenzene	106.17	61	0.00044
xylenes	106.17	61	0.00133
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00005

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.310724	8.386	0.03705
benzene	0.031093	8.386	0.00371
2,2,4 TMP	0.021752	8.386	0.00259
toluene	0.028350	8.386	0.00338
ethylbenzene	0.002090	8.386	0.00025
xylenes	0.006378	8.386	0.00076
naphthalene	0.000009	8.386	0.00000
cumene	0.000215	8.386	0.00003

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**849.11**	lb/month
		0.42	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	^oR
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**511.10**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.595	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.150	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**351.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**353.60**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2P^*M_vK_c)/12$ months	**LD**	**135.74**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		55.131	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		41.1694	lb/month
benzene		3.7174	lb/month
2,2,4 TMP		3.9141	lb/month
toluene		4.2792	lb/month
ethylbenzene		0.4612	lb/month
xylenes		1.4787	lb/month
naphthalene		0.0357	lb/month
cumene		0.0747	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		40.0424	lb/month
benzene		3.5517	lb/month
2,2,4 TMP		3.5826	lb/month
toluene		3.6577	lb/month
ethylbenzene		0.2955	lb/month
xylenes		0.8986	lb/month
naphthalene		0.0013	lb/month
cumene		0.0333	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.04762
benzene	78.11	61	0.00422
2,2,4 TMP	114.23	61	0.00426
toluene	92.14	61	0.00435
ethylbenzene	106.17	61	0.00035
xylenes	106.17	61	0.00107
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.221121	6.595	0.03353
benzene	0.021639	6.595	0.00328
2,2,4 TMP	0.014926	6.595	0.00226
toluene	0.018892	6.595	0.00286
ethylbenzene	0.001325	6.595	0.00020
xylenes	0.004028	6.595	0.00061
naphthalene	0.000005	6.595	0.00000
cumene	0.000132	6.595	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**653.16**	lb/month
		0.33	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	^oR
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**500.61**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.380	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.115	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**269.57**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**271.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2P^*M_vK_c)/12$ months	**LD**	**104.11**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		39.298	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		29.2627	lb/month
benzene		2.6136	lb/month
2,2,4 TMP		2.7708	lb/month
toluene		3.0506	lb/month
ethylbenzene		0.3536	lb/month
xylenes		1.1496	lb/month
naphthalene		0.0351	lb/month
cumene		0.0620	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		28.1357	lb/month
benzene		2.4478	lb/month
2,2,4 TMP		2.4394	lb/month
toluene		2.4292	lb/month
ethylbenzene		0.1878	lb/month
xylenes		0.5696	lb/month
naphthalene		0.0007	lb/month
cumene		0.0205	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
2,2,4 TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.04363
benzene	78.11	61	0.00380
2,2,4 TMP	114.23	61	0.00378
toluene	92.14	61	0.00377
ethylbenzene	106.17	61	0.00029
xylenes	106.17	61	0.00088
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.165254	5.380	0.03071
benzene	0.015863	5.380	0.00295
2,2,4 TMP	0.010809	5.380	0.00201
toluene	0.013345	5.380	0.00248
ethylbenzene	0.000895	5.380	0.00017
xylenes	0.002715	5.380	0.00050
naphthalene	0.000003	5.380	0.00000
cumene	0.000086	5.380	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**497.64**	lb/month
		0.25	tons/month
Product Type	Component (Average RVP 14.33)		
Monthly Throughput (only change if actual is known)	Q_{month}	83,690.48	barrels/month
Vapor Molecular weight	M_v	**60.67**	
Vapor Pressure Equation Constant A	A	11.61	
Vapor Pressure Equation Constant B	B	4971.67	^oR
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**489.49**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.294	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.087	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**204.56**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**8.29**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**205.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2P^*M_vK_c)/12$ months	**LD**	**79.00**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		27.688	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		20.4456	lb/month
benzene		1.8101	lb/month
TMP		1.9480	lb/month
toluene		2.1872	lb/month
ethylbenzene		0.2809	lb/month
xylenes		0.9282	lb/month
naphthalene		0.0348	lb/month
cumene		0.0536	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		19.3186	lb/month
benzene		1.6443	lb/month
TMP		1.6165	lb/month
toluene		1.5657	lb/month
ethylbenzene		0.1151	lb/month
xylenes		0.3482	lb/month
naphthalene		0.0004	lb/month
cumene		0.0122	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.1270	lb/month
benzene		0.1657	lb/month
TMP		0.3315	lb/month
toluene		0.6215	lb/month
ethylbenzene		0.1657	lb/month
xylenes		0.5801	lb/month
naphthalene		0.0344	lb/month
cumene		0.0414	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	61	0.03948
benzene	78.11	61	0.00336
2,2,4 TMP	114.23	61	0.00330
toluene	92.14	61	0.00320
ethylbenzene	106.17	61	0.00024
xylenes	106.17	61	0.00071
naphthalene	128.17	61	0.00000
cumene	120.19	61	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.119325	4.294	0.02779
benzene	0.011206	4.294	0.00261
2,2,4 TMP	0.007533	4.294	0.00175
toluene	0.009046	4.294	0.00211
ethylbenzene	0.000577	4.294	0.00013
xylenes	0.001746	4.294	0.00041
naphthalene	0.000002	4.294	0.00000
cumene	0.000054	4.294	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	92	86.18	0.14518
benzene	0.02	92	78.11	0.02356
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.075	92	92.14	0.07489
ethylbenzene	0.02	92	106.17	0.01733
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 119			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**21,485,314**	gal/yr
Turnovers	N	**12.42**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		Mechanical-shoe seal | Primary only	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.300**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**5,217.57**	lb/year
		2.61	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**2,073.66**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	5.80	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.30	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	2.10	NA
Vapor pressure function	P*	0.2234548	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**256.88**	lb/yr
Annual throughput	Q	511,555	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,086.17**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**800.86**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Crude Oil	
Total HAP Annual Average Emissions		46.33	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
	hexane	15.006	lb/yr
	benzene	14.163	lb/yr
	2,2,4 TMP	1.317	lb/yr
	toluene	8.324	lb/yr
	ethylbenzene	1.722	lb/yr
	xylenes	5.707	lb/yr
	naphthalene	0.096	lb/yr
	cumene	0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

		M_i	M_V	Z_{VI}
hexane	86.18	50		0.00282
benzene	78.11	50		0.00254
2,2,4 TMP	114.23	50		0.00021
toluene	92.14	50		0.00116
ethylbenzene	106.17	50		0.00014
xylenes	106.17	50		0.00043
naphthalene	128.17	50		0.00000
cumene	120.19	50		0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.014204	8.688	0.00163
benzene	0.014150	8.688	0.00163
2,2,4 TMP	0.000812	8.688	0.00009
toluene	0.005470	8.688	0.00063
ethylbenzene	0.000573	8.688	0.00007
xylenes	0.001741	8.688	0.00020
naphthalene	0.000001	8.688	0.00000
cumene	0.000000	8.688	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$

	Z_{LI}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0	207	128.17	0.00059
cumene	0.0	207	120.19	0.00000

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**119**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**1,790,443**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Primary only**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.3**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**244.77**	lb/month
		0.12	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**93.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**93.93**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**36.06**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		1.965	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.5461	lb/month
benzene		0.5237	lb/month
TMP		0.0536	lb/month
toluene		0.3779	lb/month
ethylbenzene		0.1032	lb/month
xylenes		0.3529	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.4604	lb/month
benzene		0.3953	lb/month
TMP		0.0322	lb/month
toluene		0.1638	lb/month
ethylbenzene		0.0176	lb/month
xylenes		0.0532	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**260.30**	lb/month
		0.13	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**99.86**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**100.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**38.57**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.099	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.5971	lb/month
benzene		0.5703	lb/month
TMP		0.0575	lb/month
toluene		0.3993	lb/month
ethylbenzene		0.1058	lb/month
xylenes		0.3607	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.5115	lb/month
benzene		0.4418	lb/month
TMP		0.0361	lb/month
toluene		0.1852	lb/month
ethylbenzene		0.0202	lb/month
xylenes		0.0610	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**318.91**	lb/month
		0.16	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**124.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**125.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**48.03**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.642	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.8022	lb/month
benzene		0.7593	lb/month
2,2,4 TMP		0.0735	lb/month
toluene		0.4881	lb/month
ethylbenzene		0.1168	lb/month
xylenes		0.3942	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.7166	lb/month
benzene		0.6309	lb/month
2,2,4 TMP		0.0521	lb/month
toluene		0.2741	lb/month
ethylbenzene		0.0312	lb/month
xylenes		0.0945	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**432.00**	lb/month
		0.22	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} v^b)DP* M_v K_c)/12 months	**L_R**	**171.63**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**172.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	**LD**	**66.29**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.830	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vl}(L_R + L_F + L_D) + Z_{cl}L_W$			
		L_{TI}	
hexane		1.2391	lb/month
benzene		1.1695	lb/month
2,2,4 TMP		0.1088	lb/month
toluene		0.6883	lb/month
ethylbenzene		0.1428	lb/month
xylenes		0.4734	lb/month
naphthalene		0.0080	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vl}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1535	lb/month
benzene		1.0410	lb/month
2,2,4 TMP		0.0874	lb/month
toluene		0.4743	lb/month
ethylbenzene		0.0572	lb/month
xylenes		0.1737	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{cl}L_W$			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**569.60**	lb/month
		0.28	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} v^b)DP* M_v K_c)/12 months	**L_R**	**229.16**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**230.54**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	**LD**	**88.50**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.437	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vl}(L_R + L_F + L_D) + Z_{cl}L_W$			
		L_{TI}	
hexane		1.8167	lb/month
benzene		1.7205	lb/month
2,2,4 TMP		1.566	lb/month
toluene		0.9665	lb/month
ethylbenzene		0.1802	lb/month
xylenes		0.5882	lb/month
naphthalene		0.0081	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vl}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7311	lb/month
benzene		1.5921	lb/month
2,2,4 TMP		0.1352	lb/month
toluene		0.7524	lb/month
ethylbenzene		0.0946	lb/month
xylenes		0.2885	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{cl}L_W$			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**763.93**	lb/month
		0.38	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} v^b)DP* M_v K_c)/12 months	**L_R**	**310.39**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**312.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	**LD**	**119.87**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		7.862	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vl}(L_R + L_F + L_D) + Z_{cl}L_W$			
		L_{TI}	
hexane		2.6743	lb/month
benzene		2.5476	lb/month
2,2,4 TMP		0.2290	lb/month
toluene		1.3940	lb/month
ethylbenzene		0.2394	lb/month
xylenes		0.7699	lb/month
naphthalene		0.0082	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vl}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.5886	lb/month
benzene		2.4192	lb/month
2,2,4 TMP		0.2076	lb/month
toluene		1.1800	lb/month
ethylbenzene		0.1538	lb/month
xylenes		0.4702	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{cl}L_W$			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**881.09**	lb/month
		0.44	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**359.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**361.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**138.79**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.362	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		3.2003	lb/month
benzene		3.0573	lb/month
2,2,4 TMP		0.2738	lb/month
toluene		1.6604	lb/month
ethylbenzene		0.2768	lb/month
xylenes		0.8847	lb/month
naphthalene		0.0084	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.1147	lb/month
benzene		2.9289	lb/month
2,2,4 TMP		0.2524	lb/month
toluene		1.4464	lb/month
ethylbenzene		0.1911	lb/month
xylenes		0.5851	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**830.66**	lb/month
		0.42	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**338.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**340.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**130.65**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		8.715	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.9736	lb/month
benzene		2.8376	lb/month
2,2,4 TMP		0.2545	lb/month
toluene		1.5454	lb/month
ethylbenzene		0.2606	lb/month
xylenes		0.8351	lb/month
naphthalene		0.0083	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.8880	lb/month
benzene		2.7091	lb/month
2,2,4 TMP		0.2331	lb/month
toluene		1.3313	lb/month
ethylbenzene		0.1750	lb/month
xylenes		0.5354	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**628.42**	lb/month
		0.31	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**253.74**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**255.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**98.00**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.158	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.0728	lb/month
benzene		1.9667	lb/month
2,2,4 TMP		0.1781	lb/month
toluene		1.0928	lb/month
ethylbenzene		0.1976	lb/month
xylenes		0.6414	lb/month
naphthalene		0.0081	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9872	lb/month
benzene		1.8383	lb/month
2,2,4 TMP		0.1567	lb/month
toluene		0.8788	lb/month
ethylbenzene		0.1120	lb/month
xylenes		0.3417	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**446.51**	lb/month
		0.22	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.843	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.230	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**177.70**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**178.77**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**68.63**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.992	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.2981	lb/month
benzene		1.2254	lb/month
2,2,4 TMP		0.1136	lb/month
toluene		0.7162	lb/month
ethylbenzene		0.1465	lb/month
xylenes		0.4847	lb/month
naphthalene		0.0080	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2125	lb/month
benzene		1.0970	lb/month
2,2,4 TMP		0.0922	lb/month
toluene		0.5021	lb/month
ethylbenzene		0.0608	lb/month
xylenes		0.1850	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00285
benzene	78.11	50	0.00258
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00118
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00044
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.014633	8.843	0.00165
benzene	0.014607	8.843	0.00165
2,2,4 TMP	0.000840	8.843	0.00009
toluene	0.005668	8.843	0.00064
ethylbenzene	0.000596	8.843	0.00007
xylenes	0.001813	8.843	0.00020
naphthalene	0.000001	8.843	0.00000
cumene	0.000000	8.843	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**349.62**	lb/month
		0.17	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.448	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.177	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**137.20**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**138.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**52.99**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.949	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.9162	lb/month
benzene		0.8655	lb/month
2,2,4 TMP		0.0826	lb/month
toluene		0.5392	lb/month
ethylbenzene		0.1233	lb/month
xylenes		0.4140	lb/month
naphthalene		0.0080	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.8306	lb/month
benzene		0.7371	lb/month
2,2,4 TMP		0.0612	lb/month
toluene		0.3251	lb/month
ethylbenzene		0.0377	lb/month
xylenes		0.1143	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00253
benzene	78.11	50	0.00225
2,2,4 TMP	114.23	50	0.00019
toluene	92.14	50	0.00099
ethylbenzene	106.17	50	0.00011
xylenes	106.17	50	0.00035
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.010936	7.448	0.00147
benzene	0.010707	7.448	0.00144
2,2,4 TMP	0.000608	7.448	0.00008
toluene	0.004003	7.448	0.00054
ethylbenzene	0.000403	7.448	0.00005
xylenes	0.001222	7.448	0.00016
naphthalene	0.000001	7.448	0.00000
cumene	0.000000	7.448	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**274.36**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,629.59	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.158	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**105.74**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**21.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**106.38**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**40.84**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.223	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.6447	lb/month
benzene		0.6138	lb/month
TMP		0.0612	lb/month
toluene		0.4195	lb/month
ethylbenzene		0.1083	lb/month
xylenes		0.3682	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.5590	lb/month
benzene		0.4853	lb/month
TMP		0.0398	lb/month
toluene		0.2054	lb/month
ethylbenzene		0.0227	lb/month
xylenes		0.0685	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0856	lb/month
benzene		0.1284	lb/month
TMP		0.0214	lb/month
toluene		0.2141	lb/month
ethylbenzene		0.0856	lb/month
xylenes		0.2997	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentration $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00221
benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.007897	6.158	0.00128
benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.002714	6.158	0.00044
ethylbenzene	0.000260	6.158	0.00004
xylenes	0.000785	6.158	0.00013
naphthalene	0.000000	6.158	0.00000
cumene	0.000000	6.158	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 119			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**66,365,746**	gal/yr
Turnovers	N	**38.37**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		Mechanical-shoe seal | Primary only	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.300**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**209.98**	lb/year
		0.10	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**4.85**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	5.80	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.30	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	2.10	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**198.37**	lb/yr
Annual throughput	Q	1,580,137	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**4.88**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**1.87**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = (ITAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel	
Total HAP Annual Average Emissions		1.83	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
hexane		0.006	lb/yr
benzene		0.027	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.343	lb/yr
ethylbenzene		0.060	lb/yr
xylenes		1.239	lb/yr
naphthalene		0.154	lb/yr
cumene		0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02408
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05712
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000159	0.005	0.03394
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000328	0.005	0.06994
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
naphthalene	7.146	1831.6	211.82	0.0015

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**119**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**5,530,479**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Primary only**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.3**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**16.91**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.06**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.100	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0148	lb/month
ethylbenzene		0.0033	lb/month
xylenes		0.0678	lb/month
naphthalene		0.0126	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0095	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0199	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**16.95**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.104	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0012	lb/month
TMP		0.0000	lb/month
toluene		0.0158	lb/month
ethylbenzene		0.0033	lb/month
xylenes		0.0704	lb/month
naphthalene		0.0126	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0106	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0225	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.13**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.25**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.119	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0201	lb/month
ethylbenzene		0.0039	lb/month
xylenes		0.0809	lb/month
naphthalene		0.0127	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0003	lb/month
benzene		0.0014	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0148	lb/month
ethylbenzene		0.0017	lb/month
xylenes		0.0330	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.49**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.40**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**0.40**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.15**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.152	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0022	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0284	lb/month
ethylbenzene		0.0050	lb/month
xylenes		0.1027	lb/month
naphthalene		0.0128	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0021	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0547	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.91**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.58**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**0.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.22**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.190	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0006	lb/month
benzene		0.0030	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0378	lb/month
ethylbenzene		0.0063	lb/month
xylenes		0.1287	lb/month
naphthalene		0.0131	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0029	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0325	lb/month
ethylbenzene		0.0042	lb/month
xylenes		0.0808	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**18.42**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.79**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**0.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.30**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.235	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0008	lb/month
benzene		0.0039	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0490	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.1606	lb/month
naphthalene		0.0134	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0437	lb/month
ethylbenzene		0.0058	lb/month
xylenes		0.1126	lb/month
naphthalene		0.0009	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**18.67**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.89**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.34**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.258	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0008	lb/month
benzene		0.0043	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0543	lb/month
ethylbenzene		0.0087	lb/month
xylenes		0.1762	lb/month
naphthalene		0.0135	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0008	lb/month
benzene		0.0041	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0490	lb/month
ethylbenzene		0.0066	lb/month
xylenes		0.1283	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02294
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06008
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00322
2,2,4 TMP	0.000000	0.010	-
toluene	0.000335	0.010	0.03237
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000760	0.010	0.07356
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**18.56**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.85**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.86**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.33**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.249	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0008	lb/month
benzene		0.0041	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0521	lb/month
ethylbenzene		0.0084	lb/month
xylenes		0.1698	lb/month
naphthalene		0.0135	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0008	lb/month
benzene		0.0040	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0468	lb/month
ethylbenzene		0.0063	lb/month
xylenes		0.1219	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00195
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02302
ethylbenzene	106.17	130	0.00307
xylenes	106.17	130	0.05992
naphthalene	128.17	130	0.00047
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00059
benzene	0.000032	0.010	0.00325
2,2,4 TMP	0.000000	0.010	-
toluene	0.000320	0.010	0.03248
ethylbenzene	0.000037	0.010	0.00376
xylenes	0.000722	0.010	0.07337
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**18.08**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.65**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.25**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.205	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0007	lb/month
benzene		0.0033	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0415	lb/month
ethylbenzene		0.0068	lb/month
xylenes		0.1391	lb/month
naphthalene		0.0132	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0032	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0362	lb/month
ethylbenzene		0.0047	lb/month
xylenes		0.0911	lb/month
naphthalene		0.0007	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.54**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.42**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.42**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.16**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.156	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0023	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0294	lb/month
ethylbenzene		0.0051	lb/month
xylenes		0.1055	lb/month
naphthalene		0.0129	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0022	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0241	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0576	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00219
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05728
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00364
2,2,4 TMP	0.000000	0.005	-
toluene	0.000165	0.005	0.03388
ethylbenzene	0.000018	0.005	0.00362
xylenes	0.000341	0.005	0.07014
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.23**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.29**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.11**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.128	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0004	lb/month
benzene		0.0017	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0223	lb/month
ethylbenzene		0.0042	lb/month
xylenes		0.0867	lb/month
naphthalene		0.0127	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0016	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0170	lb/month
ethylbenzene		0.0020	lb/month
xylenes		0.0388	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00049
benzene	78.11	130	0.00231
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02443
ethylbenzene	106.17	130	0.00288
xylenes	106.17	130	0.05562
naphthalene	128.17	130	0.00031
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.003	0.00074
benzene	0.000013	0.003	0.00384
2,2,4 TMP	0.000000	0.003	-
toluene	0.000116	0.003	0.03447
ethylbenzene	0.000012	0.003	0.00352
xylenes	0.000230	0.003	0.06810
naphthalene	0.000001	0.003	0.00032
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.00**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.53**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.08**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.107	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
TMP		0.0000	lb/month
toluene		0.0168	lb/month
ethylbenzene		0.0034	lb/month
xylenes		0.0729	lb/month
naphthalene		0.0126	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0116	lb/month
ethylbenzene		0.0013	lb/month
xylenes		0.0249	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0479	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentratior $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00053
benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.002	-
toluene	0.000079	0.002	0.03500
ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000148	0.002	0.06558
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		119	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**66,365,746**	gal/yr
Turnovers	N	**38.37**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type,		Mechanical-shoe seal | Primary only	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ea}	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Eb}	**0.300**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**206.82**	lb/year
		0.10	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**1.20**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	5.80	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.30	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	2.10	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$/D)[1+(N.F$_P$/D)]	**LW**	**203.95**	lb/yr
Annual throughput	Q	1,580,137	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1.20**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**0.46**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	biodiesel	
Total HAP Annual Average Emissions		23.81	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_{WF}$		L_{Ti}	
hexane		0.000	lb/yr
benzene		0.000	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.000	lb/yr
ethylbenzene		0.000	lb/yr
xylenes		0.000	lb/yr
naphthalene		0.000	lb/yr
cumene		11.904	lb/yr
methanol		11.904	lb/yr

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01644

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018811	0.005	4.01644

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**119**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**5,530,479**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Primary only**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**5.8**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.3**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**2.1**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	**2**	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

1 Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.09**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**0.02**	lb/month
HAPS Speciation	Product - select from list		biodiesel
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{TI}**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4266	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3926	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{\wedge}(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.10**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**0.02**	lb/month
HAPS Speciation	Product - same as January		biodiesel
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{TI}**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4707	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4368	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{\wedge}(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.14**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**0.02**	lb/month
HAPS Speciation	Product - same as January		biodiesel
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{TI}**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6436	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6096	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{\wedge}(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**17.23**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.04**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9837	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9498	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.01842	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.018648	0.005	4.01842	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**17.34**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.14**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.05**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3722	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3382	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.93734	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.007	-	
benzene	0.000000	0.007	-	
2,2,4 TMP	0.000000	0.007	-	
toluene	0.000000	0.007	-	
ethylbenzene	0.000000	0.007	-	
xylenes	0.000000	0.007	-	
naphthalene	0.000000	0.007	-	
cumene	0.000000	0.007	-	
methanol	0.026274	0.007	3.93734	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**17.46**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.08**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.8309	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7969	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.86270	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.009	-	
benzene	0.000000	0.009	-	
2,2,4 TMP	0.000000	0.009	-	
toluene	0.000000	0.009	-	
ethylbenzene	0.000000	0.009	-	
xylenes	0.000000	0.009	-	
naphthalene	0.000000	0.009	-	
cumene	0.000000	0.009	-	
methanol	0.035276	0.009	3.86270	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July				MONTH August				MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.52**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**17.50**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**17.38**	lb/month
		0.01	tons/month			0.01	tons/month			0.01	tons/month
Product Type		Biodiesel		Product Type		Biodiesel		Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month	Monthly Throughput (only change if actual is know	Q_{month}	131,678.07	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R	Vapor Pressure Equation Constant B	B	8907.00	°R	Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R	Average daily maximum ambient temper	T_{AX}	539.70	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R	Average daily minimum ambient temper	T_{AN}	520.60	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	532.75		TB = TAA + 0.003 as I	T_B	531.38		TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.22**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.21**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.16**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**17.00**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**17.00**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.22**	lb/month	$L_F = F_F P^*M_v K_c)$	**LF**	**0.21**	lb/month	$L_F = F_F P^*M_v K_c)$	**LF**	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.08**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.08**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.06**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		biodiesel		**Product - same as January**		biodiesel		**Product - same as January**		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
	L_{Ti}				L_{Ti}				L_{Ti}		
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		2.0512	lb/month	**methanol**		1.9615	lb/month	**methanol**		1.5232	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}((L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses				**Standing losses**				**Standing losses**		
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		2.0172	lb/month	**methanol**		1.9275	lb/month	**methanol**		1.4892	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$			
	Working losses				**Working losses**				**Working losses**		
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		0.0340	lb/month	**methanol**		0.0340	lb/month	**methanol**		0.0340	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-4** $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}		M_i	M_v	Z_{vi}		M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000	hexane	86.18	32	0.00000	hexane	86.18	32	0.00000
benzene	78.11	32	0.00000	benzene	78.11	32	0.00000	benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000	toluene	92.14	32	0.00000	toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000	cumene	120.19	32	0.00000	cumene	120.19	32	0.00000
methanol	32.04	32	3.83221	methanol	32.04	32	3.84429	methanol	32.04	32	3.91078
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i		$P_i = P_{vA}(x_i)$	P_{vA}	y_i		$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-	hexane	0.000000	0.010	-	hexane	0.000000	0.007	-
benzene	0.000000	0.010	-	benzene	0.000000	0.010	-	benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.010	-	toluene	0.000000	0.010	-	toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.010	-	xylenes	0.000000	0.010	-	xylenes	0.000000	0.007	-
naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.007	-
cumene	0.000000	0.010	-	cumene	0.000000	0.010	-	cumene	0.000000	0.007	-
methanol	0.039600	0.010	3.83221	methanol	0.037838	0.010	3.84429	methanol	0.029238	0.007	3.91078
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581	6.878	1171.5	224.37	2.6553	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.7291	6.906	1211	220.79	1.6605	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.8939	6.812	1257.8	220.74	0.8571	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.5123	7.017	1377.6	222.64	0.4896	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1692	6.95	1419.3	212.61	0.1609	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1480	7.009	1462.3	215.11	0.1406	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0045	7.146	1831.6	211.82	0.0042	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0810	6.929	1455.8	207.2	0.0767	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	2.2869	8.079	1581.3	239.65	1.2852	8.079	1581.3	239.65	1.6885

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.24**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.04**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.0266	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9926	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.00835

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.019489	0.005	4.00835

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.17**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.03**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7362	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7022	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0340	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.08439

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.013788	0.003	4.08439

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.11**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,678.07	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**17.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.02**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5115	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4775	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4775	lb/month

Vapor Weight Concentrations $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16083

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009376	0.002	4.16083

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 120			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**83,534,784**	gal/yr
Turnovers	N	**48.29**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	52	1.2	
Legs (IFR type) — IFR type, Adjustable	40	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		466.80	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**5,613.11**	lb/year
		2.81	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**374.61**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1258755	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**196.93**	lb/yr
Annual throughput	Q	1,988,923	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**3,643.04**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**1,398.53**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:		Gasoline	
Total HAP Annual Average Emissions			143.65	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$			L_{TI}	
hexane			22.528	lb/yr
benzene			25.820	lb/yr
2,2,4 TMP			32.813	lb/yr
toluene			37.486	lb/yr
ethylbenzene			4.187	lb/yr
xylenes			19.995	lb/yr
naphthalene			0.826	lb/yr
cumene			1.214	lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$				
	M_i	**M_V**	**Z_{VI}**	
hexane	86.18	62	0.00380	
benzene	78.11	62	0.00411	
2,2,4 TMP	114.23	62	0.00460	
toluene	92.14	62	0.00438	
ethylbenzene	106.17	62	0.00026	
xylenes	106.17	62	0.00115	
naphthalene	128.17	62	0.00000	
cumene	120.19	62	0.00004	
Vapor Mole Fraction Eq. 40-5 $y_i=P_i/P_{VA}$				
	$P_i=P_{VA}(x_i)$		**P_{VA}**	**y_i**
hexane	0.015782	5.779	0.00273	
benzene	0.018867	5.779	0.00326	
2,2,4 TMP	0.014442	5.779	0.00250	
toluene	0.017017	5.779	0.00294	
ethylbenzene	0.000891	5.779	0.00015	
xylenes	0.003869	5.779	0.00067	
naphthalene	0.000005	5.779	0.00000	
cumene	0.000126	5.779	0.00002	
Liquid Mole Fraction Eq. 40-4 $x_i=(Z_{Li}M_i)/M_L$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**120**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**6,961,232**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**299.52**	lb/month
		0.15	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**19.58**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	L_W	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**190.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**73.10**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		7.240	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		0.9410	lb/month
benzene		1.0957	lb/month
TMP		1.5246	lb/month
toluene		1.9226	lb/month
ethylbenzene		0.2713	lb/month
xylenes		1.3282	lb/month
naphthalene		0.0683	lb/month
cumene		0.0882	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.7768	lb/month
benzene		0.8003	lb/month
TMP		0.8681	lb/month
toluene		0.7738	lb/month
ethylbenzene		0.0416	lb/month
xylenes		0.1794	lb/month
naphthalene		0.0002	lb/month
cumene		0.0062	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.1641	lb/month
benzene		0.2954	lb/month
TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**320.96**	lb/month
		0.16	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**21.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	L_W	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**204.85**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**78.64**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		7.647	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		1.0241	lb/month
benzene		1.1868	lb/month
TMP		1.6271	lb/month
toluene		2.0206	lb/month
ethylbenzene		0.2773	lb/month
xylenes		1.3539	lb/month
naphthalene		0.0683	lb/month
cumene		0.0892	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.8600	lb/month
benzene		0.8914	lb/month
TMP		0.9706	lb/month
toluene		0.8718	lb/month
ethylbenzene		0.0475	lb/month
xylenes		0.2051	lb/month
naphthalene		0.0002	lb/month
cumene		0.0071	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.1641	lb/month
benzene		0.2954	lb/month
TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**357.42**	lb/month
		0.18	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**23.59**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	L_W	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**229.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**88.05**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		8.917	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		1.2718	lb/month
benzene		1.4655	lb/month
TMP		1.9457	lb/month
toluene		2.3349	lb/month
ethylbenzene		0.2973	lb/month
xylenes		1.4410	lb/month
naphthalene		0.0685	lb/month
cumene		0.0925	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.1076	lb/month
benzene		1.1701	lb/month
TMP		1.2892	lb/month
toluene		1.1861	lb/month
ethylbenzene		0.0675	lb/month
xylenes		0.2923	lb/month
naphthalene		0.0004	lb/month
cumene		0.0104	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.1641	lb/month
benzene		0.2954	lb/month
TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**464.75**	lb/month
		0.23	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**31.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**301.56**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**115.77**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		11.993	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.8623	lb/month
benzene		2.1346	lb/month
2,2,4 TMP		2.7146	lb/month
toluene		3.1037	lb/month
ethylbenzene		0.3476	lb/month
xylenes		1.6604	lb/month
naphthalene		0.0688	lb/month
cumene		0.1009	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.6982	lb/month
benzene		1.8392	lb/month
2,2,4 TMP		2.0581	lb/month
toluene		1.9549	lb/month
ethylbenzene		0.1178	lb/month
xylenes		0.5116	lb/month
naphthalene		0.0007	lb/month
cumene		0.0189	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_I M_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(x_I)$	**P_{VA}**	**y_I**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**397.94**	lb/month
		0.20	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**26.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**256.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**98.52**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		14.545	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.3171	lb/month
benzene		2.6716	lb/month
2,2,4 TMP		3.3476	lb/month
toluene		3.7690	lb/month
ethylbenzene		0.3945	lb/month
xylenes		1.8664	lb/month
naphthalene		0.0692	lb/month
cumene		0.1093	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.1530	lb/month
benzene		2.3762	lb/month
2,2,4 TMP		2.6911	lb/month
toluene		2.6203	lb/month
ethylbenzene		0.1648	lb/month
xylenes		0.7176	lb/month
naphthalene		0.0011	lb/month
cumene		0.0272	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_I M_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(x_I)$	**P_{VA}**	**y_I**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**498.11**	lb/month
		0.25	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**33.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**324.00**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**124.38**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		18.626	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		3.0486	lb/month
benzene		3.5302	lb/month
2,2,4 TMP		4.3578	lb/month
toluene		4.8302	lb/month
ethylbenzene		0.4697	lb/month
xylenes		2.1967	lb/month
naphthalene		0.0699	lb/month
cumene		0.1227	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.8845	lb/month
benzene		3.2348	lb/month
2,2,4 TMP		3.7014	lb/month
toluene		3.6815	lb/month
ethylbenzene		0.2399	lb/month
xylenes		1.0479	lb/month
naphthalene		0.0018	lb/month
cumene		0.0406	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_I M_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(x_I)$	**P_{VA}**	**y_I**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**546.36**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**36.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**356.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**136.84**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.683	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		3.4109	lb/month
benzene		3.9592	lb/month
2,2,4 TMP		4.8656	lb/month
toluene		5.3705	lb/month
ethylbenzene		0.5087	lb/month
xylenes		2.3685	lb/month
naphthalene		0.0703	lb/month
cumene		0.1297	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.2468	lb/month
benzene		3.6638	lb/month
2,2,4 TMP		4.2091	lb/month
toluene		4.2217	lb/month
ethylbenzene		0.2789	lb/month
xylenes		1.2198	lb/month
naphthalene		0.0022	lb/month
cumene		0.0477	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**526.67**	lb/month
		0.26	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**35.29**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**343.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**131.75**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		19.837	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		3.2623	lb/month
benzene		3.7830	lb/month
2,2,4 TMP		4.6569	lb/month
toluene		5.1479	lb/month
ethylbenzene		0.4926	lb/month
xylenes		2.2975	lb/month
naphthalene		0.0701	lb/month
cumene		0.1268	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.0982	lb/month
benzene		3.4876	lb/month
2,2,4 TMP		4.0004	lb/month
toluene		3.9991	lb/month
ethylbenzene		0.2628	lb/month
xylenes		1.1487	lb/month
naphthalene		0.0020	lb/month
cumene		0.0448	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**662.83**	lb/month
		0.33	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**44.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**434.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**166.91**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.549	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.8897	lb/month
benzene		3.3211	lb/month
2,2,4 TMP		4.0960	lb/month
toluene		4.5237	lb/month
ethylbenzene		0.4447	lb/month
xylenes		2.0862	lb/month
naphthalene		0.0696	lb/month
cumene		0.1179	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.7256	lb/month
benzene		3.0257	lb/month
2,2,4 TMP		3.4396	lb/month
toluene		3.3750	lb/month
ethylbenzene		0.2150	lb/month
xylenes		0.9374	lb/month
naphthalene		0.0015	lb/month
cumene		0.0358	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**507.09**	lb/month
		0.25	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**33.94**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_P/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**330.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**126.70**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		12.520	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.9636	lb/month
benzene		2.2491	lb/month
2,2,4 TMP		2.8461	lb/month
toluene		3.2353	lb/month
ethylbenzene		0.3562	lb/month
xylenes		1.6980	lb/month
naphthalene		0.0689	lb/month
cumene		0.1024	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7995	lb/month
benzene		1.9537	lb/month
2,2,4 TMP		2.1897	lb/month
toluene		2.0865	lb/month
ethylbenzene		0.1264	lb/month
xylenes		0.5492	lb/month
naphthalene		0.0008	lb/month
cumene		0.0204	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00367
benzene	78.11	62	0.00398
2,2,4 TMP	114.23	62	0.00446
toluene	92.14	62	0.00425
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00112
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.016259	6.162	0.00264
benzene	0.019475	6.162	0.00316
2,2,4 TMP	0.014926	6.162	0.00242
toluene	0.017633	6.162	0.00286
ethylbenzene	0.000927	6.162	0.00015
xylenes	0.004028	6.162	0.00065
naphthalene	0.000005	6.162	0.00000
cumene	0.000132	6.162	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**444.19**	lb/month
		0.22	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**29.59**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_P/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**287.74**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**110.46**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.214	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.5334	lb/month
benzene		1.7535	lb/month
2,2,4 TMP		2.2710	lb/month
toluene		2.6494	lb/month
ethylbenzene		0.3168	lb/month
xylenes		1.5258	lb/month
naphthalene		0.0686	lb/month
cumene		0.0956	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3693	lb/month
benzene		1.4581	lb/month
2,2,4 TMP		1.6146	lb/month
toluene		1.5006	lb/month
ethylbenzene		0.0870	lb/month
xylenes		0.3770	lb/month
naphthalene		0.0005	lb/month
cumene		0.0136	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
2,2,4 TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00320
benzene	78.11	60	0.00341
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00351
ethylbenzene	106.17	60	0.00020
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.012679	5.675	0.00223
benzene	0.014897	5.675	0.00262
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.012997	5.675	0.00229
ethylbenzene	0.000654	5.675	0.00012
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**340.38**	lb/month
		0.17	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**22.41**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_P/D)]$	**L_W**	**16.41**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**217.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**83.65**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		8.027	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1010	lb/month
benzene		1.2715	lb/month
TMP		1.7226	lb/month
toluene		2.1126	lb/month
ethylbenzene		0.2829	lb/month
xylenes		1.3784	lb/month
naphthalene		0.0684	lb/month
cumene		0.0901	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.9369	lb/month
benzene		0.9761	lb/month
TMP		1.0662	lb/month
toluene		0.9638	lb/month
ethylbenzene		0.0532	lb/month
xylenes		0.2296	lb/month
naphthalene		0.0003	lb/month
cumene		0.0080	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1641	lb/month
benzene		0.2954	lb/month
TMP		0.6564	lb/month
toluene		1.1488	lb/month
ethylbenzene		0.2298	lb/month
xylenes		1.1488	lb/month
naphthalene		0.0681	lb/month
cumene		0.0821	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00289
benzene	78.11	60	0.00301
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.009155	4.536	0.00202
benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.008810	4.536	0.00194
ethylbenzene	0.000422	4.536	0.00009
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.	120		
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**83,534,784**	gal/yr
Turnovers	N	**48.29**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0)	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	Type	Qty	Loss Factor Kf (Table 7.1-12)
			Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**669.59**	lb/year
		0.33	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5))^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**30.79**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_v$W$_L$/D)*[1+(N,F$_p$/D)]	**LW**	**224.36**	lb/yr
Annual throughput	Q	1,988,923	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/ft
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**299.47**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: Ethanol

Total HAP Annual Average Emissions		487.68
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R+L_F+L_D)+Z_{vL}L_{WD}$		L_{Ti}
hexane		0.333 lb/yr
benzene		0.409 lb/yr
2,2,4 TMP		0.591 lb/yr
toluene		0.777 lb/yr
ethylbenzene		0.113 lb/yr
xylenes		0.551 lb/yr
naphthalene		0.028 lb/yr
cumene		0.037 lb/yr
ethyl alcohol (ethanol)		484.842 lb/yr

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**120**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**6,961,232**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**1**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**1**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**52**	1.2
Legs (IFR type)	IFR type, Adjustable	**40**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**1**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	38.90 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**34.04**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.005	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**1.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	LF	**10.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	LD	**3.96**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.175	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_L L_W$		L_{TI}	
hexane		0.0159	lb/month
benzene		0.0207	lb/month
TMP		0.0339	lb/month
toluene		0.0495	lb/month
ethylbenzene		0.0084	lb/month
xylenes		0.0416	lb/month
naphthalene		0.0023	lb/month
cumene		0.0029	lb/month
ethyl alcohol {ethanol}		26.2313	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		Standing losses	
hexane		0.0103	lb/month
benzene		0.0106	lb/month
TMP		0.0115	lb/month
toluene		0.0102	lb/month
ethylbenzene		0.0005	lb/month
xylenes		0.0024	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		8.0953	lb/month
Individual HAP Monthly Emissions Working losses $= Z_L L_W$		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1360	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol {ethanol}	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.73**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**1.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	LF	**11.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	LD	**4.40**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.180	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_L L_W$		L_{TI}	
hexane		0.0168	lb/month
benzene		0.0217	lb/month
TMP		0.0351	lb/month
toluene		0.0507	lb/month
ethylbenzene		0.0085	lb/month
xylenes		0.0419	lb/month
naphthalene		0.0023	lb/month
cumene		0.0029	lb/month
ethyl alcohol {ethanol}		27.2679	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		Standing losses	
hexane		0.0112	lb/month
benzene		0.0116	lb/month
TMP		0.0127	lb/month
toluene		0.0114	lb/month
ethylbenzene		0.0006	lb/month
xylenes		0.0027	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		9.1319	lb/month
Individual HAP Monthly Emissions Working losses $= Z_L L_W$		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1360	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol {ethanol}	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**42.34**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.008	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**1.64**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	LF	**15.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	LD	**6.10**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.199	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_L L_W$		L_{TI}	
hexane		0.0206	lb/month
benzene		0.0259	lb/month
2,2,4 TMP		0.0399	lb/month
toluene		0.0553	lb/month
ethylbenzene		0.0088	lb/month
xylenes		0.0432	lb/month
naphthalene		0.0023	lb/month
cumene		0.0029	lb/month
ethyl alcohol {ethanol}		31.4543	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		Standing losses	
hexane		0.0150	lb/month
benzene		0.0158	lb/month
2,2,4 TMP		0.0174	lb/month
toluene		0.0160	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0039	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		13.3183	lb/month
Individual HAP Monthly Emissions Working losses $= Z_L L_W$		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1360	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol {ethanol}	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2781

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**55.48**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**2.54**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**24.74**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**9.50**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.236	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0275	lb/month
benzene		0.0339	lb/month
2,2,4 TMP		0.0490	lb/month
toluene		0.0645	lb/month
ethylbenzene		0.0094	lb/month
xylenes		0.0459	lb/month
naphthalene		0.0023	lb/month
cumene		0.0030	lb/month
ethyl alcohol (ethanol)		40.1836	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0219	lb/month
benzene		0.0238	lb/month
2,2,4 TMP		0.0266	lb/month
toluene		0.0253	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0066	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		22.0476	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**70.75**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.60**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**35.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**13.44**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.277	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0352	lb/month
benzene		0.0427	lb/month
2,2,4 TMP		0.0594	lb/month
toluene		0.0752	lb/month
ethylbenzene		0.0101	lb/month
xylenes		0.0491	lb/month
naphthalene		0.0023	lb/month
cumene		0.0032	lb/month
ethyl alcohol (ethanol)		50.7904	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0296	lb/month
benzene		0.0326	lb/month
2,2,4 TMP		0.0370	lb/month
toluene		0.0360	lb/month
ethylbenzene		0.0023	lb/month
xylenes		0.0099	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		32.6543	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**89.23**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**4.88**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**47.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**18.21**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.327	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0439	lb/month
benzene		0.0531	lb/month
2,2,4 TMP		0.0716	lb/month
toluene		0.0882	lb/month
ethylbenzene		0.0110	lb/month
xylenes		0.0532	lb/month
naphthalene		0.0024	lb/month
cumene		0.0033	lb/month
ethyl alcohol (ethanol)		64.0499	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0383	lb/month
benzene		0.0430	lb/month
2,2,4 TMP		0.0492	lb/month
toluene		0.0489	lb/month
ethylbenzene		0.0032	lb/month
xylenes		0.0139	lb/month
naphthalene		0.0000	lb/month
cumene		0.0005	lb/month
ethyl alcohol (ethanol)		45.9138	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1360	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_S+L_W+L_F+L_D$)	**LT**	**98.28**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**5.50**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**53.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**20.55**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.351	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$		L_{TI}	
hexane		0.0481	lb/month
benzene		0.0580	lb/month
2,2,4 TMP		0.0775	lb/month
toluene		0.0945	lb/month
ethylbenzene		0.0115	lb/month
xylenes		0.0552	lb/month
naphthalene		0.0024	lb/month
cumene		0.0034	lb/month
ethyl alcohol {ethanol}		70.6783	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0425	lb/month
benzene		0.0479	lb/month
2,2,4 TMP		0.0551	lb/month
toluene		0.0552	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0160	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol {ethanol}		52.5423	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol {ethanol}	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_S+L_W+L_F+L_D$)	**LT**	**94.58**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temper	T_{AX}	539.70	°R
Average daily minimum ambient temper	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**5.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**51.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**19.59**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.341	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$		L_{TI}	
hexane		0.0464	lb/month
benzene		0.0560	lb/month
2,2,4 TMP		0.0751	lb/month
toluene		0.0919	lb/month
ethylbenzene		0.0113	lb/month
xylenes		0.0544	lb/month
naphthalene		0.0024	lb/month
cumene		0.0034	lb/month
ethyl alcohol {ethanol}		67.9586	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0408	lb/month
benzene		0.0459	lb/month
2,2,4 TMP		0.0527	lb/month
toluene		0.0526	lb/month
ethylbenzene		0.0035	lb/month
xylenes		0.0151	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol {ethanol}		49.8226	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol {ethanol}	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_S+L_W+L_F+L_D$)	**LT**	**76.78**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**4.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**39.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**15.00**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.294	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$		L_{TI}	
hexane		0.0381	lb/month
benzene		0.0461	lb/month
2,2,4 TMP		0.0634	lb/month
toluene		0.0795	lb/month
ethylbenzene		0.0104	lb/month
xylenes		0.0504	lb/month
naphthalene		0.0023	lb/month
cumene		0.0032	lb/month
ethyl alcohol {ethanol}		55.0720	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0325	lb/month
benzene		0.0360	lb/month
2,2,4 TMP		0.0410	lb/month
toluene		0.0402	lb/month
ethylbenzene		0.0026	lb/month
xylenes		0.0112	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol {ethanol}		36.9359	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$		**Working losses**	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol {ethanol}		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol {ethanol}	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.7530

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**57.15**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**2.66**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**25.86**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**9.93**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.240	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0284	lb/month
benzene		0.0348	lb/month
2,2,4 TMP		0.0502	lb/month
toluene		0.0657	lb/month
ethylbenzene		0.0095	lb/month
xylenes		0.0462	lb/month
naphthalene		0.0023	lb/month
cumene		0.0031	lb/month
ethyl alcohol (ethanol)		41.3224	lb/month
Individual HAP Monthly Emissions **Standing losses** $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0228	lb/month
benzene		0.0247	lb/month
2,2,4 TMP		0.0277	lb/month
toluene		0.0264	lb/month
ethylbenzene		0.0016	lb/month
xylenes		0.0070	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		23.1864	lb/month
Individual HAP Monthly Emissions **Working losses** $= Z_iL_W$			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_V	Z_{Vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**45.90**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**1.88**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**18.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**7.02**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.209	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0225	lb/month
benzene		0.0281	lb/month
2,2,4 TMP		0.0424	lb/month
toluene		0.0578	lb/month
ethylbenzene		0.0089	lb/month
xylenes		0.0439	lb/month
naphthalene		0.0023	lb/month
cumene		0.0030	lb/month
ethyl alcohol (ethanol)		33.7715	lb/month
Individual HAP Monthly Emissions **Standing losses** $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0169	lb/month
benzene		0.0180	lb/month
2,2,4 TMP		0.0199	lb/month
toluene		0.0185	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0047	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		15.6355	lb/month
Individual HAP Monthly Emissions **Working losses** $= Z_iL_W$			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
2,2,4 TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1360	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_V	Z_{Vi}
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**37.28**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	165,743.62	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**1.29**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**18.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**12.50**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**4.80**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.184	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0177	lb/month
benzene		0.0227	lb/month
TMP		0.0362	lb/month
toluene		0.0517	lb/month
ethylbenzene		0.0085	lb/month
xylenes		0.0422	lb/month
naphthalene		0.0023	lb/month
cumene		0.0029	lb/month
ethyl alcohol (ethanol)		28.2361	lb/month
Individual HAP Monthly Emi **Standing losses** $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0121	lb/month
benzene		0.0126	lb/month
TMP		0.0138	lb/month
toluene		0.0125	lb/month
ethylbenzene		0.0007	lb/month
xylenes		0.0030	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		10.1001	lb/month
Individual HAP Monthly Emi **Working losses** $= Z_iL_W$			
		Working losses	
hexane		0.0056	lb/month
benzene		0.0101	lb/month
TMP		0.0224	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0079	lb/month
xylenes		0.0393	lb/month
naphthalene		0.0023	lb/month
cumene		0.0028	lb/month
ethyl alcohol (ethanol)		18.1360	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	M_V	Z_{Vi}
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

		Symbol		Units
Tank No.	120			
Nearest US Location			Albany, NY	
Time Period			**Annual**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Product Type (annual average, see below for monthly calcs)			Crude RVP 12.5	
Vapor Molecular weight		M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)		A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)		B	**4189.71**	°R
Average organic liquid density		W_L	**7.10**	lb/gal
Average Reid Vapor Pressure		RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	0.40	
Tank design data				
Shell height		Hs	**48.00**	ft
Diameter		D	**80.00**	ft
Throughput		Q	**21,435,831**	gal/yr
Turnovers		N	**12.39**	per year
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**24.00**	ft
Tank Construction (pick from drop down list)			Welded	
Tank Color (pick from drop down list)			White	
Tank Shell Condition (pick from drop down list)			Average	
Tank Interior Condition (pick from drop down list)			Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)			Average	
Number of fixed roof support columns		Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c		Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**1.0**	NA
Shell clingage factor; see Table 7.1-10		Cs	0.0060	bbl/1,000 ft^2
Deck Design Data				
Deck Seam (choose Welded or Bolted)			Bolted	
Select Deck Construction Type			Continuous sheet	
If bolted continuous sheet or panel, enter width			5	
If bolted panel, also enter length				
Deck seam length factor; Length of Seam / Area of Deck		SD	**0.20**	ft/ft^2
			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	52	1.2	
Legs (IFR type)	IFR type, Adjustable	40	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		466.80	(per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**3,357.84**	lb/year
		1.68	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**214.52**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_VW_V/D)*[1+(N_FF_C/D)]$	**LW**	**256.28**	lb/yr
Annual throughput	Q	510,377	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,086.17**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**800.86**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:		Crude Oil	
Total HAP Annual Average Emissions			32.74	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$			L_{TI}	
hexane			9.765	lb/yr
benzene			9.429	lb/yr
2,2,4 TMP			0.919	lb/yr
toluene			6.161	lb/yr
ethylbenzene			1.459	lb/yr
xylenes			4.908	lb/yr
naphthalene			0.095	lb/yr
cumene			0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$				
		M_i	**M_V**	**Z_{VI}**
hexane	86.18	50		0.00282
benzene	78.11	50		0.00254
2,2,4 TMP	114.23	50		0.00021
toluene	92.14	50		0.00116
ethylbenzene	106.17	50		0.00014
xylenes	106.17	50		0.00043
naphthalene	128.17	50		0.00000
cumene	120.19	50		0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**
hexane	0.014204		8.688	0.00163
benzene	0.014150		8.688	0.00163
2,2,4 TMP	0.000812		8.688	0.00009
toluene	0.005470		8.688	0.00063
ethylbenzene	0.000573		8.688	0.00007
xylenes	0.001741		8.688	0.00020
naphthalene	0.000001		8.688	0.00000
cumene	0.000000		8.688	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
		Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207		86.18	0.00961
benzene	0.006	207		78.11	0.01590
2,2,4 TMP	0.001	207		114.23	0.00181
toluene	0.01	207		92.14	0.02247
ethylbenzene	0.004	207		106.17	0.00780
xylenes	0.014	207		106.17	0.02730
naphthalene	0.0	207		128.17	0.00059
cumene	0.0	207		120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$					
		A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5		224.37	1.4784
benzene	6.906	1211		220.79	0.8899
2,2,4 TMP	6.812	1257.8		220.74	0.4483
toluene	7.017	1377.6		222.64	0.2435
ethylbenzene	6.95	1419.3		212.61	0.0734
xylenes	7.009	1462.3		215.11	0.0638
naphthalene	7.146	1831.6		211.82	0.0015
cumene	6.929	1455.8		207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**120**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**1,786,319**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**161.01**	lb/month
		0.08	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**9.66**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**93.93**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**36.06**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		1.543	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.3733	lb/month
benzene		0.3753	lb/month
TMP		0.0415	lb/month
toluene		0.3160	lb/month
ethylbenzene		0.0964	lb/month
xylenes		0.3322	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.2879	lb/month
benzene		0.2471	lb/month
TMP		0.0201	lb/month
toluene		0.1024	lb/month
ethylbenzene		0.0110	lb/month
xylenes		0.0332	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**170.72**	lb/month
		0.09	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**10.33**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**100.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**38.57**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		1.626	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.4052	lb/month
benzene		0.4044	lb/month
TMP		0.0439	lb/month
toluene		0.3294	lb/month
ethylbenzene		0.0981	lb/month
xylenes		0.3371	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.3198	lb/month
benzene		0.2762	lb/month
TMP		0.0226	lb/month
toluene		0.1158	lb/month
ethylbenzene		0.0126	lb/month
xylenes		0.0381	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**207.36**	lb/month
		0.10	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**12.87**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**125.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**48.03**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		1.966	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.5335	lb/month
benzene		0.5226	lb/month
2,2,4 TMP		0.0540	lb/month
toluene		0.3849	lb/month
ethylbenzene		0.1049	lb/month
xylenes		0.3581	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4480	lb/month
benzene		0.3944	lb/month
2,2,4 TMP		0.0326	lb/month
toluene		0.1714	lb/month
ethylbenzene		0.0195	lb/month
xylenes		0.0591	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**278.07**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣΣ I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**17.76**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**172.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**66.29**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.708	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.8066	lb/month
benzene		0.7790	lb/month
2,2,4 TMP		0.0760	lb/month
toluene		0.5101	lb/month
ethylbenzene		0.1212	lb/month
xylenes		0.4076	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7212	lb/month
benzene		0.6509	lb/month
2,2,4 TMP		0.0546	lb/month
toluene		0.2965	lb/month
ethylbenzene		0.0357	lb/month
xylenes		0.1086	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**364.10**	lb/month
		0.18	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣΣ I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**23.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**230.54**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**88.50**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.713	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1677	lb/month
benzene		1.1235	lb/month
2,2,4 TMP		1.1059	lb/month
toluene		0.6840	lb/month
ethylbenzene		0.1446	lb/month
xylenes		0.4794	lb/month
naphthalene		0.0080	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0823	lb/month
benzene		0.9954	lb/month
2,2,4 TMP		0.0846	lb/month
toluene		0.4704	lb/month
ethylbenzene		0.0592	lb/month
xylenes		0.1804	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**485.60**	lb/month
		0.24	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣΣ I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**32.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**312.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**119.87**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.230	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.7039	lb/month
benzene		1.6407	lb/month
2,2,4 TMP		0.1512	lb/month
toluene		0.9513	lb/month
ethylbenzene		0.1816	lb/month
xylenes		0.5930	lb/month
naphthalene		0.0081	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.6185	lb/month
benzene		1.5125	lb/month
2,2,4 TMP		0.1298	lb/month
toluene		0.7377	lb/month
ethylbenzene		0.0961	lb/month
xylenes		0.2940	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**558.85**	lb/month
		0.28	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Sb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**37.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**361.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**138.79**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.167	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.0328	lb/month
benzene		1.9594	lb/month
2,2,4 TMP		0.1791	lb/month
toluene		1.1179	lb/month
ethylbenzene		0.2049	lb/month
xylenes		0.6648	lb/month
naphthalene		0.0082	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9474	lb/month
benzene		1.8312	lb/month
2,2,4 TMP		0.1578	lb/month
toluene		0.9043	lb/month
ethylbenzene		0.1195	lb/month
xylenes		0.3658	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-/ $Z_{VI} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**527.32**	lb/month
		0.26	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Sb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**34.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**340.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**130.65**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.763	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.8911	lb/month
benzene		1.8220	lb/month
2,2,4 TMP		0.1671	lb/month
toluene		1.0460	lb/month
ethylbenzene		0.1948	lb/month
xylenes		0.6337	lb/month
naphthalene		0.0081	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.8056	lb/month
benzene		1.6938	lb/month
2,2,4 TMP		0.1457	lb/month
toluene		0.8324	lb/month
ethylbenzene		0.1094	lb/month
xylenes		0.3347	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{VI} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**400.88**	lb/month
		0.20	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Sb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**26.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**255.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**98.00**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.164	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.3279	lb/month
benzene		1.2775	lb/month
2,2,4 TMP		0.1193	lb/month
toluene		0.7630	lb/month
ethylbenzene		0.1554	lb/month
xylenes		0.5127	lb/month
naphthalene		0.0080	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2424	lb/month
benzene		1.1494	lb/month
2,2,4 TMP		0.0980	lb/month
toluene		0.5494	lb/month
ethylbenzene		0.0700	lb/month
xylenes		0.2137	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.0854	lb/month
benzene		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month
toluene		0.2136	lb/month
ethylbenzene		0.0854	lb/month
xylenes		0.2990	lb/month
naphthalene		0.0079	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**287.14**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**226.56**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**179.51**	lb/month
		0.14	tons/month			0.11	tons/month			0.09	tons/month
Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	42,531.41	barrels/month
Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	882.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	534.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	510.41		TB = TAA + 0.003 as I	T_B	500.20		TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	8.843	psia	PvA = exp(A-(B/TLA))	P_{vA}	7.448	psia	PvA = exp(A-(B/TLA))	P_{vA}	6.158	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.230	NA	$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.177	NA	$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**18.38**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**14.19**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**10.94**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**21.36**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**21.36**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**21.36**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c)$	**LF**	**178.77**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**138.03**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**106.38**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**68.63**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**52.99**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**40.84**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Crude Oil		**Product - same as January**		Crude Oil		**Product - same as January**		Crude Oil	
Total HAP Monthly Emissions		2.810	lb/month	**Total HAP Monthly Emissions**		2.158	lb/month	**Total HAP Monthly Emissions**		1.704	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{T1} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{T1} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{T1} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{T1}				L_{T1}				L_{T1}	
hexane		0.8435	lb/month	**hexane**		0.6047	lb/month	**hexane**		0.4349	lb/month
benzene		0.8140	lb/month	**benzene**		0.5890	lb/month	**benzene**		0.4316	lb/month
2,2,4 TMP		0.0790	lb/month	**2,2,4 TMP**		0.0598	lb/month	**TMP**		0.0462	lb/month
toluene		0.5275	lb/month	**toluene**		0.4168	lb/month	**toluene**		0.3420	lb/month
ethylbenzene		0.1235	lb/month	**ethylbenzene**		0.1090	lb/month	**ethylbenzene**		0.0996	lb/month
xylenes		0.4147	lb/month	**xylenes**		0.3705	lb/month	**xylenes**		0.3418	lb/month
naphthalene		0.0079	lb/month	**naphthalene**		0.0079	lb/month	**naphthalene**		0.0079	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		0.7581	lb/month	**hexane**		0.5193	lb/month	**hexane**		0.3495	lb/month
benzene		0.6858	lb/month	**benzene**		0.4608	lb/month	**benzene**		0.3035	lb/month
2,2,4 TMP		0.0577	lb/month	**2,2,4 TMP**		0.0383	lb/month	**TMP**		0.0249	lb/month
toluene		0.3139	lb/month	**toluene**		0.2033	lb/month	**toluene**		0.1284	lb/month
ethylbenzene		0.0380	lb/month	**ethylbenzene**		0.0236	lb/month	**ethylbenzene**		0.0142	lb/month
xylenes		0.1157	lb/month	**xylenes**		0.0715	lb/month	**xylenes**		0.0428	lb/month
naphthalene		0.0001	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses = $Z_{Li}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.0854	lb/month	**hexane**		0.0854	lb/month	**hexane**		0.0854	lb/month
benzene		0.1281	lb/month	**benzene**		0.1281	lb/month	**benzene**		0.1281	lb/month
2,2,4 TMP		0.0214	lb/month	**2,2,4 TMP**		0.0214	lb/month	**TMP**		0.0214	lb/month
toluene		0.2136	lb/month	**toluene**		0.2136	lb/month	**toluene**		0.2136	lb/month
ethylbenzene		0.0854	lb/month	**ethylbenzene**		0.0854	lb/month	**ethylbenzene**		0.0854	lb/month
xylenes		0.2990	lb/month	**xylenes**		0.2990	lb/month	**xylenes**		0.2990	lb/month
naphthalene		0.0079	lb/month	**naphthalene**		0.0079	lb/month	**naphthalene**		0.0079	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = yM_i / M_v$				**Vapor Weight Concentratior** $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00285	hexane	86.18	50	0.00253	hexane	86.18	50	0.00221
benzene	78.11	50	0.00258	benzene	78.11	50	0.00225	benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00022	2,2,4 TMP	114.23	50	0.00019	2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00118	toluene	92.14	50	0.00099	toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00014	ethylbenzene	106.17	50	0.00011	ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00044	xylenes	106.17	50	0.00035	xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000	cumene	120.19	50	0.00000	cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**		**$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**		**$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.014633	8.843	0.00165	hexane	0.010936	7.448	0.00147	hexane	0.007897	6.158	0.00128
benzene	0.014607	8.843	0.00165	benzene	0.010707	7.448	0.00144	benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000840	8.843	0.00009	2,2,4 TMP	0.000608	7.448	0.00008	2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.005668	8.843	0.00064	toluene	0.004003	7.448	0.00054	toluene	0.002714	6.158	0.00044
ethylbenzene	0.000596	8.843	0.00007	ethylbenzene	0.000403	7.448	0.00005	ethylbenzene	0.000260	6.158	0.00004
xylenes	0.001813	8.843	0.00020	xylenes	0.001222	7.448	0.00016	xylenes	0.000785	6.158	0.00013
naphthalene	0.000001	8.843	0.00000	naphthalene	0.000001	7.448	0.00000	naphthalene	0.000000	6.158	0.00000
cumene	0.000000	8.843	-	cumene	0.000000	7.448	-	cumene	0.000000	6.158	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000	0	207	120.19	0.00000	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230	6.878	1171.5	224.37	1.1382	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.9186	6.906	1211	220.79	0.6734	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.4633	6.812	1257.8	220.74	0.3355	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.2523	7.017	1377.6	222.64	0.1782	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0764	6.95	1419.3	212.61	0.0517	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0664	7.009	1462.3	215.11	0.0448	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0016	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0344	6.929	1455.8	207.2	0.0226	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 120			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**66,212,900**	gal/yr
Turnovers	N	**38.28**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			466.80 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**205.17**	lb/year
		0.10	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.50**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_L/D)*[1+(N_FF_C/D)]$	**LW**	**197.91**	lb/yr
Annual throughput	Q	1,576,498	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**4.88**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1.87**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel	
Total HAP Annual Average Emissions		1.45	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
hexane		0.004	lb/yr
benzene		0.018	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.238	lb/yr
ethylbenzene		0.047	lb/yr
xylenes		0.989	lb/yr
naphthalene		0.152	lb/yr
cumene		0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

		M_i	M_V	Z_{VI}
hexane	86.18	130		0.00046
benzene	78.11	130		0.00220
2,2,4 TMP	114.23	130		0.00000
toluene	92.14	130		0.02408
ethylbenzene	106.17	130		0.00295
xylenes	106.17	130		0.05712
naphthalene	128.17	130		0.00036
cumene	120.19	130		0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000159	0.005	0.03394
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000328	0.005	0.06994
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**120**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**5,517,742**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type) — IFR type, Adjustable	**40**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	38.90	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**16.73**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.06**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.088	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0001	lb/month
benzene		0.0007	lb/month
TMP		0.0000	lb/month
toluene		0.0112	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0603	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0001	lb/month
benzene		0.0006	lb/month
TMP		0.0000	lb/month
toluene		0.0059	lb/month
ethylbenzene		0.0006	lb/month
xylenes		0.0124	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**16.76**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.090	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0008	lb/month
TMP		0.0000	lb/month
toluene		0.0119	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0619	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0001	lb/month
benzene		0.0007	lb/month
TMP		0.0000	lb/month
toluene		0.0066	lb/month
ethylbenzene		0.0007	lb/month
xylenes		0.0141	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**16.87**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.25**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.100	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0145	lb/month
ethylbenzene		0.0032	lb/month
xylenes		0.0685	lb/month
naphthalene		0.0126	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0092	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0206	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.09**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.40**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.15**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.120	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0197	lb/month
ethylbenzene		0.0039	lb/month
xylenes		0.0821	lb/month
naphthalene		0.0127	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0144	lb/month
ethylbenzene		0.0018	lb/month
xylenes		0.0342	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.35**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.22**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.144	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0256	lb/month
ethylbenzene		0.0047	lb/month
xylenes		0.0983	lb/month
naphthalene		0.0128	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0018	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0203	lb/month
ethylbenzene		0.0026	lb/month
xylenes		0.0505	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.67**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.30**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.173	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0025	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0326	lb/month
ethylbenzene		0.0058	lb/month
xylenes		0.1183	lb/month
naphthalene		0.0130	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0023	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0273	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0704	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.83**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**0.34**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.187	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0359	lb/month
ethylbenzene		0.0063	lb/month
xylenes		0.1280	lb/month
naphthalene		0.0131	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0026	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0306	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0802	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02294
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06008
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00322
2,2,4 TMP	0.000000	0.010	-
toluene	0.000335	0.010	0.03237
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000760	0.010	0.07356
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.76**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.86**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**0.33**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.181	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0026	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0346	lb/month
ethylbenzene		0.0061	lb/month
xylenes		0.1240	lb/month
naphthalene		0.0131	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0025	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0293	lb/month
ethylbenzene		0.0039	lb/month
xylenes		0.0762	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00195
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02302
ethylbenzene	106.17	130	0.00307
xylenes	106.17	130	0.05992
naphthalene	128.17	130	0.00047
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00059
benzene	0.000032	0.010	0.00325
2,2,4 TMP	0.000000	0.010	-
toluene	0.000320	0.010	0.03248
ethylbenzene	0.000037	0.010	0.00376
xylenes	0.000722	0.010	0.07337
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.46**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.65**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**0.25**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.153	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0021	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0279	lb/month
ethylbenzene		0.0051	lb/month
xylenes		0.1048	lb/month
naphthalene		0.0129	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0226	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0570	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0053	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0478	lb/month
naphthalene		0.0125	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.12**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**16.93**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**16.78**	lb/month
		0.01	tons/month			0.01	tons/month			0.01	tons/month
Product Type		Distillate Fuel Oil No.2		Product Type		Distillate Fuel Oil No.2		Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**130.00**		Vapor Molecular weight	M_v	**130.00**		Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR	Vapor Pressure Equation Constant B	B	8907.00	^oR	Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	882.0	Btu/ft^2-day	Daily total solar insolation on a horizontal surface	I	534.0	Btu/ft^2-day	Daily total solar insolation on a horizontal surface	I	422.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	^oR	TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	^oR	TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	^oR	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	^oR	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	^oR	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	^oR	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	^oR
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	510.41		TB = TAA + 0.003 as I	T_B	500.20		TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	^oR	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	^oR	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	^oR
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**0.04**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**0.03**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**16.49**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**16.49**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**16.49**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.42**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**0.29**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.16**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.11**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.08**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Diesel		**Product - same as January**		Diesel		**Product - same as January**		Diesel	
Total HAP Monthly Emissions		0.123	lb/month	**Total HAP Monthly Emissions**		0.105	lb/month	**Total HAP Monthly Emissions**		0.092	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}				L_{TI}				L_{TI}		
hexane		0.0003	lb/month	**hexane**		0.0002	lb/month	**hexane**		0.0002	lb/month
benzene		0.0015	lb/month	**benzene**		0.0011	lb/month	**benzene**		0.0008	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**TMP**		0.0000	lb/month
toluene		0.0204	lb/month	**toluene**		0.0159	lb/month	**toluene**		0.0125	lb/month
ethylbenzene		0.0040	lb/month	**ethylbenzene**		0.0034	lb/month	**ethylbenzene**		0.0030	lb/month
xylenes		0.0838	lb/month	**xylenes**		0.0721	lb/month	**xylenes**		0.0634	lb/month
naphthalene		0.0127	lb/month	**naphthalene**		0.0126	lb/month	**naphthalene**		0.0126	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
	Standing losses				**Standing losses**				**Standing losses**		
hexane		0.0003	lb/month	**hexane**		0.0002	lb/month	**hexane**		0.0002	lb/month
benzene		0.0014	lb/month	**benzene**		0.0010	lb/month	**benzene**		0.0007	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**TMP**		0.0000	lb/month
toluene		0.0151	lb/month	**toluene**		0.0107	lb/month	**toluene**		0.0072	lb/month
ethylbenzene		0.0019	lb/month	**ethylbenzene**		0.0013	lb/month	**ethylbenzene**		0.0008	lb/month
xylenes		0.0360	lb/month	**xylenes**		0.0243	lb/month	**xylenes**		0.0156	lb/month
naphthalene		0.0002	lb/month	**naphthalene**		0.0001	lb/month	**naphthalene**		0.0001	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses = $Z_{Li}L_W$			
	Working losses				**Working losses**				**Working losses**		
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0001	lb/month	**benzene**		0.0001	lb/month	**benzene**		0.0001	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**TMP**		0.0000	lb/month
toluene		0.0053	lb/month	**toluene**		0.0053	lb/month	**toluene**		0.0053	lb/month
ethylbenzene		0.0021	lb/month	**ethylbenzene**		0.0021	lb/month	**ethylbenzene**		0.0021	lb/month
xylenes		0.0478	lb/month	**xylenes**		0.0478	lb/month	**xylenes**		0.0478	lb/month
naphthalene		0.0125	lb/month	**naphthalene**		0.0125	lb/month	**naphthalene**		0.0125	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = yM_i / M_v$				**Vapor Weight Concentratior** $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}		M_i	M_v	Z_{Vi}		M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00045	hexane	86.18	130	0.00049	hexane	86.18	130	0.00053
benzene	78.11	130	0.00219	benzene	78.11	130	0.00231	benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000	2,2,4 TMP	114.23	130	0.00000	2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401	toluene	92.14	130	0.02443	toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00296	ethylbenzene	106.17	130	0.00288	ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05728	xylenes	106.17	130	0.05562	xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00036	naphthalene	128.17	130	0.00031	naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000	cumene	120.19	130	0.00000	cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	P_{VA}	y_i		$P_i = P_{VA}(X_i)$	P_{VA}	y_i		$P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00068	hexane	0.000002	0.003	0.00074	hexane	0.000002	0.002	0.00080
benzene	0.000018	0.005	0.00364	benzene	0.000013	0.003	0.00384	benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.005	-	2,2,4 TMP	0.000000	0.003	-	2,2,4 TMP	0.000000	0.002	-
toluene	0.000165	0.005	0.03388	toluene	0.000116	0.003	0.03447	toluene	0.000079	0.002	0.03500
ethylbenzene	0.000018	0.005	0.00362	ethylbenzene	0.000012	0.003	0.00352	ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000341	0.005	0.07014	xylenes	0.000230	0.003	0.06810	xylenes	0.000148	0.002	0.06558
naphthalene	0.000002	0.005	0.00037	naphthalene	0.000001	0.003	0.00032	naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.005	-	cumene	0.000000	0.003	-	cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000	0.000001	188	86.18	0.00000	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002	0.000008	188	78.11	0.00002	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000	0	188	114.23	0.00000	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065	0.00032	188	92.14	0.00065	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023	0.00013	188	106.17	0.00023	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514	0.0029	188	106.17	0.00514	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111	0.0007565	188	128.17	0.00111	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000	0	188	120.19	0.00000	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230	6.878	1171.5	224.37	1.1382	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.9186	6.906	1211	220.79	0.6734	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.4633	6.812	1257.8	220.74	0.3355	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.2523	7.017	1377.6	222.64	0.1782	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0764	6.95	1419.3	212.61	0.0517	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0664	7.009	1462.3	215.11	0.0448	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0016	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0344	6.929	1455.8	207.2	0.0226	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		120	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**80.00**	ft
Throughput	Q	**66,212,900**	gal/yr
Turnovers	N	**38.28**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ea}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Eb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	52	1.2
Legs (IFR type)	IFR type, Adjustable	40	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		466.80 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**205.27**	lb/year
		0.10	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.12**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	80.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$ID)/[1+(N,F$_F$/D)]	**LW**	**203.48**	lb/yr
Annual throughput	Q	1,576,498	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	80.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1.20**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	466.80	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**0.46**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	80.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:		biodiesel	
Total HAP Annual Average Emissions		15.19	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_{WF}$			
		L_{Ti}	
hexane		0.000	lb/yr
benzene		0.000	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.000	lb/yr
ethylbenzene		0.000	lb/yr
xylenes		0.000	lb/yr
naphthalene		0.000	lb/yr
cumene		7.595	lb/yr
methanol		7.595	lb/yr
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
cumene	120.19	32	0.00000
naphthalene	128.17	32	0.00000
methanol	32.04	32	4.01644
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018811	0.005	4.01644
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA		Symbol		Units
Tank No.	**120**			
Nearest US Location			**Albany, NY**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Average organic liquid density		W_L	**7.30**	lb/gal
Average Reid Vapor Pressure		RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		K_c	**1.00**	
Tank design data			**0**	
Shell height		Hs	**48.00**	ft
Diameter		D	**80.00**	ft
Throughput		Q	**5,517,742**	gal/month
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**24.00**	ft
Tank Construction (pick from drop down list)			**Welded**	
Tank Color (pick from drop down list)			**White**	
Tank Shell Condition (pick from drop down list)			**Average**	
Tank Interior Condition (pick from drop down list)			**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	**Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)			**Average**	
Number of fixed roof support columns		Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0		Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		KRb	**0.4**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**1.0**	NA
Shell clingage factor; see Table 7.1-10		Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			**Bolted**	
Deck Seam (choose Welded or Bolted)			**Continuous sheet**	
Select Deck Construction Type			**5**	
If bolted continuous sheet or panel, enter width			**0**	
If bolted panel, also enter length			**0.20**	
Deck seam length factor; Length of Seam / Area of Deck		SD		ft/ft^2
			Loss Factor	
Deck Fitting Data		**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	**2**	1.6	
Column Well	Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain	Stub drain (1-inch diameter)	**52**	1.2	
Legs (IFR type)	IFR type, Adjustable	**40**	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder	Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0	
	Monthly deck fitting loss factor:	**F_F**	38.90	per month

1 Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**17.02**	lb/month
			0.01	tons/month
Product Type			Biodiesel	
Monthly Throughput (only change if actual is known)		Q_{month}	131,374.80	barrels/month
Vapor Molecular weight		M_v	**32.04**	
Vapor Pressure Equation Constant A		A	12.10	
Vapor Pressure Equation Constant B		B	8907.00	°R
Daily total solar insolation on a horizontal surface		I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 as I		T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months		L_R	**0.00**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_CF_C/D)]$		L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_c)$		LF	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months		LD	**0.02**	lb/month
HAPS Speciation	Product - select from list		biodiesel	
Total HAP Monthly Emissions			0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			L_{TI}	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.2794	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$			**Standing losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.2454	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			**Working losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**17.02**	lb/month
			0.01	tons/month
Product Type			Biodiesel	
Monthly Throughput (only change if actual is known)		Q_{month}	131,374.80	barrels/month
Vapor Molecular weight		M_v	**32.04**	
Vapor Pressure Equation Constant A		A	12.10	
Vapor Pressure Equation Constant B		B	8907.00	°R
Daily total solar insolation on a horizontal surface		I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 as I		T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months		L_R	**0.00**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_CF_C/D)]$		L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_c)$		LF	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months		LD	**0.02**	lb/month
HAPS Speciation	Product - same as January		biodiesel	
Total HAP Monthly Emissions			0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			L_{TI}	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.3070	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$			**Standing losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.2731	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			**Working losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**17.05**	lb/month
			0.01	tons/month
Product Type			Biodiesel	
Monthly Throughput (only change if actual is known)		Q_{month}	131,374.80	barrels/month
Vapor Molecular weight		M_v	**32.04**	
Vapor Pressure Equation Constant A		A	12.10	
Vapor Pressure Equation Constant B		B	8907.00	°R
Daily total solar insolation on a horizontal surface		I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 as I		T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months		L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_CF_C/D)]$		L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_c)$		LF	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months		LD	**0.02**	lb/month
HAPS Speciation	Product - same as January		biodiesel	
Total HAP Monthly Emissions			0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			L_{TI}	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
2,2,4 TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.4151	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$			**Standing losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
2,2,4 TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.3811	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			**Working losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
2,2,4 TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**17.10**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.04**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6277	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5938	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.01842	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.018648	0.005	4.01842	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$				
	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**17.17**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.14**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.05**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8706	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8367	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.93734	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i	
hexane	0.000000	0.007	-	
benzene	0.000000	0.007	-	
2,2,4 TMP	0.000000	0.007	-	
toluene	0.000000	0.007	-	
ethylbenzene	0.000000	0.007	-	
xylenes	0.000000	0.007	-	
naphthalene	0.000000	0.007	-	
cumene	0.000000	0.007	-	
methanol	0.026274	0.007	3.93734	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$				
	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**17.25**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.08**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1574	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1235	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.86270	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i	
hexane	0.000000	0.009	-	
benzene	0.000000	0.009	-	
2,2,4 TMP	0.000000	0.009	-	
toluene	0.000000	0.009	-	
ethylbenzene	0.000000	0.009	-	
xylenes	0.000000	0.009	-	
naphthalene	0.000000	0.009	-	
cumene	0.000000	0.009	-	
methanol	0.035276	0.009	3.86270	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$				
	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.29**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.08**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2951	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2612	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.83221

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.039600	0.010	3.83221

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
methanol	8.079	1581.3	239.65	2.2869

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.27**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is know	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.08**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2390	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2051	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.84429

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.037838	0.010	3.84429

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
methanol	8.079	1581.3	239.65	2.1852

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.20**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.06**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9650	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9311	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.91078

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.029238	0.007	3.91078

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	1.6885

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.11**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.04**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6545	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6206	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.00835

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.019489	0.005	4.00835

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.06**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.03**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4729	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4390	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.08439

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.013788	0.003	4.08439

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**17.03**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	131,374.80	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.00**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**16.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.02**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3324	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2985	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0339	lb/month

Vapor Weight Concentrations $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16083

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009376	0.002	4.16083

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

	Symbol		Units
Tank No. 121			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**298,051,213**	gal/yr
Turnovers	N	**49.01**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	90% closed	60	1.8	
Legs (IFR type)	IFR type, Adjustable	112	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:			1,081.20	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**14,431.82**	lb/year
		7.22	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**702.39**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1258755	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**374.75**	lb/yr
Annual throughput	Q	7,096,457	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**8,437.99**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	1,081.20	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**4,916.70**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:		Gasoline	
Total HAP Annual Average Emissions			342.00	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$			L_{Ti}	
hexane			57.104	lb/yr
benzene			64.560	lb/yr
2,2,4 TMP			79.707	lb/yr
toluene			87.744	lb/yr
ethylbenzene			8.957	lb/yr
xylenes			42.348	lb/yr
naphthalene			1.578	lb/yr
cumene			2.469	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00380
benzene	78.11	62	0.00411
2,2,4 TMP	114.23	62	0.00460
toluene	92.14	62	0.00438
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004

Vapor Mole Fraction Eq. 40-5 $y_i=P_i/P_{VA}$			
	$P_i=P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015782	5.779	0.00273
benzene	0.018867	5.779	0.00326
2,2,4 TMP	0.014442	5.779	0.00250
toluene	0.017017	5.779	0.00294
ethylbenzene	0.000891	5.779	0.00015
xylenes	0.003869	5.779	0.00067
naphthalene	0.000005	5.779	0.00000
cumene	0.000126	5.779	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i=(Z_{Li}M_L)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**121**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**24,837,601**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — 90% closed	**60**	1.8	
Legs (IFR type) — IFR type, Adjustable	**112**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	90.10	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**766.01**	lb/month
		0.38	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**36.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**441.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**257.00**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		16.163	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		2.3285	lb/month
benzene		2.6392	lb/month
TMP		3.5023	lb/month
toluene		4.1945	lb/month
ethylbenzene		0.5451	lb/month
xylenes		2.6516	lb/month
naphthalene		0.1301	lb/month
cumene		0.1721	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		2.0162	lb/month
benzene		2.0770	lb/month
TMP		2.2531	lb/month
toluene		2.0084	lb/month
ethylbenzene		0.1079	lb/month
xylenes		0.4656	lb/month
naphthalene		0.0005	lb/month
cumene		0.0160	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$		**Working losses**	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**821.65**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**39.49**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**474.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**276.46**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.221	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		2.5443	lb/month
benzene		2.8756	lb/month
TMP		3.7883	lb/month
toluene		4.4488	lb/month
ethylbenzene		0.5606	lb/month
xylenes		2.7185	lb/month
naphthalene		0.1302	lb/month
cumene		0.1746	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		2.2320	lb/month
benzene		2.3135	lb/month
TMP		2.5191	lb/month
toluene		2.2628	lb/month
ethylbenzene		0.1233	lb/month
xylenes		0.5324	lb/month
naphthalene		0.0006	lb/month
cumene		0.0184	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$		**Working losses**	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**916.28**	lb/month
		0.46	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**44.22**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**531.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**309.56**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.517	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		3.1871	lb/month
benzene		3.5991	lb/month
TMP		4.5952	lb/month
toluene		5.2645	lb/month
ethylbenzene		0.6125	lb/month
xylenes		2.9446	lb/month
naphthalene		0.1305	lb/month
cumene		0.1832	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		2.8748	lb/month
benzene		3.0370	lb/month
TMP		3.3461	lb/month
toluene		3.0784	lb/month
ethylbenzene		0.1753	lb/month
xylenes		0.7586	lb/month
naphthalene		0.0009	lb/month
cumene		0.0270	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$		**Working losses**	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**L_T**	**1,194.84**	lb/month
		0.60	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣS I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**58.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**698.47**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**406.99**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		28.499	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.7197	lb/month
benzene		5.3354	lb/month
2,2,4 TMP		6.5908	lb/month
toluene		7.2599	lb/month
ethylbenzene		0.7429	lb/month
xylenes		3.5138	lb/month
naphthalene		0.1315	lb/month
cumene		0.2052	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.4075	lb/month
benzene		4.7733	lb/month
2,2,4 TMP		5.3417	lb/month
toluene		5.0739	lb/month
ethylbenzene		0.3057	lb/month
xylenes		1.3277	lb/month
naphthalene		0.0019	lb/month
cumene		0.0490	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**L_T**	**1,021.44**	lb/month
		0.51	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣS I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**49.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**594.39**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**346.34**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		35.122	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		5.9002	lb/month
benzene		6.7292	lb/month
2,2,4 TMP		8.3337	lb/month
toluene		8.9866	lb/month
ethylbenzene		0.8648	lb/month
xylenes		4.0486	lb/month
naphthalene		0.1325	lb/month
cumene		0.2268	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.5879	lb/month
benzene		6.1671	lb/month
2,2,4 TMP		6.9846	lb/month
toluene		6.8006	lb/month
ethylbenzene		0.4276	lb/month
xylenes		1.8626	lb/month
naphthalene		0.0029	lb/month
cumene		0.0706	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**L_T**	**1,281.43**	lb/month
		0.64	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣS I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**62.47**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**750.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**437.28**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		45.714	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		7.7986	lb/month
benzene		8.9576	lb/month
2,2,4 TMP		10.8556	lb/month
toluene		11.7408	lb/month
ethylbenzene		1.0598	lb/month
xylenes		4.9057	lb/month
naphthalene		0.1343	lb/month
cumene		0.2616	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		7.4863	lb/month
benzene		8.3955	lb/month
2,2,4 TMP		9.6065	lb/month
toluene		9.5548	lb/month
ethylbenzene		0.6226	lb/month
xylenes		2.7197	lb/month
naphthalene		0.0047	lb/month
cumene		0.1054	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,406.65**	lb/month
		0.70	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**68.73**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**825.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**481.08**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		51.055	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		8.7390	lb/month
benzene		10.0711	lb/month
2,2,4 TMP		12.1735	lb/month
toluene		13.1429	lb/month
ethylbenzene		1.1612	lb/month
xylenes		5.3518	lb/month
naphthalene		0.1353	lb/month
cumene		0.2799	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		8.4267	lb/month
benzene		9.5090	lb/month
2,2,4 TMP		10.9244	lb/month
toluene		10.9569	lb/month
ethylbenzene		0.7239	lb/month
xylenes		3.1657	lb/month
naphthalene		0.0057	lb/month
cumene		0.1238	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Vi}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,355.54**	lb/month
		0.68	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**66.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**794.94**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**463.20**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		48.858	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		8.3534	lb/month
benzene		9.6139	lb/month
2,2,4 TMP		11.6318	lb/month
toluene		12.5654	lb/month
ethylbenzene		1.1193	lb/month
xylenes		5.1673	lb/month
naphthalene		0.1349	lb/month
cumene		0.2723	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		8.0411	lb/month
benzene		9.0518	lb/month
2,2,4 TMP		10.3826	lb/month
toluene		10.3793	lb/month
ethylbenzene		0.6821	lb/month
xylenes		2.9813	lb/month
naphthalene		0.0053	lb/month
cumene		0.1162	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Vi}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,708.93**	lb/month
		0.85	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**83.83**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**1,007.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**586.80**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		42.920	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		7.3863	lb/month
benzene		8.4150	lb/month
2,2,4 TMP		10.1763	lb/month
toluene		10.9454	lb/month
ethylbenzene		0.9952	lb/month
xylenes		4.6190	lb/month
naphthalene		0.1336	lb/month
cumene		0.2491	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		7.0741	lb/month
benzene		7.8529	lb/month
2,2,4 TMP		8.9271	lb/month
toluene		8.7593	lb/month
ethylbenzene		0.5580	lb/month
xylenes		2.4330	lb/month
naphthalene		0.0040	lb/month
cumene		0.0930	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Vi}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,304.73**	lb/month
		0.65	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**63.63**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_P/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**764.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**445.43**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		29.866	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.9827	lb/month
benzene		5.6327	lb/month
2,2,4 TMP		6.9322	lb/month
toluene		7.6013	lb/month
ethylbenzene		0.7653	lb/month
xylenes		3.6115	lb/month
naphthalene		0.1316	lb/month
cumene		0.2090	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.6704	lb/month
benzene		5.0705	lb/month
2,2,4 TMP		5.6830	lb/month
toluene		5.4153	lb/month
ethylbenzene		0.3281	lb/month
xylenes		1.4255	lb/month
naphthalene		0.0020	lb/month
cumene		0.0528	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00367
benzene	78.11	62	0.00398
2,2,4 TMP	114.23	62	0.00446
toluene	92.14	62	0.00425
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00112
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.016259	6.162	0.00264
benzene	0.019475	6.162	0.00316
2,2,4 TMP	0.014926	6.162	0.00242
toluene	0.017633	6.162	0.00286
ethylbenzene	0.000927	6.162	0.00015
xylenes	0.004028	6.162	0.00065
naphthalene	0.000005	6.162	0.00000
cumene	0.000132	6.162	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,141.49**	lb/month
		0.57	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**55.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_P/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**666.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**388.33**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		23.883	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.8661	lb/month
benzene		4.3466	lb/month
2,2,4 TMP		5.4390	lb/month
toluene		6.0807	lb/month
ethylbenzene		0.6631	lb/month
xylenes		3.1645	lb/month
naphthalene		0.1308	lb/month
cumene		0.1914	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.5539	lb/month
benzene		3.7845	lb/month
2,2,4 TMP		4.1904	lb/month
toluene		3.8947	lb/month
ethylbenzene		0.2259	lb/month
xylenes		0.9784	lb/month
naphthalene		0.0012	lb/month
cumene		0.0353	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
2,2,4 TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00320
benzene	78.11	60	0.00341
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00351
ethylbenzene	106.17	60	0.00020
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.012679	5.675	0.00223
benzene	0.014897	5.675	0.00262
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.012997	5.675	0.00229
ethylbenzene	0.000654	5.675	0.00012
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**872.06**	lb/month
		0.44	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**42.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_P/D)]$	**L_W**	**31.23**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**504.72**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**294.09**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		18.208	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.7439	lb/month
benzene		3.0954	lb/month
TMP		4.0163	lb/month
toluene		4.6876	lb/month
ethylbenzene		0.5752	lb/month
xylenes		2.7820	lb/month
naphthalene		0.1303	lb/month
cumene		0.1769	lb/month
Individual HAP Monthly Em Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4316	lb/month
benzene		2.5333	lb/month
TMP		2.7671	lb/month
toluene		2.5015	lb/month
ethylbenzene		0.1380	lb/month
xylenes		0.5960	lb/month
naphthalene		0.0007	lb/month
cumene		0.0208	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.3123	lb/month
benzene		0.5621	lb/month
TMP		1.2492	lb/month
toluene		2.1860	lb/month
ethylbenzene		0.4372	lb/month
xylenes		2.1860	lb/month
naphthalene		0.1296	lb/month
cumene		0.1561	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00289
benzene	78.11	60	0.00301
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.009155	4.536	0.00202
benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.008810	4.536	0.00194
ethylbenzene	0.000422	4.536	0.00009
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

*Input data in Green. **Select Cells in** Red **to open the drop down selection list.***

	Symbol		Units
Tank No.	121		
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	^oR
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**298,051,213**	gal/yr
Turnovers	N	**49.01**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal	Rim-mounted secondary		
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	90% closed	60	1.8
Legs (IFR type)	IFR type, Adjustable	112	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		1,081.20 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**1,582.49**	lb/year
		0.79	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**57.74**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$ID)/[1+(N,F$_F$/D)]	**LW**	**426.95**	lb/yr
Annual throughput	Q	7,096,457	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/ft2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**693.63**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	1,081.20	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:		Ethanol	
Total HAP Annual Average Emissions		1113.94	
Individual HAP Annual Average Emiss Eq. 40-2 L_{Ti} =Z_{vi}(L$_R$ + L$_F$ + L$_D$) + Z_{vi}L$_W$		L_{Ti}	
hexane		0.816	lb/yr
benzene		0.976	lb/yr
2,2,4 TMP		1.347	lb/yr
toluene		1.690	lb/yr
ethylbenzene		0.227	lb/yr
xylenes		1.104	lb/yr
naphthalene		0.053	lb/yr
cumene		0.072	lb/yr
ethyl alcohol (ethanol)		1107.651	lb/yr

Vapor Weight Concentrations Eq. 40-6 Z_{vi} = y_iM$_i$/ M$_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 y_i = P$_i$ / P_{VA}

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 x_i = (Z_{Li}M$_i$)/M$_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure P_{VAi}=(0.019337)10^(A-(B/(TLA+C)))

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA		Symbol		Units
Tank No.	**121**			
Nearest US Location			**Albany, NY**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Average organic liquid density		W_L	**6.38**	lb/gal
Average Reid Vapor Pressure		RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		K_C	**1.00**	
Tank design data			**0**	
Shell height		Hs	**48.00**	ft
Diameter		D	**150.00**	ft
Throughput		Q	**24,837,601**	gal/month
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**24.00**	ft
Tank Construction (pick from drop down list)			**Welded**	
Tank Color (pick from drop down list)			**White**	
Tank Shell Condition (pick from drop down list)			**Average**	
Tank Interior Condition (pick from drop down list)			**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	**Mechanical-shoe seal** |	**Rim-mounted secondary**		
Rim Seal Fit (Average or Tight fitting)			**Average**	
Number of fixed roof support columns		Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0		Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**1.0**	NA
Shell clingage factor; see Table 7.1-10		Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			**Bolted**	
Deck Seam (choose Welded or Bolted)			**Continuous sheet**	
Select Deck Construction Type			**5**	
If bolted continuous sheet or panel, enter width			**0**	
If bolted panel, also enter length			**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck		SD	**Loss Factor**	
Deck Fitting Data		**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	**2**	1.6	
Column Well	Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain	90% closed	**60**	1.8	
Legs (IFR type)	IFR type, Adjustable	**112**	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder	Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0	
	Monthly deck fitting loss factor:	F_F	90.10	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**75.41**	lb/month
			0.04	tons/month
Product Type			Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)		Q_{month}	591,371.45	barrels/month
Vapor Molecular weight		M_v	**48.86**	
Vapor Pressure Equation Constant A		A	15.90	
Vapor Pressure Equation Constant B		B	8257.84	°R
Daily total solar insolation on a horizontal surface		I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 αs I		T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		P*	0.005	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_C)/12$ months		L_R	**1.99**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[((0.943)QCsW_v)/D]*[1+(N_CF_C/D)]$		L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_C)$		LF	**23.91**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months		LD	**13.93**	lb/month
HAPS Speciation				
	Product - select from list		Ethanol	
Total HAP Monthly Emissions			0.365	lb/month
Individual HAP Monthly Emissions	**Eq. 40-2** $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
	hexane		0.0373	lb/month
	benzene		0.0466	lb/month
	TMP		0.0724	lb/month
	toluene		0.1012	lb/month
	ethylbenzene		0.0164	lb/month
	xylenes		0.0809	lb/month
	naphthalene		0.0044	lb/month
	cumene		0.0055	lb/month
	ethyl alcohol {ethanol}		55.5221	lb/month
Individual HAP Monthly Emissions	**Standing losses** $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
	hexane		0.0266	lb/month
	benzene		0.0274	lb/month
	TMP		0.0297	lb/month
	toluene		0.0265	lb/month
	ethylbenzene		0.0014	lb/month
	xylenes		0.0061	lb/month
	naphthalene		0.0000	lb/month
	cumene		0.0002	lb/month
	ethyl alcohol {ethanol}		21.0105	lb/month
Individual HAP Monthly Emissions	**Working losses** $= Z_{Li}L_W$		**Working losses**	
	hexane		0.0107	lb/month
	benzene		0.0192	lb/month
	TMP		0.0427	lb/month
	toluene		0.0747	lb/month
	ethylbenzene		0.0149	lb/month
	xylenes		0.0747	lb/month
	naphthalene		0.0044	lb/month
	cumene		0.0053	lb/month
	ethyl alcohol {ethanol}		34.5115	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol {ethanol}	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**79.78**	lb/month
			0.04	tons/month
Product Type			Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)		Q_{month}	591,371.45	barrels/month
Vapor Molecular weight		M_v	**48.86**	
Vapor Pressure Equation Constant A		A	15.90	
Vapor Pressure Equation Constant B		B	8257.84	°R
Daily total solar insolation on a horizontal surface		I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 αs I		T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		P*	0.006	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_C)/12$ months		L_R	**2.21**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[((0.943)QCsW_v)/D]*[1+(N_CF_C/D)]$		L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_C)$		LF	**26.53**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months		LD	**15.46**	lb/month
HAPS Speciation				
	Product - same as January		Ethanol	
Total HAP Monthly Emissions			0.377	lb/month
Individual HAP Monthly Emissions	**Eq. 40-2** $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
	hexane		0.0398	lb/month
	benzene		0.0494	lb/month
	TMP		0.0756	lb/month
	toluene		0.1043	lb/month
	ethylbenzene		0.0166	lb/month
	xylenes		0.0817	lb/month
	naphthalene		0.0044	lb/month
	cumene		0.0056	lb/month
	ethyl alcohol {ethanol}		58.2124	lb/month
Individual HAP Monthly Emissions	**Standing losses** $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
	hexane		0.0292	lb/month
	benzene		0.0302	lb/month
	TMP		0.0329	lb/month
	toluene		0.0296	lb/month
	ethylbenzene		0.0016	lb/month
	xylenes		0.0070	lb/month
	naphthalene		0.0000	lb/month
	cumene		0.0002	lb/month
	ethyl alcohol {ethanol}		23.7008	lb/month
Individual HAP Monthly Emissions	**Working losses** $= Z_{Li}L_W$		**Working losses**	
	hexane		0.0107	lb/month
	benzene		0.0192	lb/month
	TMP		0.0427	lb/month
	toluene		0.0747	lb/month
	ethylbenzene		0.0149	lb/month
	xylenes		0.0747	lb/month
	naphthalene		0.0044	lb/month
	cumene		0.0053	lb/month
	ethyl alcohol {ethanol}		34.5115	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol {ethanol}	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**96.94**	lb/month
			0.05	tons/month
Product Type			Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)		Q_{month}	591,371.45	barrels/month
Vapor Molecular weight		M_v	**48.86**	
Vapor Pressure Equation Constant A		A	15.90	
Vapor Pressure Equation Constant B		B	8257.84	°R
Daily total solar insolation on a horizontal surface		I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 αs I		T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		P*	0.008	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_C)/12$ months		L_R	**3.07**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[((0.943)QCsW_v)/D]*[1+(N_CF_C/D)]$		L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_C)$		LF	**36.83**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months		LD	**21.46**	lb/month
HAPS Speciation				
	Product - same as January		Ethanol	
Total HAP Monthly Emissions			0.426	lb/month
Individual HAP Monthly Emissions	**Eq. 40-2** $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
	hexane		0.0495	lb/month
	benzene		0.0602	lb/month
	2,2,4 TMP		0.0879	lb/month
	toluene		0.1163	lb/month
	ethylbenzene		0.0173	lb/month
	xylenes		0.0850	lb/month
	naphthalene		0.0044	lb/month
	cumene		0.0057	lb/month
	ethyl alcohol {ethanol}		69.0778	lb/month
Individual HAP Monthly Emissions	**Standing losses** $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
	hexane		0.0388	lb/month
	benzene		0.0410	lb/month
	2,2,4 TMP		0.0452	lb/month
	toluene		0.0416	lb/month
	ethylbenzene		0.0024	lb/month
	xylenes		0.0102	lb/month
	naphthalene		0.0000	lb/month
	cumene		0.0004	lb/month
	ethyl alcohol {ethanol}		34.5662	lb/month
Individual HAP Monthly Emissions	**Working losses** $= Z_{Li}L_W$		**Working losses**	
	hexane		0.0107	lb/month
	benzene		0.0192	lb/month
	2,2,4 TMP		0.0427	lb/month
	toluene		0.0747	lb/month
	ethylbenzene		0.0149	lb/month
	xylenes		0.0747	lb/month
	naphthalene		0.0044	lb/month
	cumene		0.0053	lb/month
	ethyl alcohol {ethanol}		34.5115	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol {ethanol}	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2781

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**131.04**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**4.77**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**57.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**33.39**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.522	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0676	lb/month
benzene		0.0809	lb/month
2,2,4 TMP		0.1117	lb/month
toluene		0.1403	lb/month
ethylbenzene		0.0189	lb/month
xylenes		0.0919	lb/month
naphthalene		0.0045	lb/month
cumene		0.0060	lb/month
ethyl alcohol (ethanol)		91.7337	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0569	lb/month
benzene		0.0817	lb/month
2,2,4 TMP		0.0690	lb/month
toluene		0.0655	lb/month
ethylbenzene		0.0039	lb/month
xylenes		0.0172	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol (ethanol)		57.2221	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0107	lb/month
benzene		0.0192	lb/month
2,2,4 TMP		0.0427	lb/month
toluene		0.0747	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0747	lb/month
naphthalene		0.0044	lb/month
cumene		0.0053	lb/month
ethyl alcohol (ethanol)		34.5115	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**170.69**	lb/month
		0.09	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**6.75**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**81.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**47.26**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.630	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0874	lb/month
benzene		0.1039	lb/month
2,2,4 TMP		0.1386	lb/month
toluene		0.1681	lb/month
ethylbenzene		0.0208	lb/month
xylenes		0.1003	lb/month
naphthalene		0.0045	lb/month
cumene		0.0063	lb/month
ethyl alcohol (ethanol)		119.2623	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0767	lb/month
benzene		0.0847	lb/month
2,2,4 TMP		0.0959	lb/month
toluene		0.0934	lb/month
ethylbenzene		0.0059	lb/month
xylenes		0.0256	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol (ethanol)		84.7507	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0107	lb/month
benzene		0.0192	lb/month
2,2,4 TMP		0.0427	lb/month
toluene		0.0747	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0747	lb/month
naphthalene		0.0044	lb/month
cumene		0.0053	lb/month
ethyl alcohol (ethanol)		34.5115	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**218.63**	lb/month
		0.11	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**9.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**109.88**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**64.03**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.758	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.1101	lb/month
benzene		0.1307	lb/month
2,2,4 TMP		0.1703	lb/month
toluene		0.2016	lb/month
ethylbenzene		0.0232	lb/month
xylenes		0.1108	lb/month
naphthalene		0.0045	lb/month
cumene		0.0067	lb/month
ethyl alcohol (ethanol)		153.6758	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0995	lb/month
benzene		0.1115	lb/month
2,2,4 TMP		0.1276	lb/month
toluene		0.1269	lb/month
ethylbenzene		0.0083	lb/month
xylenes		0.0361	lb/month
naphthalene		0.0001	lb/month
cumene		0.0014	lb/month
ethyl alcohol (ethanol)		119.1643	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0107	lb/month
benzene		0.0192	lb/month
2,2,4 TMP		0.0427	lb/month
toluene		0.0747	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0747	lb/month
naphthalene		0.0044	lb/month
cumene		0.0053	lb/month
ethyl alcohol (ethanol)		34.5115	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**242.13**	lb/month
		0.12	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	L_R	**10.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**123.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**72.24**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.820	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.1209	lb/month
benzene		0.1436	lb/month
2,2,4 TMP		0.1856	lb/month
toluene		0.2180	lb/month
ethylbenzene		0.0244	lb/month
xylenes		0.1161	lb/month
naphthalene		0.0045	lb/month
cumene		0.0070	lb/month
ethyl alcohol {ethanol}		170.8792	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.1102	lb/month
benzene		0.1244	lb/month
2,2,4 TMP		0.1429	lb/month
toluene		0.1433	lb/month
ethylbenzene		0.0095	lb/month
xylenes		0.0414	lb/month
naphthalene		0.0001	lb/month
cumene		0.0016	lb/month
ethyl alcohol {ethanol}		136.3677	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$		**Working losses**	
hexane		0.0107	lb/month
benzene		0.0192	lb/month
2,2,4 TMP		0.0427	lb/month
toluene		0.0747	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0747	lb/month
naphthalene		0.0044	lb/month
cumene		0.0053	lb/month
ethyl alcohol {ethanol}		34.5115	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol {ethanol}	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**232.52**	lb/month
		0.12	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temper	T_{AX}	539.70	°R
Average daily minimum ambient temper	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ month	L_R	**9.84**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**118.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**68.88**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.795	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.1165	lb/month
benzene		0.1384	lb/month
2,2,4 TMP		0.1794	lb/month
toluene		0.2113	lb/month
ethylbenzene		0.0239	lb/month
xylenes		0.1140	lb/month
naphthalene		0.0045	lb/month
cumene		0.0069	lb/month
ethyl alcohol {ethanol}		163.8206	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.1058	lb/month
benzene		0.1191	lb/month
2,2,4 TMP		0.1367	lb/month
toluene		0.1366	lb/month
ethylbenzene		0.0090	lb/month
xylenes		0.0392	lb/month
naphthalene		0.0001	lb/month
cumene		0.0015	lb/month
ethyl alcohol {ethanol}		129.3090	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$		**Working losses**	
hexane		0.0107	lb/month
benzene		0.0192	lb/month
2,2,4 TMP		0.0427	lb/month
toluene		0.0747	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0747	lb/month
naphthalene		0.0044	lb/month
cumene		0.0053	lb/month
ethyl alcohol {ethanol}		34.5115	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol {ethanol}	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**186.33**	lb/month
		0.09	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	L_R	**7.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**90.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**52.73**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.672	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.0949	lb/month
benzene		0.1128	lb/month
2,2,4 TMP		0.1490	lb/month
toluene		0.1791	lb/month
ethylbenzene		0.0216	lb/month
xylenes		0.1037	lb/month
naphthalene		0.0045	lb/month
cumene		0.0064	lb/month
ethyl alcohol {ethanol}		130.3747	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0843	lb/month
benzene		0.0935	lb/month
2,2,4 TMP		0.1063	lb/month
toluene		0.1043	lb/month
ethylbenzene		0.0066	lb/month
xylenes		0.0290	lb/month
naphthalene		0.0000	lb/month
cumene		0.0011	lb/month
ethyl alcohol {ethanol}		95.8631	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$		**Working losses**	
hexane		0.0107	lb/month
benzene		0.0192	lb/month
2,2,4 TMP		0.0427	lb/month
toluene		0.0747	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0747	lb/month
naphthalene		0.0044	lb/month
cumene		0.0053	lb/month
ethyl alcohol {ethanol}		34.5115	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol {ethanol}	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.7530

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**135.37**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+[1-(P_{vA}/P_A)]^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**4.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**59.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**34.90**	lb/month

HAPS Speciation	Product - same as January			Ethanol	
Total HAP Monthly Emissions				0.534	lb/month
Individual HAP Monthly Emissions	Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$				
				L_{Ti}	
	hexane			0.0698	lb/month
	benzene			0.0834	lb/month
	2,2,4 TMP			0.1147	lb/month
	toluene			0.1433	lb/month
	ethylbenzene			0.0191	lb/month
	xylenes			0.0928	lb/month
	naphthalene			0.0045	lb/month
	cumene			0.0060	lb/month
	ethyl alcohol (ethanol)			94.6892	lb/month
Individual HAP Monthly Emissions	Standing losses $=Z_{vi}(L_R + L_F + L_D)$				
				Standing losses	
	hexane			0.0592	lb/month
	benzene			0.0642	lb/month
	2,2,4 TMP			0.0720	lb/month
	toluene			0.0686	lb/month
	ethylbenzene			0.0042	lb/month
	xylenes			0.0181	lb/month
	naphthalene			0.0000	lb/month
	cumene			0.0007	lb/month
	ethyl alcohol (ethanol)			60.1777	lb/month
Individual HAP Monthly Emissions	Working losses $= Z_iL_W$				
				Working losses	
	hexane			0.0107	lb/month
	benzene			0.0192	lb/month
	2,2,4 TMP			0.0427	lb/month
	toluene			0.0747	lb/month
	ethylbenzene			0.0149	lb/month
	xylenes			0.0747	lb/month
	naphthalene			0.0044	lb/month
	cumene			0.0053	lb/month
	ethyl alcohol (ethanol)			34.5115	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	49	0.00059	
benzene	78.11	49	0.00064	
2,2,4 TMP	114.23	49	0.00072	
toluene	92.14	49	0.00069	
ethylbenzene	106.17	49	0.00004	
xylenes	106.17	49	0.00018	
naphthalene	128.17	49	0.00000	
cumene	120.19	49	0.00001	
ethyl alcohol (ethanol)	46.07	49	0.60305	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i	
hexane	0.000259	0.771	0.00034	
benzene	0.000310	0.771	0.00040	
2,2,4 TMP	0.000238	0.771	0.00031	
toluene	0.000281	0.771	0.00036	
ethylbenzene	0.000015	0.771	0.00002	
xylenes	0.000064	0.771	0.00008	
naphthalene	0.000000	0.771	0.00000	
cumene	0.000002	0.771	0.00000	
ethyl alcohol (ethanol)	0.492970	0.771	0.63957	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**106.17**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+[1-(P_{vA}/P_A)]^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**42.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**24.69**	lb/month

HAPS Speciation	Product - same as January			Ethanol	
Total HAP Monthly Emissions				0.452	lb/month
Individual HAP Monthly Emissions	Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$				
				L_{Ti}	
	hexane			0.0545	lb/month
	benzene			0.0659	lb/month
	2,2,4 TMP			0.0944	lb/month
	toluene			0.1228	lb/month
	ethylbenzene			0.0177	lb/month
	xylenes			0.0868	lb/month
	naphthalene			0.0044	lb/month
	cumene			0.0058	lb/month
	ethyl alcohol (ethanol)			75.0917	lb/month
Individual HAP Monthly Emissions	Standing losses $=Z_{vi}(L_R + L_F + L_D)$				
				Standing losses	
	hexane			0.0439	lb/month
	benzene			0.0467	lb/month
	2,2,4 TMP			0.0517	lb/month
	toluene			0.0481	lb/month
	ethylbenzene			0.0028	lb/month
	xylenes			0.0121	lb/month
	naphthalene			0.0000	lb/month
	cumene			0.0004	lb/month
	ethyl alcohol (ethanol)			40.5801	lb/month
Individual HAP Monthly Emissions	Working losses $= Z_iL_W$				
				Working losses	
	hexane			0.0107	lb/month
	benzene			0.0192	lb/month
	2,2,4 TMP			0.0427	lb/month
	toluene			0.0747	lb/month
	ethylbenzene			0.0149	lb/month
	xylenes			0.0747	lb/month
	naphthalene			0.0044	lb/month
	cumene			0.0053	lb/month
	ethyl alcohol (ethanol)			34.5115	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	49	0.00062	
benzene	78.11	49	0.00066	
2,2,4 TMP	114.23	49	0.00073	
toluene	92.14	49	0.00068	
ethylbenzene	106.17	49	0.00004	
xylenes	106.17	49	0.00017	
naphthalene	128.17	49	0.00000	
cumene	120.19	49	0.00001	
ethyl alcohol (ethanol)	46.07	49	0.57485	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i	
hexane	0.000194	0.550	0.00035	
benzene	0.000227	0.550	0.00041	
2,2,4 TMP	0.000172	0.550	0.00031	
toluene	0.000198	0.550	0.00036	
ethylbenzene	0.000010	0.550	0.00002	
xylenes	0.000043	0.550	0.00008	
naphthalene	0.000000	0.550	0.00000	
cumene	0.000001	0.550	0.00000	
ethyl alcohol (ethanol)	0.335056	0.550	0.60966	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**83.82**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	591,371.45	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+[1-(P_{vA}/P_A)]^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**2.41**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**35.58**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**28.96**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**16.87**	lb/month

HAPS Speciation	Product - same as January			Ethanol	
Total HAP Monthly Emissions				0.389	lb/month
Individual HAP Monthly Emi	Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$				
				L_{Ti}	
	hexane			0.0422	lb/month
	benzene			0.0520	lb/month
	TMP			0.0785	lb/month
	toluene			0.1071	lb/month
	ethylbenzene			0.0167	lb/month
	xylenes			0.0824	lb/month
	naphthalene			0.0044	lb/month
	cumene			0.0056	lb/month
	ethyl alcohol (ethanol)			60.7251	lb/month
Individual HAP Monthly Emi	Standing losses $=Z_{vi}(L_R + L_F + L_D)$				
				Standing losses	
	hexane			0.0315	lb/month
	benzene			0.0328	lb/month
	TMP			0.0358	lb/month
	toluene			0.0324	lb/month
	ethylbenzene			0.0018	lb/month
	xylenes			0.0077	lb/month
	naphthalene			0.0000	lb/month
	cumene			0.0003	lb/month
	ethyl alcohol (ethanol)			26.2136	lb/month
Individual HAP Monthly Emi	Working losses $= Z_iL_W$				
				Working losses	
	hexane			0.0107	lb/month
	benzene			0.0192	lb/month
	TMP			0.0427	lb/month
	toluene			0.0747	lb/month
	ethylbenzene			0.0149	lb/month
	xylenes			0.0747	lb/month
	naphthalene			0.0044	lb/month
	cumene			0.0053	lb/month
	ethyl alcohol (ethanol)			34.5115	lb/month

Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	49	0.00065	
benzene	78.11	49	0.00068	
2,2,4 TMP	114.23	49	0.00074	
toluene	92.14	49	0.00067	
ethylbenzene	106.17	49	0.00004	
xylenes	106.17	49	0.00016	
naphthalene	128.17	49	0.00000	
cumene	120.19	49	0.00001	
ethyl alcohol (ethanol)	46.07	49	0.54343	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i	
hexane	0.000140	0.378	0.00037	
benzene	0.000161	0.378	0.00043	
2,2,4 TMP	0.000120	0.378	0.00032	
toluene	0.000135	0.378	0.00036	
ethylbenzene	0.000006	0.378	0.00002	
xylenes	0.000028	0.378	0.00007	
naphthalene	0.000000	0.378	0.00000	
cumene	0.000001	0.378	0.00000	
ethyl alcohol (ethanol)	0.217749	0.378	0.57634	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

		Symbol		Units
Tank No.	121			
Nearest US Location			Albany, NY	
Time Period			**Annual**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Product Type (annual average, see below for monthly calcs)			Gasoline - RVP 15	
Vapor Molecular weight		M_v	**60**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)		A	**11.60**	
Vapor Pressure Equation Constant B (Figure 7.1-15)		B	**4937.93**	°R
Average organic liquid density		W_L	**5.60**	lb/gal
Average Reid Vapor Pressure		RVP	**15.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00	
Tank design data				
Shell height		Hs	**48.00**	ft
Diameter		D	**150.00**	ft
Throughput		Q	**190,000,000**	gal/yr
Turnovers		N	**31.24**	per year
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**24.00**	ft
Tank Construction (pick from drop down list)			Welded	
Tank Color (pick from drop down list)			White	
Tank Shell Condition (pick from drop down list)			Average	
Tank Interior Condition (pick from drop down list)			Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)			Average	
Number of fixed roof support columns		Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c		Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**1.0**	NA
Shell clingage factor; see Table 7.1-10		Cs	0.0015	bbl/1,000 ft^2
Deck Design Data				
Deck Seam (choose Welded or Bolted)			Bolted	
Select Deck Construction Type			Continuous sheet	
If bolted continuous sheet or panel, enter width			5	
If bolted panel, also enter length				
Deck seam length factor; Length of Seam / Area of Deck		SD	**0.20**	ft/ft^2
			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	90% closed	60	1.8	
Legs (IFR type)	IFR type, Adjustable	112	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		1,081.20	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**17,177.30**	lb/year
		8.59	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	6.805	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.156	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**846.36**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1563417	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**238.89**	lb/yr
Annual throughput	Q	4,523,810	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	150.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**10,167.56**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	1,081.20	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.16	
Average vapor molecular weight	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**5,924.49**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.16	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			blendstock
Total HAP Annual Average Emissions				1124.05
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				831.229 lb/yr
benzene				75.485 lb/yr
2,2,4 TMP				80.791 lb/yr
toluene				90.460 lb/yr
ethylbenzene				10.613 lb/yr
xylenes				34.461 lb/yr
naphthalene				1.016 lb/yr
cumene				1.850 lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_v$				
		M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60		0.04716
benzene	78.11	60		0.00417
2,2,4 TMP	114.23	60		0.00421
toluene	92.14	60		0.00428
ethylbenzene	106.17	60		0.00034
xylenes	106.17	60		0.00105
naphthalene	128.17	60		0.00000
cumene	120.19	60		0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**
hexane	0.223969	6.805		0.03291
benzene	0.021875	6.805		0.00321
2,2,4 TMP	0.015070	6.805		0.00221
toluene	0.019025	6.805		0.00280
ethylbenzene	0.001328	6.805		0.00020
xylenes	0.004037	6.805		0.00059
naphthalene	0.000005	6.805		0.00000
cumene	0.000132	6.805		0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.0	96	128.17	0.00311
cumene	0.0	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
		A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**121**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**15.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**15,833,333**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — 90% closed	**60**	1.8	
Legs (IFR type) — IFR type, Adjustable	**112**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	90.10	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**754.69**	lb/month
		0.38	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**36.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**441.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**257.00**	lb/month
HAPS Speciation			
Total HAP Monthly Emissions	Product - select from list	42.138	lb/month
		blendstock	
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		30.1279	lb/month
benzene		2.7060	lb/month
TMP		3.0494	lb/month
toluene		3.6450	lb/month
ethylbenzene		0.5524	lb/month
xylenes		1.8591	lb/month
naphthalene		0.0831	lb/month
cumene		0.1155	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		27.4205	lb/month
benzene		2.3078	lb/month
TMP		2.2531	lb/month
toluene		2.1519	lb/month
ethylbenzene		0.1542	lb/month
xylenes		0.4656	lb/month
naphthalene		0.0005	lb/month
cumene		0.0160	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.03732
benzene	78.11	60	0.00314
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00293
ethylbenzene	106.17	60	0.00021
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.105500	4.050	0.02605
benzene	0.009797	4.050	0.00242
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007744	4.050	0.00191
ethylbenzene	0.000482	4.050	0.00012
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**810.33**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**39.49**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**474.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**276.46**	lb/month
HAPS Speciation			
Total HAP Monthly Emissions	Product - same as January	45.965	lb/month
		blendstock	
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		33.0623	lb/month
benzene		2.9687	lb/month
TMP		3.3154	lb/month
toluene		3.9175	lb/month
ethylbenzene		0.5744	lb/month
xylenes		1.9260	lb/month
naphthalene		0.0832	lb/month
cumene		0.1180	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		30.3549	lb/month
benzene		2.5705	lb/month
TMP		2.5191	lb/month
toluene		2.4244	lb/month
ethylbenzene		0.1762	lb/month
xylenes		0.5324	lb/month
naphthalene		0.0006	lb/month
cumene		0.0184	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.03840
benzene	78.11	60	0.00325
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00307
ethylbenzene	106.17	60	0.00022
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.115470	4.308	0.02680
benzene	0.010789	4.308	0.00250
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008626	4.308	0.00200
ethylbenzene	0.000544	4.308	0.00013
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,020.43**	lb/month
		0.51	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.227	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.111	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**49.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**600.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**349.95**	lb/month
HAPS Speciation			
Total HAP Monthly Emissions	Product - same as January	61.215	lb/month
		blendstock	
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{TI}	
hexane		44.6834	lb/month
benzene		4.0211	lb/month
TMP		4.3888	lb/month
toluene		5.0343	lb/month
ethylbenzene		0.6670	lb/month
xylenes		2.2080	lb/month
naphthalene		0.0836	lb/month
cumene		0.1286	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		41.9760	lb/month
benzene		3.6229	lb/month
TMP		3.5925	lb/month
toluene		3.5412	lb/month
ethylbenzene		0.2689	lb/month
xylenes		0.8144	lb/month
naphthalene		0.0010	lb/month
cumene		0.0290	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.04195
benzene	78.11	60	0.00362
2,2,4 TMP	114.23	60	0.00359
toluene	92.14	60	0.00354
ethylbenzene	106.17	60	0.00027
xylenes	106.17	60	0.00081
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.153056	5.227	0.02928
benzene	0.014575	5.227	0.00279
2,2,4 TMP	0.009883	5.227	0.00189
toluene	0.012077	5.227	0.00231
ethylbenzene	0.000796	5.227	0.00015
xylenes	0.002410	5.227	0.00046
naphthalene	0.000002	5.227	0.00000
cumene	0.000076	5.227	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,421.63**	lb/month
		0.71	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.770	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.155	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} v^n)DP* M_v K_c)/12 months	**L_R**	**70.04**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**841.41**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**490.28**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		93.014	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		68.6603	lb/month
benzene		6.2338	lb/month
2,2,4 TMP		6.6737	lb/month
toluene		7.4746	lb/month
ethylbenzene		0.8787	lb/month
xylenes		2.8544	lb/month
naphthalene		0.0847	lb/month
cumene		0.1535	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		65.9529	lb/month
benzene		5.8356	lb/month
2,2,4 TMP		5.8774	lb/month
toluene		5.9815	lb/month
ethylbenzene		0.4806	lb/month
xylenes		1.4609	lb/month
naphthalene		0.0021	lb/month
cumene		0.0539	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.04705
benzene	78.11	60	0.00416
2,2,4 TMP	114.23	60	0.00419
toluene	92.14	60	0.00427
ethylbenzene	106.17	60	0.00034
xylenes	106.17	60	0.00104
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.222338	6.770	0.03284
benzene	0.021705	6.770	0.00321
2,2,4 TMP	0.014948	6.770	0.00221
toluene	0.018860	6.770	0.00279
ethylbenzene	0.001315	6.770	0.00019
xylenes	0.003998	6.770	0.00059
naphthalene	0.000005	6.770	0.00000
cumene	0.000130	6.770	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,892.67**	lb/month
		0.95	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.281	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.207	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} v^n)DP* M_v K_c)/12 months	**L_R**	**93.58**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**1,124.15**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**655.03**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		133.355	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		98.7726	lb/month
benzene		9.0601	lb/month
2,2,4 TMP		9.6255	lb/month
toluene		10.7037	lb/month
ethylbenzene		1.1703	lb/month
xylenes		3.7480	lb/month
naphthalene		0.0863	lb/month
cumene		0.1888	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		96.0651	lb/month
benzene		8.6620	lb/month
2,2,4 TMP		8.8292	lb/month
toluene		9.2107	lb/month
ethylbenzene		0.7722	lb/month
xylenes		2.3545	lb/month
naphthalene		0.0037	lb/month
cumene		0.0893	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05130
benzene	78.11	60	0.00463
2,2,4 TMP	114.23	60	0.00471
toluene	92.14	60	0.00492
ethylbenzene	106.17	60	0.00041
xylenes	106.17	60	0.00126
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.296469	8.281	0.03580
benzene	0.029494	8.281	0.00356
2,2,4 TMP	0.020557	8.281	0.00248
toluene	0.026587	8.281	0.00321
ethylbenzene	0.001934	8.281	0.00023
xylenes	0.005898	8.281	0.00071
naphthalene	0.000008	8.281	0.00000
cumene	0.000198	8.281	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**2,506.53**	lb/month
		1.25	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.854	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.275	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} v^n)DP* M_v K_c)/12 months	**L_R**	**124.25**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**1,492.64**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**869.74**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		188.842	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		139.8700	lb/month
benzene		12.9652	lb/month
2,2,4 TMP		13.7380	lb/month
toluene		15.2846	lb/month
ethylbenzene		1.5965	lb/month
xylenes		5.0574	lb/month
naphthalene		0.0890	lb/month
cumene		0.2418	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		137.1625	lb/month
benzene		12.5670	lb/month
2,2,4 TMP		12.9417	lb/month
toluene		13.7915	lb/month
ethylbenzene		1.1983	lb/month
xylenes		3.6639	lb/month
naphthalene		0.0064	lb/month
cumene		0.1420	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05516
benzene	78.11	60	0.00505
2,2,4 TMP	114.23	60	0.00520
toluene	92.14	60	0.00555
ethylbenzene	106.17	60	0.00048
xylenes	106.17	60	0.00147
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.379372	9.854	0.03850
benzene	0.038350	9.854	0.00389
2,2,4 TMP	0.027005	9.854	0.00274
toluene	0.035678	9.854	0.00362
ethylbenzene	0.002690	9.854	0.00027
xylenes	0.008226	9.854	0.00083
naphthalene	0.000012	9.854	0.00000
cumene	0.000282	9.854	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**2,838.60**	lb/month
		1.42	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.552	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.312	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**140.84**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**1,691.97**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**985.89**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		219.686	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		162.6170	lb/month
benzene		15.1406	lb/month
2,2,4 TMP		16.0394	lb/month
toluene		17.8736	lb/month
ethylbenzene		1.8412	lb/month
xylenes		5.8108	lb/month
naphthalene		0.0906	lb/month
cumene		0.2722	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		159.9096	lb/month
benzene		14.7425	lb/month
2,2,4 TMP		15.2431	lb/month
toluene		16.3805	lb/month
ethylbenzene		1.4431	lb/month
xylenes		4.4173	lb/month
naphthalene		0.0080	lb/month
cumene		0.1727	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	60	0.05673
benzene	78.11	60	0.00523
2,2,4 TMP	114.23	60	0.00541
toluene	92.14	60	0.00581
ethylbenzene	106.17	60	0.00051
xylenes	106.17	60	0.00157
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vAi}(x_i)$	**P_{VA}**	**y_i**
hexane	0.417841	10.552	0.03960
benzene	0.042502	10.552	0.00403
2,2,4 TMP	0.030049	10.552	0.00285
toluene	0.040033	10.552	0.00379
ethylbenzene	0.003061	10.552	0.00029
xylenes	0.009369	10.552	0.00089
naphthalene	0.000014	10.552	0.00000
cumene	0.000324	10.552	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**2,699.61**	lb/month
		1.35	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is know	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.272	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.297	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**133.90**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**1,608.54**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**937.27**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		206.725	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		153.0648	lb/month
benzene		14.2262	lb/month
2,2,4 TMP		15.0713	lb/month
toluene		16.7829	lb/month
ethylbenzene		1.7378	lb/month
xylenes		5.4925	lb/month
naphthalene		0.0899	lb/month
cumene		0.2593	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		150.3573	lb/month
benzene		13.8280	lb/month
2,2,4 TMP		14.2750	lb/month
toluene		15.2898	lb/month
ethylbenzene		1.3397	lb/month
xylenes		4.0990	lb/month
naphthalene		0.0073	lb/month
cumene		0.1597	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	60	0.05611
benzene	78.11	60	0.00516
2,2,4 TMP	114.23	60	0.00533
toluene	92.14	60	0.00571
ethylbenzene	106.17	60	0.00050
xylenes	106.17	60	0.00153
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vAi}(x_i)$	**P_{VA}**	**y_i**
hexane	0.402264	10.272	0.03916
benzene	0.040817	10.272	0.00397
2,2,4 TMP	0.028813	10.272	0.00281
toluene	0.038260	10.272	0.00372
ethylbenzene	0.002909	10.272	0.00028
xylenes	0.008902	10.272	0.00087
naphthalene	0.000013	10.272	0.00000
cumene	0.000306	10.272	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**2,085.73**	lb/month
		1.04	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.819	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.229	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**103.22**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**1,240.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**722.55**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		150.529	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		111.5233	lb/month
benzene		10.2672	lb/month
2,2,4 TMP		10.8934	lb/month
toluene		12.1081	lb/month
ethylbenzene		1.2998	lb/month
xylenes		4.1454	lb/month
naphthalene		0.0871	lb/month
cumene		0.2047	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		108.8159	lb/month
benzene		9.8690	lb/month
2,2,4 TMP		10.0971	lb/month
toluene		10.6150	lb/month
ethylbenzene		0.9016	lb/month
xylenes		2.7518	lb/month
naphthalene		0.0045	lb/month
cumene		0.1052	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	60	0.05267
benzene	78.11	60	0.00478
2,2,4 TMP	114.23	60	0.00489
toluene	92.14	60	0.00514
ethylbenzene	106.17	60	0.00044
xylenes	106.17	60	0.00133
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vAi}(x_i)$	**P_{VA}**	**y_i**
hexane	0.324234	8.819	0.03676
benzene	0.032444	8.819	0.00368
2,2,4 TMP	0.022698	8.819	0.00257
toluene	0.029583	8.819	0.00335
ethylbenzene	0.002181	8.819	0.00025
xylenes	0.006656	8.819	0.00075
naphthalene	0.000009	8.819	0.00000
cumene	0.000225	8.819	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,472.36**	lb/month
		0.74	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.948	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**72.57**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**871.86**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**508.02**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		97.227	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		71.8187	lb/month
benzene		6.5282	lb/month
2,2,4 TMP		6.9798	lb/month
toluene		7.8061	lb/month
ethylbenzene		0.9082	lb/month
xylenes		2.9446	lb/month
naphthalene		0.0848	lb/month
cumene		0.1570	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		69.1112	lb/month
benzene		6.1300	lb/month
2,2,4 TMP		6.1834	lb/month
toluene		6.3130	lb/month
ethylbenzene		0.5100	lb/month
xylenes		1.5510	lb/month
naphthalene		0.0022	lb/month
cumene		0.0575	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04758
benzene	78.11	60	0.00422
2,2,4 TMP	114.23	60	0.00426
toluene	92.14	60	0.00435
ethylbenzene	106.17	60	0.00035
xylenes	106.17	60	0.00107
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.230735	6.948	0.03321
benzene	0.022580	6.948	0.00325
2,2,4 TMP	0.015575	6.948	0.00224
toluene	0.019713	6.948	0.00284
ethylbenzene	0.001382	6.948	0.00020
xylenes	0.004203	6.948	0.00060
naphthalene	0.000005	6.948	0.00000
cumene	0.000138	6.948	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,130.17**	lb/month
		0.57	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**55.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**666.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**388.33**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		69.607	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		51.0399	lb/month
benzene		4.6031	lb/month
2,2,4 TMP		4.9867	lb/month
toluene		5.6660	lb/month
ethylbenzene		0.7208	lb/month
xylenes		2.3720	lb/month
naphthalene		0.0839	lb/month
cumene		0.1348	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		48.3325	lb/month
benzene		4.2050	lb/month
2,2,4 TMP		4.1904	lb/month
toluene		4.1729	lb/month
ethylbenzene		0.3227	lb/month
xylenes		0.9784	lb/month
naphthalene		0.0012	lb/month
cumene		0.0353	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
2,2,4 TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04353
benzene	78.11	60	0.00379
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00376
ethylbenzene	106.17	60	0.00029
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.172439	5.675	0.03038
benzene	0.016552	5.675	0.00292
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.013925	5.675	0.00245
ethylbenzene	0.000934	5.675	0.00016
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**860.74**	lb/month
		0.43	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	376,984.13	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**42.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**19.91**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**504.72**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**294.09**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		49.515	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		35.7767	lb/month
benzene		3.2129	lb/month
TMP		3.5635	lb/month
toluene		4.1733	lb/month
ethylbenzene		0.5953	lb/month
xylenes		1.9895	lb/month
naphthalene		0.0833	lb/month
cumene		0.1203	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		33.0693	lb/month
benzene		2.8147	lb/month
TMP		2.7671	lb/month
toluene		2.6802	lb/month
ethylbenzene		0.1971	lb/month
xylenes		0.5960	lb/month
naphthalene		0.0007	lb/month
cumene		0.0208	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		2.7075	lb/month
benzene		0.3982	lb/month
TMP		0.7963	lb/month
toluene		1.4931	lb/month
ethylbenzene		0.3982	lb/month
xylenes		1.3935	lb/month
naphthalene		0.0826	lb/month
cumene		0.0995	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.03933
benzene	78.11	60	0.00335
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00319
ethylbenzene	106.17	60	0.00023
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.124513	4.536	0.02745
benzene	0.011693	4.536	0.00258
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.009439	4.536	0.00208
ethylbenzene	0.000602	4.536	0.00013
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 121			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**76,482,815**	gal/yr
Turnovers	N	**12.58**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	90% closed	60	1.8	
Legs (IFR type)	IFR type, Adjustable	112	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		1,081.20	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**8,537.42**	lb/year
		4.27	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**402.22**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_V/D)*[1+(N_FF_C/D)]$	**LW**	**487.69**	lb/yr
Annual throughput	Q	1,821,019	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**4,831.99**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	1,081.20	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**2,815.53**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			Crude Oil	
Total HAP Annual Average Emissions				77.98	
Individual HAP Annual Average Emist Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$				L_{TI}	
hexane				24.633	lb/yr
benzene				23.407	lb/yr
2,2,4 TMP				2.207	lb/yr
toluene				14.216	lb/yr
ethylbenzene				3.077	lb/yr
xylenes				10.253	lb/yr
naphthalene				0.182	lb/yr
cumene				0.000	lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$					
	M_i	**M_V**	**Z_{VI}**		
hexane	86.18	50	0.00282		
benzene	78.11	50	0.00254		
2,2,4 TMP	114.23	50	0.00021		
toluene	92.14	50	0.00116		
ethylbenzene	106.17	50	0.00014		
xylenes	106.17	50	0.00043		
naphthalene	128.17	50	0.00000		
cumene	120.19	50	0.00000		
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$					
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**	
hexane	0.014204		8.688	0.00163	
benzene	0.014150		8.688	0.00163	
2,2,4 TMP	0.000812		8.688	0.00009	
toluene	0.005470		8.688	0.00063	
ethylbenzene	0.000573		8.688	0.00007	
xylenes	0.001741		8.688	0.00020	
naphthalene	0.000001		8.688	0.00000	
cumene	0.000000		8.688	-	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$					
	Z_{Li}	**M_L**	**M_i**		**X_i**
hexane	0.004	207	86.18		0.00961
benzene	0.006	207	78.11		0.01590
2,2,4 TMP	0.001	207	114.23		0.00181
toluene	0.01	207	92.14		0.02247
ethylbenzene	0.004	207	106.17		0.00780
xylenes	0.014	207	106.17		0.02730
naphthalene	0.0	207	128.17		0.00059
cumene	0.0	207	120.19		0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$					
	A	**B**	**C**		**P_{VAi}**
hexane	6.878	1171.5	224.37		1.4784
benzene	6.906	1211	220.79		0.8899
2,2,4 TMP	6.812	1257.8	220.74		0.4483
toluene	7.017	1377.6	222.64		0.2435
ethylbenzene	6.95	1419.3	212.61		0.0734
xylenes	7.009	1462.3	215.11		0.0638
naphthalene	7.146	1831.6	211.82		0.0015
cumene	6.929	1455.8	207.2		0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**121**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**6,373,568**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — 90% closed	**60**	1.8	
Legs (IFR type) — IFR type, Adjustable	**112**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	90.10	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**403.10**	lb/month
		0.20	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**18.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_F/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**217.57**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**126.77**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		3.421	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.9097	lb/month
benzene		0.8852	lb/month
TMP		0.0928	lb/month
toluene		0.6722	lb/month
ethylbenzene		0.1911	lb/month
xylenes		0.6552	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7471	lb/month
benzene		0.6414	lb/month
TMP		0.0522	lb/month
toluene		0.2658	lb/month
ethylbenzene		0.0286	lb/month
xylenes		0.0863	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**428.29**	lb/month
		0.21	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**19.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_F/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**232.69**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**135.59**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.638	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.9926	lb/month
benzene		0.9608	lb/month
TMP		0.0992	lb/month
toluene		0.7069	lb/month
ethylbenzene		0.1953	lb/month
xylenes		0.6680	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.8300	lb/month
benzene		0.7170	lb/month
TMP		0.0586	lb/month
toluene		0.3005	lb/month
ethylbenzene		0.0328	lb/month
xylenes		0.0990	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**523.40**	lb/month
		0.26	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**24.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_F/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**289.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**168.85**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.520	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.3254	lb/month
benzene		1.2676	lb/month
2,2,4 TMP		0.1252	lb/month
toluene		0.8511	lb/month
ethylbenzene		0.2132	lb/month
xylenes		0.7224	lb/month
naphthalene		0.0151	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1628	lb/month
benzene		1.0237	lb/month
2,2,4 TMP		0.0846	lb/month
toluene		0.4447	lb/month
ethylbenzene		0.0506	lb/month
xylenes		0.1534	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**706.91**	lb/month
		0.35	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ος I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**33.29**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**399.94**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**233.04**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.447	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.0344	lb/month
benzene		1.9332	lb/month
2,2,4 TMP		0.1824	lb/month
toluene		1.1760	lb/month
ethylbenzene		0.2553	lb/month
xylenes		0.8509	lb/month
naphthalene		0.0151	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.8718	lb/month
benzene		1.6893	lb/month
2,2,4 TMP		0.1418	lb/month
toluene		0.7696	lb/month
ethylbenzene		0.0927	lb/month
xylenes		0.2819	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**930.20**	lb/month
		0.47	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ος I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**44.45**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**533.97**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**311.14**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.055	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.9716	lb/month
benzene		2.8273	lb/month
2,2,4 TMP		0.2601	lb/month
toluene		1.6273	lb/month
ethylbenzene		0.3161	lb/month
xylenes		1.0371	lb/month
naphthalene		0.0153	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.8090	lb/month
benzene		2.5835	lb/month
2,2,4 TMP		0.2194	lb/month
toluene		1.2209	lb/month
ethylbenzene		0.1535	lb/month
xylenes		0.4682	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**1,245.53**	lb/month
		0.62	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ος I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**60.20**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**723.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**421.43**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		12.991	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.3632	lb/month
benzene		4.1695	lb/month
2,2,4 TMP		0.3775	lb/month
toluene		2.3211	lb/month
ethylbenzene		0.4121	lb/month
xylenes		1.3320	lb/month
naphthalene		0.0156	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.2006	lb/month
benzene		3.9256	lb/month
2,2,4 TMP		0.3369	lb/month
toluene		1.9147	lb/month
ethylbenzene		0.2495	lb/month
xylenes		0.7630	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,435.65**	lb/month
		0.72	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**69.70**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**837.38**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**487.93**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		15.424	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		5.2167	lb/month
benzene		4.9966	lb/month
2,2,4 TMP		0.4502	lb/month
toluene		2.7535	lb/month
ethylbenzene		0.4727	lb/month
xylenes		1.5183	lb/month
naphthalene		0.0157	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.0542	lb/month
benzene		4.7528	lb/month
2,2,4 TMP		0.4095	lb/month
toluene		2.3470	lb/month
ethylbenzene		0.3101	lb/month
xylenes		0.9494	lb/month
naphthalene		0.0008	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-/ $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,353.82**	lb/month
		0.68	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**65.62**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**788.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**459.31**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		14.374	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.8489	lb/month
benzene		4.6399	lb/month
2,2,4 TMP		0.4188	lb/month
toluene		2.5668	lb/month
ethylbenzene		0.4465	lb/month
xylenes		1.4377	lb/month
naphthalene		0.0157	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.6863	lb/month
benzene		4.3961	lb/month
2,2,4 TMP		0.3782	lb/month
toluene		2.1604	lb/month
ethylbenzene		0.2839	lb/month
xylenes		0.8687	lb/month
naphthalene		0.0007	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,025.64**	lb/month
		0.51	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**49.22**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**591.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**344.52**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		10.224	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.3872	lb/month
benzene		3.2269	lb/month
2,2,4 TMP		0.2950	lb/month
toluene		1.8324	lb/month
ethylbenzene		0.3442	lb/month
xylenes		1.1235	lb/month
naphthalene		0.0154	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.2246	lb/month
benzene		2.9830	lb/month
2,2,4 TMP		0.2543	lb/month
toluene		1.4260	lb/month
ethylbenzene		0.1817	lb/month
xylenes		0.5545	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1626	lb/month
benzene		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month
toluene		0.4064	lb/month
ethylbenzene		0.1626	lb/month
xylenes		0.5690	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**730.45**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**573.23**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**451.11**	lb/month
		0.37	tons/month			0.29	tons/month			0.23	tons/month
Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	151,751.62	barrels/month
Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	882.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	534.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	510.41		TB = TAA + 0.003 as I	T_B	500.20		TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	8.843	psia	PvA = exp(A-(B/TLA))	P_{vA}	7.448	psia	PvA = exp(A-(B/TLA))	P_{vA}	6.158	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.230	NA	$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.177	NA	$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	L_R	**34.47**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	L_R	**26.61**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	L_R	**20.51**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**40.64**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**40.64**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**40.64**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c)$	**LF**	**414.07**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**319.70**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**246.39**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**241.27**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**186.28**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**143.57**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Crude Oil		**Product - same as January**		Crude Oil		**Product - same as January**		Crude Oil	
Total HAP Monthly Emissions		6.711	lb/month	**Total HAP Monthly Emissions**		5.018	lb/month	**Total HAP Monthly Emissions**		3.840	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}				L_{Ti}				L_{Ti}	
hexane		2.1301	lb/month	**hexane**		1.5104	lb/month	**hexane**		1.0697	lb/month
benzene		2.0239	lb/month	**benzene**		1.4399	lb/month	**benzene**		1.0314	lb/month
2,2,4 TMP		0.1903	lb/month	**2,2,4 TMP**		0.1403	lb/month	**TMP**		0.1052	lb/month
toluene		1.2212	lb/month	**toluene**		0.9339	lb/month	**toluene**		0.7397	lb/month
ethylbenzene		0.2613	lb/month	**ethylbenzene**		0.2237	lb/month	**ethylbenzene**		0.1993	lb/month
xylenes		0.8692	lb/month	**xylenes**		0.7545	lb/month	**xylenes**		0.6801	lb/month
naphthalene		0.0152	lb/month	**naphthalene**		0.0151	lb/month	**naphthalene**		0.0150	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		1.9675	lb/month	**hexane**		1.3478	lb/month	**hexane**		0.9071	lb/month
benzene		1.7800	lb/month	**benzene**		1.1961	lb/month	**benzene**		0.7876	lb/month
2,2,4 TMP		0.1496	lb/month	**2,2,4 TMP**		0.0993	lb/month	**TMP**		0.0645	lb/month
toluene		0.8147	lb/month	**toluene**		0.5275	lb/month	**toluene**		0.3333	lb/month
ethylbenzene		0.0987	lb/month	**ethylbenzene**		0.0612	lb/month	**ethylbenzene**		0.0368	lb/month
xylenes		0.3003	lb/month	**xylenes**		0.1855	lb/month	**xylenes**		0.1112	lb/month
naphthalene		0.0002	lb/month	**naphthalene**		0.0001	lb/month	**naphthalene**		0.0001	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses = $Z_{Li}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.1626	lb/month	**hexane**		0.1626	lb/month	**hexane**		0.1626	lb/month
benzene		0.2438	lb/month	**benzene**		0.2438	lb/month	**benzene**		0.2438	lb/month
2,2,4 TMP		0.0406	lb/month	**2,2,4 TMP**		0.0406	lb/month	**TMP**		0.0406	lb/month
toluene		0.4064	lb/month	**toluene**		0.4064	lb/month	**toluene**		0.4064	lb/month
ethylbenzene		0.1626	lb/month	**ethylbenzene**		0.1626	lb/month	**ethylbenzene**		0.1626	lb/month
xylenes		0.5690	lb/month	**xylenes**		0.5690	lb/month	**xylenes**		0.5690	lb/month
naphthalene		0.0150	lb/month	**naphthalene**		0.0150	lb/month	**naphthalene**		0.0150	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentration** $Z_{Vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{Vi}		M_i	M_v	Z_{Vi}		M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00285	hexane	86.18	50	0.00253	hexane	86.18	50	0.00221
benzene	78.11	50	0.00258	benzene	78.11	50	0.00225	benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00022	2,2,4 TMP	114.23	50	0.00019	2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00118	toluene	92.14	50	0.00099	toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00014	ethylbenzene	106.17	50	0.00011	ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00044	xylenes	106.17	50	0.00035	xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000	cumene	120.19	50	0.00000	cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	P_{VA}	y_i		$P_i = P_{VA}(X_i)$	P_{VA}	y_i		$P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.014633	8.843	0.00165	hexane	0.010936	7.448	0.00147	hexane	0.007897	6.158	0.00128
benzene	0.014607	8.843	0.00165	benzene	0.010707	7.448	0.00144	benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000840	8.843	0.00009	2,2,4 TMP	0.000608	7.448	0.00008	2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.005668	8.843	0.00064	toluene	0.004003	7.448	0.00054	toluene	0.002714	6.158	0.00044
ethylbenzene	0.000596	8.843	0.00007	ethylbenzene	0.000403	7.448	0.00005	ethylbenzene	0.000260	6.158	0.00004
xylenes	0.001813	8.843	0.00020	xylenes	0.001222	7.448	0.00016	xylenes	0.000785	6.158	0.00013
naphthalene	0.000001	8.843	0.00000	naphthalene	0.000001	7.448	0.00000	naphthalene	0.000000	6.158	0.00000
cumene	0.000000	8.843	-	cumene	0.000000	7.448	-	cumene	0.000000	6.158	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000	0	207	120.19	0.00000	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230	6.878	1171.5	224.37	1.1382	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.9186	6.906	1211	220.79	0.6734	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.4633	6.812	1257.8	220.74	0.3355	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.2523	7.017	1377.6	222.64	0.1782	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0764	6.95	1419.3	212.61	0.0517	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0664	7.009	1462.3	215.11	0.0448	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0016	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0344	6.929	1455.8	207.2	0.0226	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

		Symbol		Units
Tank No.	121			
Nearest US Location			Albany, NY	
Time Period			**Annual**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Product Type (annual average, see below for monthly calcs)			Distillate Fuel Oil No.2	
Vapor Molecular weight		M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)		A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)		B	**8907.00**	°R
Average organic liquid density		W_L	**7.10**	lb/gal
Average Reid Vapor Pressure		RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00	
Tank design data				
Shell height		Hs	**48.00**	ft
Diameter		D	**150.00**	ft
Throughput		Q	**236,246,918**	gal/yr
Turnovers		N	**38.85**	per year
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**24.00**	ft
Tank Construction (pick from drop down list)			Welded	
Tank Color (pick from drop down list)			White	
Tank Shell Condition (pick from drop down list)			Average	
Tank Interior Condition (pick from drop down list)			Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)			Average	
Number of fixed roof support columns		Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u		Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**1.0**	NA
Shell clingage factor; see Table 7.1-10		Cs	0.0015	bbl/1,000 ft^2
Deck Design Data				
Deck Seam (choose Welded or Bolted)			Bolted	
Select Deck Construction Type			Continuous sheet	
If bolted continuous sheet or panel, enter width			5	
If bolted panel, also enter length				
Deck seam length factor; Length of Seam / Area of Deck		SD	**0.20**	ft/ft^2
			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	90% closed	60	1.8	
Legs (IFR type)	IFR type, Adjustable	112	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	1	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		1,081.20	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**395.45**	lb/year
		0.20	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.94**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Annual throughput	Q	5,624,927	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**11.31**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	1,081.20	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**6.59**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel	
Total HAP Annual Average Emissions		3.19	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$			
		L_{TI}	
hexane		0.009	lb/yr
benzene		0.044	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.574	lb/yr
ethylbenzene		0.105	lb/yr
xylenes		2.169	lb/yr
naphthalene		0.292	lb/yr
cumene		0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

		M_i	M_V	Z_{VI}
hexane	86.18	130		0.00046
benzene	78.11	130		0.00220
2,2,4 TMP	114.23	130		0.00000
toluene	92.14	130		0.02408
ethylbenzene	106.17	130		0.00295
xylenes	106.17	130		0.05712
naphthalene	128.17	130		0.00036
cumene	120.19	130		0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000159	0.005	0.03394
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000328	0.005	0.06994
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**121**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**19,687,243**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**1**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**1**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — 90% closed	**60**	1.8	
Legs (IFR type) — IFR type, Adjustable	**112**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**1**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	90.10	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.00**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.22**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.181	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0004		lb/month
benzene	0.0018		lb/month
TMP	0.0000		lb/month
toluene	0.0254		lb/month
ethylbenzene	0.0058		lb/month
xylenes	0.1233		lb/month
naphthalene	0.0239		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0003		lb/month
benzene	0.0015		lb/month
TMP	0.0000		lb/month
toluene	0.0154		lb/month
ethylbenzene	0.0017		lb/month
xylenes	0.0323		lb/month
naphthalene	0.0001		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0003		lb/month
TMP	0.0000		lb/month
toluene	0.0100		lb/month
ethylbenzene	0.0041		lb/month
xylenes	0.0910		lb/month
naphthalene	0.0237		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.07**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.41**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.24**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.187	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0004		lb/month
benzene	0.0020		lb/month
TMP	0.0000		lb/month
toluene	0.0272		lb/month
ethylbenzene	0.0060		lb/month
xylenes	0.1275		lb/month
naphthalene	0.0239		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0004		lb/month
benzene	0.0017		lb/month
TMP	0.0000		lb/month
toluene	0.0171		lb/month
ethylbenzene	0.0019		lb/month
xylenes	0.0365		lb/month
naphthalene	0.0002		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0003		lb/month
TMP	0.0000		lb/month
toluene	0.0100		lb/month
ethylbenzene	0.0041		lb/month
xylenes	0.0910		lb/month
naphthalene	0.0237		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-*l* $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.36**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.59**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.34**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.213	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0005		lb/month
benzene	0.0026		lb/month
TMP	0.0000		lb/month
toluene	0.0340		lb/month
ethylbenzene	0.0069		lb/month
xylenes	0.1446		lb/month
naphthalene	0.0240		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0005		lb/month
benzene	0.0023		lb/month
TMP	0.0000		lb/month
toluene	0.0240		lb/month
ethylbenzene	0.0028		lb/month
xylenes	0.0536		lb/month
naphthalene	0.0003		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0003		lb/month
TMP	0.0000		lb/month
toluene	0.0100		lb/month
ethylbenzene	0.0041		lb/month
xylenes	0.0910		lb/month
naphthalene	0.0237		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.94**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.93**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.54**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.265	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0475	lb/month
ethylbenzene		0.0087	lb/month
xylenes		0.1798	lb/month
naphthalene		0.0243	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0034	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0375	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0888	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**33.62**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**1.34**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.78**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.326	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0010	lb/month
benzene		0.0049	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0628	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.2221	lb/month
naphthalene		0.0247	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0009	lb/month
benzene		0.0047	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0528	lb/month
ethylbenzene		0.0067	lb/month
xylenes		0.1311	lb/month
naphthalene		0.0009	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**34.45**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**1.84**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1.07**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.401	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0012	lb/month
benzene		0.0063	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0809	lb/month
ethylbenzene		0.0135	lb/month
xylenes		0.2738	lb/month
naphthalene		0.0251	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0012	lb/month
benzene		0.0061	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0709	lb/month
ethylbenzene		0.0094	lb/month
xylenes		0.1828	lb/month
naphthalene		0.0014	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**34.85**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**2.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1.21**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.437	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0014	lb/month
benzene		0.0070	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0896	lb/month
ethylbenzene		0.0148	lb/month
xylenes		0.2992	lb/month
naphthalene		0.0254	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0013	lb/month
benzene		0.0067	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0795	lb/month
ethylbenzene		0.0107	lb/month
xylenes		0.2082	lb/month
naphthalene		0.0017	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02294
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06008
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00322
2,2,4 TMP	0.000000	0.010	-
toluene	0.000335	0.010	0.03237
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000760	0.010	0.07356
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**34.68**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**1.98**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1.15**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.422	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0013	lb/month
benzene		0.0067	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0860	lb/month
ethylbenzene		0.0142	lb/month
xylenes		0.2888	lb/month
naphthalene		0.0253	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0013	lb/month
benzene		0.0064	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0760	lb/month
ethylbenzene		0.0101	lb/month
xylenes		0.1978	lb/month
naphthalene		0.0015	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00039
benzene	78.11	130	0.00195
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02302
ethylbenzene	106.17	130	0.00307
xylenes	106.17	130	0.05992
naphthalene	128.17	130	0.00047
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.010	0.00059
benzene	0.000032	0.010	0.00325
2,2,4 TMP	0.000000	0.010	-
toluene	0.000320	0.010	0.03248
ethylbenzene	0.000037	0.010	0.00376
xylenes	0.000722	0.010	0.07337
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**33.89**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.13**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**1.50**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.88**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.351	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0011	lb/month
benzene		0.0054	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0688	lb/month
ethylbenzene		0.0117	lb/month
xylenes		0.2389	lb/month
naphthalene		0.0248	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0010	lb/month
benzene		0.0051	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0588	lb/month
ethylbenzene		0.0076	lb/month
xylenes		0.1479	lb/month
naphthalene		0.0011	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**33.01**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.98**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.57**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.271	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0008	lb/month
benzene		0.0038	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0492	lb/month
ethylbenzene		0.0089	lb/month
xylenes		0.1844	lb/month
naphthalene		0.0243	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0036	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0391	lb/month
ethylbenzene		0.0048	lb/month
xylenes		0.0934	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00219
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05728
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00364
2,2,4 TMP	0.000000	0.005	-
toluene	0.000165	0.005	0.03388
ethylbenzene	0.000018	0.005	0.00362
xylenes	0.000341	0.005	0.07014
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.52**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.68**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.40**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.227	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0006	lb/month
benzene		0.0029	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0377	lb/month
ethylbenzene		0.0073	lb/month
xylenes		0.1540	lb/month
naphthalene		0.0241	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0026	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0277	lb/month
ethylbenzene		0.0033	lb/month
xylenes		0.0630	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00049
benzene	78.11	130	0.00231
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02443
ethylbenzene	106.17	130	0.00288
xylenes	106.17	130	0.05562
naphthalene	128.17	130	0.00031
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.003	0.00074
benzene	0.000013	0.003	0.00384
2,2,4 TMP	0.000000	0.003	-
toluene	0.000116	0.003	0.03447
ethylbenzene	0.000012	0.003	0.00352
xylenes	0.000230	0.003	0.06810
naphthalene	0.000001	0.003	0.00032
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.14**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**31.38**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.26**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.193	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0004	lb/month
benzene		0.0021	lb/month
TMP		0.0000	lb/month
toluene		0.0288	lb/month
ethylbenzene		0.0062	lb/month
xylenes		0.1315	lb/month
naphthalene		0.0239	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0018	lb/month
TMP		0.0000	lb/month
toluene		0.0187	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0405	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
TMP		0.0000	lb/month
toluene		0.0100	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0910	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00053
benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.002	-
toluene	0.000079	0.002	0.03500
ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000148	0.002	0.06558
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		121	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**236,246,918**	gal/yr
Turnovers	N	**38.85**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0)	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ea}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Eb}	**0.400**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	1	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	1	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	90% closed	60	1.8
Legs (IFR type)	IFR type, Adjustable	112	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	1	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		1,081.20 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**391.86**	lb/year
		0.20	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.23**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$ID)/[1+(N,F$_P$/D)]	**LW**	**387.21**	lb/yr
Annual throughput	Q	5,624,927	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2.79**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	1,081.20	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:		biodiesel	
Total HAP Annual Average Emissions			38.86	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_C) + Z_{Li}L_{WF}$				
			L_{Ti}	
hexane			0.000	lb/yr
benzene			0.000	lb/yr
2,2,4 TMP			0.000	lb/yr
toluene			0.000	lb/yr
ethylbenzene			0.000	lb/yr
xylenes			0.000	lb/yr
naphthalene			0.000	lb/yr
cumene			19.430	lb/yr
methanol			19.430	lb/yr
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$				
	M_i	**M_v**	**Z_{vi}**	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.01644	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.018811	0.005	4.01644	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**121**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**19,687,243**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD		

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**1**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**1**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	90% closed	**60**	1.8
Legs (IFR type)	IFR type, Adjustable	**112**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**1**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	**F_F**	90.10 per month

1 Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.42**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L/D]^*[1+(N_CF_C/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	LF	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.05**	lb/month

HAPS Speciation — Product - select from list — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.7016	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.6370	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0645	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vai}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.44**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L/D]^*[1+(N_CF_C/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	LF	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.06**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.7733	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.7087	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0645	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vai}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.51**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L/D]^*[1+(N_CF_C/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	LF	**0.14**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.08**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	1.0537	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.9892	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0645	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vai}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**32.65**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.23**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.13**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
	L_{Ti}		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	1.6057	lb/month	
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	1.5412	lb/month	
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
	Working losses		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	0.0645	lb/month	

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01842

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018648	0.005	4.01842

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**32.82**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.33**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.19**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
	L_{Ti}		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	2.2361	lb/month	
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	2.1716	lb/month	
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
	Working losses		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	0.0645	lb/month	

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.93734

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.026274	0.007	3.93734

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**33.02**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.26**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
	L_{Ti}		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	2.9804	lb/month	
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	2.9159	lb/month	
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
	Working losses		
hexane	0.0000	lb/month	
benzene	0.0000	lb/month	
2,2,4 TMP	0.0000	lb/month	
toluene	0.0000	lb/month	
ethylbenzene	0.0000	lb/month	
xylenes	0.0000	lb/month	
naphthalene	0.0000	lb/month	
cumene	0.0000	lb/month	
methanol	0.0645	lb/month	

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.86270

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.009	-
benzene	0.000000	0.009	-
2,2,4 TMP	0.000000	0.009	-
toluene	0.000000	0.009	-
ethylbenzene	0.000000	0.009	-
xylenes	0.000000	0.009	-
naphthalene	0.000000	0.009	-
cumene	0.000000	0.009	-
methanol	0.035276	0.009	3.86270

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**33.12**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.51**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.30**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		3.3379	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		3.2734	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0645	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.83221
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.039600	0.010	3.83221
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
methanol	8.079	1581.3	239.65	2.2869

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**33.08**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is know	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.28**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		3.1923	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		3.1277	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0645	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.84429
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.037838	0.010	3.84429
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
methanol	8.079	1581.3	239.65	2.1852

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.89**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.22**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		2.4811	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		2.4166	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0645	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.91078
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.029238	0.007	3.91078
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	1.6885

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.67**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.14**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.6752	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.6107	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0645	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.00835
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.019489	0.005	4.00835
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.55**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.17**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2040	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1395	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0645	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.08439
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.013788	0.003	4.08439
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.45**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	468,743.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**32.27**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8393	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7748	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0645	lb/month
Vapor Weight Concentration $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16083
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009376	0.002	4.16083
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA *Input data in Green. Select Cells in Red to open the drop down selection list.*	Symbol		Units
Tank No. 114			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**221,141,319**	gal/yr
Turnovers	N	**56.82**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	116	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		172.60	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**5,713.17**	lb/year
		2.86	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	6.051	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.134	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**596.36**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1335938	NA
Tank diameter	D	120.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**347.56**	lb/yr
Annual throughput	Q	5,265,269	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	120.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1,429.61**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	172.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**3,339.63**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	120.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation				
Product - select from list:				Gasoline
Total HAP Annual Average Emissions				179.37
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$				L_{TI}
hexane				24.222 lb/yr
benzene				28.831 lb/yr
2,2,4 TMP				39.241 lb/yr
toluene				48.546 lb/yr
ethylbenzene				6.341 lb/yr
xylenes				30.739 lb/yr
naphthalene				1.452 lb/yr
cumene				1.976 lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$				
		M_i	M_V	Z_{VI}
hexane	86.18	62		0.00387
benzene	78.11	62		0.00421
2,2,4 TMP	114.23	62		0.00472
toluene	92.14	62		0.00451
ethylbenzene	106.17	62		0.00027
xylenes	106.17	62		0.00119
naphthalene	128.17	62		0.00000
cumene	120.19	62		0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$		P_{VA}	y_i
hexane	0.016831	6.051		0.00278
benzene	0.020207	6.051		0.00334
2,2,4 TMP	0.015509	6.051		0.00256
toluene	0.018375	6.051		0.00304
ethylbenzene	0.000971	6.051		0.00016
xylenes	0.004221	6.051		0.00070
naphthalene	0.000005	6.051		0.00000
cumene	0.000139	6.051		0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**114**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**18,428,443**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**116**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	14.38	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**300.34**	lb/month
		0.15	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.143	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.084	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**30.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**72.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**168.91**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		10.046	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.0422	lb/month
benzene		1.2983	lb/month
TMP		2.0025	lb/month
toluene		2.7819	lb/month
ethylbenzene		0.4462	lb/month
xylenes		2.2033	lb/month
naphthalene		0.1204	lb/month
cumene		0.1509	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7525	lb/month
benzene		0.7770	lb/month
TMP		0.8440	lb/month
toluene		0.7544	lb/month
ethylbenzene		0.0408	lb/month
xylenes		0.1759	lb/month
naphthalene		0.0002	lb/month
cumene		0.0061	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00277
benzene	78.11	60	0.00286
2,2,4 TMP	114.23	60	0.00311
toluene	92.14	60	0.00278
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00065
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008018	4.143	0.00194
benzene	0.009134	4.143	0.00220
2,2,4 TMP	0.006784	4.143	0.00164
toluene	0.007518	4.143	0.00181
ethylbenzene	0.000353	4.143	0.00009
xylenes	0.001521	4.143	0.00037
naphthalene	0.000001	4.143	0.00000
cumene	0.000046	4.143	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**324.67**	lb/month
		0.16	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.452	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.091	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**32.87**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**78.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**184.05**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.515	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1375	lb/month
benzene		1.4030	lb/month
TMP		2.1025	lb/month
toluene		2.8951	lb/month
ethylbenzene		0.4531	lb/month
xylenes		2.2332	lb/month
naphthalene		0.1204	lb/month
cumene		0.1520	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.8478	lb/month
benzene		0.8817	lb/month
TMP		0.9620	lb/month
toluene		0.8676	lb/month
ethylbenzene		0.0477	lb/month
xylenes		0.2058	lb/month
naphthalene		0.0002	lb/month
cumene		0.0072	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00287
benzene	78.11	60	0.00298
2,2,4 TMP	114.23	60	0.00325
toluene	92.14	60	0.00293
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00070
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008910	4.452	0.00200
benzene	0.010223	4.452	0.00230
2,2,4 TMP	0.007627	4.452	0.00171
toluene	0.008528	4.452	0.00192
ethylbenzene	0.000406	4.452	0.00009
xylenes	0.001755	4.452	0.00039
naphthalene	0.000002	4.452	0.00000
cumene	0.000054	4.452	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**365.06**	lb/month
		0.18	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.826	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.100	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**37.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**89.55**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**209.19**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		11.880	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.4024	lb/month
benzene		1.7019	lb/month
2,2,4 TMP		2.4627	lb/month
toluene		3.2339	lb/month
ethylbenzene		0.4749	lb/month
xylenes		2.3278	lb/month
naphthalene		0.1206	lb/month
cumene		0.1556	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1127	lb/month
benzene		1.1806	lb/month
2,2,4 TMP		1.3042	lb/month
toluene		1.2064	lb/month
ethylbenzene		0.0694	lb/month
xylenes		0.3004	lb/month
naphthalene		0.0004	lb/month
cumene		0.0108	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00331
benzene	78.11	62	0.00351
2,2,4 TMP	114.23	62	0.00388
toluene	92.14	62	0.00359
ethylbenzene	106.17	62	0.00021
xylenes	106.17	62	0.00089
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.011496	4.826	0.00238
benzene	0.013456	4.826	0.00279
2,2,4 TMP	0.010165	4.826	0.00211
toluene	0.011657	4.826	0.00242
ethylbenzene	0.000582	4.826	0.00012
xylenes	0.002519	4.826	0.00052
naphthalene	0.000003	4.826	0.00000
cumene	0.000080	4.826	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**480.26**	lb/month
		0.24	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.093	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**50.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**120.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**280.89**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		15.225	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.0396	lb/month
benzene		2.4267	lb/month
2,2,4 TMP		3.2981	lb/month
toluene		4.0740	lb/month
ethylbenzene		0.5303	lb/month
xylenes		2.5700	lb/month
naphthalene		0.1210	lb/month
cumene		0.1650	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7499	lb/month
benzene		1.9054	lb/month
2,2,4 TMP		2.1395	lb/month
toluene		2.0465	lb/month
ethylbenzene		0.1248	lb/month
xylenes		0.5425	lb/month
naphthalene		0.0008	lb/month
cumene		0.0202	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00388
benzene	78.11	62	0.00422
2,2,4 TMP	114.23	62	0.00474
toluene	92.14	62	0.00453
ethylbenzene	106.17	62	0.00028
xylenes	106.17	62	0.00120
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.016998	6.093	0.00279
benzene	0.020421	6.093	0.00335
2,2,4 TMP	0.015680	6.093	0.00257
toluene	0.018594	6.093	0.00305
ethylbenzene	0.000984	6.093	0.00016
xylenes	0.004278	6.093	0.00070
naphthalene	0.000005	6.093	0.00000
cumene	0.000141	6.093	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**416.13**	lb/month
		0.21	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.023	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.105	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**43.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**103.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**240.98**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.965	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.5227	lb/month
benzene		3.0003	lb/month
2,2,4 TMP		3.9767	lb/month
toluene		4.7927	lb/month
ethylbenzene		0.5817	lb/month
xylenes		2.7956	lb/month
naphthalene		0.1215	lb/month
cumene		0.1742	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.2330	lb/month
benzene		2.4790	lb/month
2,2,4 TMP		2.8181	lb/month
toluene		2.7653	lb/month
ethylbenzene		0.1762	lb/month
xylenes		0.7681	lb/month
naphthalene		0.0013	lb/month
cumene		0.0294	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00577
benzene	78.11	68	0.00640
2,2,4 TMP	114.23	68	0.00728
toluene	92.14	68	0.00714
ethylbenzene	106.17	68	0.00046
xylenes	106.17	68	0.00198
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022859	5.023	0.00455
benzene	0.027999	5.023	0.00557
2,2,4 TMP	0.021765	5.023	0.00433
toluene	0.026477	5.023	0.00527
ethylbenzene	0.001464	5.023	0.00029
xylenes	0.006383	5.023	0.00127
naphthalene	0.000009	5.023	0.00000
cumene	0.000216	5.023	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**521.24**	lb/month
		0.26	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.068	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**54.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**131.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**306.40**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		22.357	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.3022	lb/month
benzene		3.9197	lb/month
2,2,4 TMP		5.0620	lb/month
toluene		5.9408	lb/month
ethylbenzene		0.6639	lb/month
xylenes		3.1573	lb/month
naphthalene		0.1222	lb/month
cumene		0.1890	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.0125	lb/month
benzene		3.3984	lb/month
2,2,4 TMP		3.9034	lb/month
toluene		3.9134	lb/month
ethylbenzene		0.2584	lb/month
xylenes		1.1298	lb/month
naphthalene		0.0020	lb/month
cumene		0.0442	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00612
benzene	78.11	68	0.00690
2,2,4 TMP	114.23	68	0.00793
toluene	92.14	68	0.00795
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029301	6.068	0.00483
benzene	0.036469	6.068	0.00601
2,2,4 TMP	0.028643	6.068	0.00472
toluene	0.035601	6.068	0.00587
ethylbenzene	0.002040	6.068	0.00034
xylenes	0.008920	6.068	0.00147
naphthalene	0.000013	6.068	0.00000
cumene	0.000308	6.068	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**571.63**	lb/month
		0.29	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.530	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.148	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^D P^* M_v K_c)/12$ months	**L_R**	**60.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v) / D]^* [1+(N_c F_c / D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**144.59**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**337.76**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		24.559	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		3.6861	lb/month
benzene		4.3765	lb/month
2,2,4 TMP		5.6043	lb/month
toluene		6.5218	lb/month
ethylbenzene		0.7063	lb/month
xylenes		3.3443	lb/month
naphthalene		0.1227	lb/month
cumene		0.1967	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.3965	lb/month
benzene		3.8552	lb/month
2,2,4 TMP		4.4458	lb/month
toluene		4.4944	lb/month
ethylbenzene		0.3008	lb/month
xylenes		1.3169	lb/month
naphthalene		0.0025	lb/month
cumene		0.0519	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00626
benzene	78.11	68	0.00710
2,2,4 TMP	114.23	68	0.00819
toluene	92.14	68	0.00828
ethylbenzene	106.17	68	0.00055
xylenes	106.17	68	0.00243
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00010
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.032250	6.530	0.00494
benzene	0.040387	6.530	0.00618
2,2,4 TMP	0.031847	6.530	0.00488
toluene	0.039914	6.530	0.00611
ethylbenzene	0.002319	6.530	0.00036
xylenes	0.010150	6.530	0.00155
naphthalene	0.000016	6.530	0.00000
cumene	0.000353	6.530	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Vi} M_V)/M_i$			
	Z_{Vi}	**M_V**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**545.27**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.292	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.141	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^D P^* M_v K_c)/12$ months	**L_R**	**57.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v) / D]^* [1+(N_c F_c / D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**137.56**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**321.35**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		23.400	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		3.4845	lb/month
benzene		4.1364	lb/month
2,2,4 TMP		5.3190	lb/month
toluene		6.2157	lb/month
ethylbenzene		0.6839	lb/month
xylenes		3.2455	lb/month
naphthalene		0.1224	lb/month
cumene		0.1926	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.1949	lb/month
benzene		3.6151	lb/month
2,2,4 TMP		4.1605	lb/month
toluene		4.1882	lb/month
ethylbenzene		0.2784	lb/month
xylenes		1.2180	lb/month
naphthalene		0.0022	lb/month
cumene		0.0478	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00619
benzene	78.11	68	0.00700
2,2,4 TMP	114.23	68	0.00806
toluene	92.14	68	0.00811
ethylbenzene	106.17	68	0.00054
xylenes	106.17	68	0.00236
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.030719	6.292	0.00488
benzene	0.038350	6.292	0.00610
2,2,4 TMP	0.030180	6.292	0.00480
toluene	0.037665	6.292	0.00599
ethylbenzene	0.002173	6.292	0.00035
xylenes	0.009506	6.292	0.00151
naphthalene	0.000014	6.292	0.00000
cumene	0.000330	6.292	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Vi} M_V)/M_i$			
	Z_{Vi}	**M_V**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**675.95**	lb/month
		0.34	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.901	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.193	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^D P^* M_v K_c)/12$ months	**L_R**	**71.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v) / D]^* [1+(N_c F_c / D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**172.38**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**402.70**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.832	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		3.0688	lb/month
benzene		3.6198	lb/month
2,2,4 TMP		4.6905	lb/month
toluene		5.5130	lb/month
ethylbenzene		0.6297	lb/month
xylenes		3.0057	lb/month
naphthalene		0.1218	lb/month
cumene		0.1824	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.7791	lb/month
benzene		3.0984	lb/month
2,2,4 TMP		3.5320	lb/month
toluene		3.4855	lb/month
ethylbenzene		0.2242	lb/month
xylenes		0.9782	lb/month
naphthalene		0.0016	lb/month
cumene		0.0376	lb/month
Individual HAP Monthly Emissions Working losses $= Z_i L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00430
benzene	78.11	62	0.00479
2,2,4 TMP	114.23	62	0.00546
toluene	92.14	62	0.00539
ethylbenzene	106.17	62	0.00035
xylenes	106.17	62	0.00151
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024415	7.901	0.00309
benzene	0.030033	7.901	0.00380
2,2,4 TMP	0.023410	7.901	0.00296
toluene	0.028641	7.901	0.00363
ethylbenzene	0.001599	7.901	0.00020
xylenes	0.006976	7.901	0.00088
naphthalene	0.000010	7.901	0.00000
cumene	0.000237	7.901	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Vi} M_V)/M_i$			
	Z_{Vi}	**M_V**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**508.07**	lb/month
		0.25	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.375	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.143	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**53.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**127.65**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**298.21**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		15.383	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.0714	lb/month
benzene		2.4618	lb/month
2,2,4 TMP		3.3378	lb/month
toluene		4.1126	lb/month
ethylbenzene		0.5327	lb/month
xylenes		2.5805	lb/month
naphthalene		0.1210	lb/month
cumene		0.1654	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7818	lb/month
benzene		1.9405	lb/month
2,2,4 TMP		2.1792	lb/month
toluene		2.0851	lb/month
ethylbenzene		0.1272	lb/month
xylenes		0.5531	lb/month
naphthalene		0.0008	lb/month
cumene		0.0206	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00372
benzene	78.11	62	0.00405
2,2,4 TMP	114.23	62	0.00455
toluene	92.14	62	0.00435
ethylbenzene	106.17	62	0.00027
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.017057	6.375	0.00268
benzene	0.020496	6.375	0.00321
2,2,4 TMP	0.015739	6.375	0.00247
toluene	0.018670	6.375	0.00293
ethylbenzene	0.000989	6.375	0.00016
xylenes	0.004298	6.375	0.00067
naphthalene	0.000005	6.375	0.00000
cumene	0.000141	6.375	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**439.26**	lb/month
		0.22	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.797	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.126	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**45.60**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**109.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**255.37**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		12.933	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.6154	lb/month
benzene		1.9360	lb/month
2,2,4 TMP		2.7269	lb/month
toluene		3.4890	lb/month
ethylbenzene		0.4906	lb/month
xylenes		2.3964	lb/month
naphthalene		0.1207	lb/month
cumene		0.1582	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3257	lb/month
benzene		1.4147	lb/month
2,2,4 TMP		1.5684	lb/month
toluene		1.4615	lb/month
ethylbenzene		0.0852	lb/month
xylenes		0.3690	lb/month
naphthalene		0.0005	lb/month
cumene		0.0133	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
2,2,4 TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00323
benzene	78.11	60	0.00345
2,2,4 TMP	114.23	60	0.00382
toluene	92.14	60	0.00356
ethylbenzene	106.17	60	0.00021
xylenes	106.17	60	0.00090
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.013073	5.797	0.00226
benzene	0.015391	5.797	0.00266
2,2,4 TMP	0.011668	5.797	0.00201
toluene	0.013479	5.797	0.00233
ethylbenzene	0.000682	5.797	0.00012
xylenes	0.002953	5.797	0.00051
naphthalene	0.000003	5.797	0.00000
cumene	0.000094	5.797	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**337.82**	lb/month
		0.17	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.616	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**34.33**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**28.96**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**82.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**192.24**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.776	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1900	lb/month
benzene		1.4610	lb/month
TMP		2.1860	lb/month
toluene		2.9583	lb/month
ethylbenzene		0.4570	lb/month
xylenes		2.2501	lb/month
naphthalene		0.1205	lb/month
cumene		0.1526	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.9004	lb/month
benzene		0.9397	lb/month
TMP		1.0275	lb/month
toluene		0.9309	lb/month
ethylbenzene		0.0515	lb/month
xylenes		0.2227	lb/month
naphthalene		0.0003	lb/month
cumene		0.0078	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.2896	lb/month
benzene		0.5213	lb/month
TMP		1.1585	lb/month
toluene		2.0274	lb/month
ethylbenzene		0.4055	lb/month
xylenes		2.0274	lb/month
naphthalene		0.1202	lb/month
cumene		0.1448	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00292
benzene	78.11	60	0.00304
2,2,4 TMP	114.23	60	0.00333
toluene	92.14	60	0.00301
ethylbenzene	106.17	60	0.00017
xylenes	106.17	60	0.00072
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.009392	4.616	0.00203
benzene	0.010814	4.616	0.00234
2,2,4 TMP	0.008086	4.616	0.00175
toluene	0.009082	4.616	0.00197
ethylbenzene	0.000436	4.616	0.00009
xylenes	0.001886	4.616	0.00041
naphthalene	0.000002	4.616	0.00000
cumene	0.000058	4.616	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.		114	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**221,141,319**	gal/yr
Turnovers	N	**56.82**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal		Rim-mounted secondary	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	Type	Qty	Loss Factor Kf (Table 7.1-12)
			Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	116	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		172.60 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**811.56**	lb/year
		0.41	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**46.19**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	120.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_L$W$_L$/D)*[1+(N,F$_p$/D)]	**LW**	**395.97**	lb/yr
Annual throughput	Q	5,265,269	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	120.00	ft
Constant		0.943	1,000 ft3*gal/ft
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**110.73**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	172.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Ethanol	
Total HAP Annual Average Emissions		637.45	
Individual HAP Annual Average Emiss Eq. 40-2 L_{TI} =Z_{vi}(L$_R$ + L$_F$ + L$_D$) + Z_{vi}L$_W$		L_{TI}	
hexane		0.366	lb/yr
benzene		0.482	lb/yr
2,2,4 TMP		0.775	lb/yr
toluene		1.117	lb/yr
ethylbenzene		0.184	lb/yr
xylenes		0.906	lb/yr
naphthalene		0.049	lb/yr
cumene		0.062	lb/yr
ethyl alcohol (ethanol)		633.513	lb/yr

Vapor Weight Concentrations Eq. 40-6 Z_{vi} = y_iM$_i$/ M$_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 y_i = P$_i$ / P$_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 x_i = (Z_{Li}M$_v$)/M$_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure P_{VAi}=(0.019337)10^(A-(B/(TLA+C)))

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA		Symbol		Units
Tank No.	**114**			
Nearest US Location			**Albany, NY**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Average organic liquid density		W_L	**6.38**	lb/gal
Average Reid Vapor Pressure		RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		K_C	**1.00**	
Tank design data			**0**	
Shell height		Hs	**48.00**	ft
Diameter		D	**120.00**	ft
Throughput		Q	**18,428,443**	gal/month
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**24.00**	ft
Tank Construction (pick from drop down list)			**Welded**	
Tank Color (pick from drop down list)			**White**	
Tank Shell Condition (pick from drop down list)			**Average**	
Tank Interior Condition (pick from drop down list)			**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	**Mechanical-shoe seal**	**Rim-mounted secondary**		
Rim Seal Fit (Average or Tight fitting)			**Average**	
Number of fixed roof support columns		Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0		Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		KRb	**0.4**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**1.0**	NA
Shell clingage factor; see Table 7.1-10		Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			**Bolted**	
Deck Seam (choose Welded or Bolted)			**Continuous sheet**	
Select Deck Construction Type			**5**	
If bolted continuous sheet or panel, enter width			**0**	
If bolted panel, also enter length			**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck		SD	**Loss Factor**	
Deck Fitting Data		**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	**2**	1.6	
Column Well	Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain	Stub drain (1-inch diameter)	**116**	1.2	
Legs (IFR type)	IFR type, Adjustable	**0**	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder	Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0	
	Monthly deck fitting loss factor:	F_F	14.38	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**47.32**	lb/month
			0.02	tons/month
Product Type			Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)		Q_{month}	438,772.46	barrels/month
Vapor Molecular weight		M_v	**48.86**	
Vapor Pressure Equation Constant A		A	15.90	
Vapor Pressure Equation Constant B		B	8257.84	°R
Daily total solar insolation on a horizontal surface		I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 αs I		T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		**P***	0.005	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_C)12$ months		L_R	**1.59**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[(0.943)QCsW_v/D]^*[1+(N_cF_c/D)]$		L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_C)$		**LF**	**3.82**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months		**LD**	**8.92**	lb/month
HAPS Speciation				
	Product - select from list		Ethanol	
Total HAP Monthly Emissions			0.271	lb/month
Individual HAP Monthly Emissions	**Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$**		L_{Ti}	
	hexane		0.0195	lb/month
	benzene		0.0277	lb/month
	TMP		0.0503	lb/month
	toluene		0.0788	lb/month
	ethylbenzene		0.0144	lb/month
	xylenes		0.0715	lb/month
	naphthalene		0.0041	lb/month
	cumene		0.0050	lb/month
	ethyl alcohol {ethanol}		39.5640	lb/month
Individual HAP Monthly Emissions	**Standing losses $=Z_{vi}(L_R + L_F + L_D)$**		**Standing losses**	
	hexane		0.0096	lb/month
	benzene		0.0099	lb/month
	TMP		0.0107	lb/month
	toluene		0.0095	lb/month
	ethylbenzene		0.0005	lb/month
	xylenes		0.0022	lb/month
	naphthalene		0.0000	lb/month
	cumene		0.0001	lb/month
	ethyl alcohol {ethanol}		7.5564	lb/month
Individual HAP Monthly Emissions	**Working losses $= Z_iL_W$**		**Working losses**	
	hexane		0.0099	lb/month
	benzene		0.0178	lb/month
	TMP		0.0396	lb/month
	toluene		0.0693	lb/month
	ethylbenzene		0.0139	lb/month
	xylenes		0.0693	lb/month
	naphthalene		0.0041	lb/month
	cumene		0.0049	lb/month
	ethyl alcohol {ethanol}		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol {ethanol}	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**48.89**	lb/month
			0.02	tons/month
Product Type			Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)		Q_{month}	438,772.46	barrels/month
Vapor Molecular weight		M_v	**48.86**	
Vapor Pressure Equation Constant A		A	15.90	
Vapor Pressure Equation Constant B		B	8257.84	°R
Daily total solar insolation on a horizontal surface		I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 αs I		T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		**P***	0.006	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_C)12$ months		L_R	**1.77**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[(0.943)QCsW_v/D]^*[1+(N_cF_c/D)]$		L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_C)$		**LF**	**4.24**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months		**LD**	**9.89**	lb/month
HAPS Speciation				
	Product - same as January		Ethanol	
Total HAP Monthly Emissions			0.276	lb/month
Individual HAP Monthly Emissions	**Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$**		L_{Ti}	
	hexane		0.0204	lb/month
	benzene		0.0287	lb/month
	TMP		0.0514	lb/month
	toluene		0.0799	lb/month
	ethylbenzene		0.0144	lb/month
	xylenes		0.0718	lb/month
	naphthalene		0.0041	lb/month
	cumene		0.0050	lb/month
	ethyl alcohol {ethanol}		40.5316	lb/month
Individual HAP Monthly Emissions	**Standing losses $=Z_{vi}(L_R + L_F + L_D)$**		**Standing losses**	
	hexane		0.0105	lb/month
	benzene		0.0109	lb/month
	TMP		0.0118	lb/month
	toluene		0.0106	lb/month
	ethylbenzene		0.0006	lb/month
	xylenes		0.0025	lb/month
	naphthalene		0.0000	lb/month
	cumene		0.0001	lb/month
	ethyl alcohol {ethanol}		8.5240	lb/month
Individual HAP Monthly Emissions	**Working losses $= Z_iL_W$**		**Working losses**	
	hexane		0.0099	lb/month
	benzene		0.0178	lb/month
	TMP		0.0396	lb/month
	toluene		0.0693	lb/month
	ethylbenzene		0.0139	lb/month
	xylenes		0.0693	lb/month
	naphthalene		0.0041	lb/month
	cumene		0.0049	lb/month
	ethyl alcohol {ethanol}		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol {ethanol}	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)		**LT**	**55.07**	lb/month
			0.03	tons/month
Product Type			Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)		Q_{month}	438,772.46	barrels/month
Vapor Molecular weight		M_v	**48.86**	
Vapor Pressure Equation Constant A		A	15.90	
Vapor Pressure Equation Constant B		B	8257.84	°R
Daily total solar insolation on a horizontal surface		I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30				
TAA = ((TAX+TAN)/2)		T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7		T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7		T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:				
TB = TAA + 0.003 αs I		T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28				
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I		T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:				
PvA = exp(A-(B/TLA))		P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:				
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$		**P***	0.008	NA
Rim Seal Losses Eq. 2-3:				
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_C)12$ months		L_R	**2.45**	lb/month
Withdrawal losses Eq. 2-19:				
$L_W=[(0.943)QCsW_v/D]^*[1+(N_cF_c/D)]$		L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:				
$L_F = F_F P^*M_vK_C)$		**LF**	**5.88**	lb/month
Deck Seam Losses Eq. 2-18:				
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months		**LD**	**13.74**	lb/month
HAPS Speciation				
	Product - same as January		Ethanol	
Total HAP Monthly Emissions			0.293	lb/month
Individual HAP Monthly Emissions	**Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$**		L_{Ti}	
	hexane		0.0239	lb/month
	benzene		0.0326	lb/month
	2,2,4 TMP		0.0559	lb/month
	toluene		0.0843	lb/month
	ethylbenzene		0.0147	lb/month
	xylenes		0.0730	lb/month
	naphthalene		0.0041	lb/month
	cumene		0.0051	lb/month
	ethyl alcohol {ethanol}		44.4393	lb/month
Individual HAP Monthly Emissions	**Standing losses $=Z_{vi}(L_R + L_F + L_D)$**		**Standing losses**	
	hexane		0.0140	lb/month
	benzene		0.0148	lb/month
	2,2,4 TMP		0.0163	lb/month
	toluene		0.0150	lb/month
	ethylbenzene		0.0009	lb/month
	xylenes		0.0037	lb/month
	naphthalene		0.0000	lb/month
	cumene		0.0001	lb/month
	ethyl alcohol {ethanol}		12.4317	lb/month
Individual HAP Monthly Emissions	**Working losses $= Z_iL_W$**		**Working losses**	
	hexane		0.0099	lb/month
	benzene		0.0178	lb/month
	2,2,4 TMP		0.0396	lb/month
	toluene		0.0693	lb/month
	ethylbenzene		0.0139	lb/month
	xylenes		0.0693	lb/month
	naphthalene		0.0041	lb/month
	cumene		0.0049	lb/month
	ethyl alcohol {ethanol}		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol {ethanol}	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2781

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**67.33**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.82**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**9.15**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**21.37**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.328	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0304	lb/month
benzene		0.0400	lb/month
2,2,4 TMP		0.0644	lb/month
toluene		0.0929	lb/month
ethylbenzene		0.0153	lb/month
xylenes		0.0755	lb/month
naphthalene		0.0041	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		52.5875	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0205	lb/month
benzene		0.0222	lb/month
2,2,4 TMP		0.0248	lb/month
toluene		0.0236	lb/month
ethylbenzene		0.0014	lb/month
xylenes		0.0062	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		20.5799	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol (ethanol)		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**81.59**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**5.40**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**12.95**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**30.24**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.367	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0375	lb/month
benzene		0.0483	lb/month
2,2,4 TMP		0.0741	lb/month
toluene		0.1029	lb/month
ethylbenzene		0.0160	lb/month
xylenes		0.0785	lb/month
naphthalene		0.0041	lb/month
cumene		0.0053	lb/month
ethyl alcohol (ethanol)		62.4882	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0276	lb/month
benzene		0.0305	lb/month
2,2,4 TMP		0.0345	lb/month
toluene		0.0336	lb/month
ethylbenzene		0.0021	lb/month
xylenes		0.0092	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		30.4805	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol (ethanol)		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**98.83**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**7.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**17.54**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**40.98**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.413	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0457	lb/month
benzene		0.0579	lb/month
2,2,4 TMP		0.0855	lb/month
toluene		0.1149	lb/month
ethylbenzene		0.0168	lb/month
xylenes		0.0823	lb/month
naphthalene		0.0041	lb/month
cumene		0.0055	lb/month
ethyl alcohol (ethanol)		74.8649	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0358	lb/month
benzene		0.0401	lb/month
2,2,4 TMP		0.0459	lb/month
toluene		0.0456	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0130	lb/month
naphthalene		0.0000	lb/month
cumene		0.0005	lb/month
ethyl alcohol (ethanol)		42.8573	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol (ethanol)		32.0076	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**107.28**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	L_R	**8.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**19.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**46.24**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.435	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0495	lb/month
benzene		0.0626	lb/month
2,2,4 TMP		0.0910	lb/month
toluene		0.1208	lb/month
ethylbenzene		0.0173	lb/month
xylenes		0.0842	lb/month
naphthalene		0.0041	lb/month
cumene		0.0055	lb/month
ethyl alcohol {ethanol}		81.0521	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0396	lb/month
benzene		0.0447	lb/month
2,2,4 TMP		0.0514	lb/month
toluene		0.0515	lb/month
ethylbenzene		0.0034	lb/month
xylenes		0.0149	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol {ethanol}		49.0445	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol {ethanol}		32.0076	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol {ethanol}	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**103.83**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ month	L_R	**7.87**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**18.87**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**44.09**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.426	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0480	lb/month
benzene		0.0607	lb/month
2,2,4 TMP		0.0887	lb/month
toluene		0.1184	lb/month
ethylbenzene		0.0171	lb/month
xylenes		0.0834	lb/month
naphthalene		0.0041	lb/month
cumene		0.0055	lb/month
ethyl alcohol {ethanol}		78.5135	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0381	lb/month
benzene		0.0429	lb/month
2,2,4 TMP		0.0492	lb/month
toluene		0.0491	lb/month
ethylbenzene		0.0032	lb/month
xylenes		0.0141	lb/month
naphthalene		0.0000	lb/month
cumene		0.0005	lb/month
ethyl alcohol {ethanol}		46.5059	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol {ethanol}		32.0076	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol {ethanol}	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**87.21**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	L_R	**6.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**14.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**33.75**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.382	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0402	lb/month
benzene		0.0515	lb/month
2,2,4 TMP		0.0778	lb/month
toluene		0.1068	lb/month
ethylbenzene		0.0162	lb/month
xylenes		0.0797	lb/month
naphthalene		0.0041	lb/month
cumene		0.0053	lb/month
ethyl alcohol {ethanol}		66.4847	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0303	lb/month
benzene		0.0336	lb/month
2,2,4 TMP		0.0382	lb/month
toluene		0.0375	lb/month
ethylbenzene		0.0024	lb/month
xylenes		0.0104	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol {ethanol}		34.4771	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol {ethanol}		32.0076	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol {ethanol}	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.7530

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**68.89**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^* M_v K_c)/12$ months	L_R	**3.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**9.56**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**22.34**	lb/month

HAPS Speciation — Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.332	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0312	lb/month
benzene		0.0409	lb/month
2,2,4 TMP		0.0655	lb/month
toluene		0.0940	lb/month
ethylbenzene		0.0154	lb/month
xylenes		0.0758	lb/month
naphthalene		0.0041	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		53.6505	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0213	lb/month
benzene		0.0231	lb/month
2,2,4 TMP		0.0259	lb/month
toluene		0.0247	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0065	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		21.6429	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol (ethanol)		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=\{0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**58.39**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^* M_v K_c)/12$ months	L_R	**2.82**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**6.76**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**15.80**	lb/month

HAPS Speciation — Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.303	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0257	lb/month
benzene		0.0346	lb/month
2,2,4 TMP		0.0582	lb/month
toluene		0.0866	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0736	lb/month
naphthalene		0.0041	lb/month
cumene		0.0051	lb/month
ethyl alcohol (ethanol)		46.6022	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0158	lb/month
benzene		0.0168	lb/month
2,2,4 TMP		0.0186	lb/month
toluene		0.0173	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0043	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		14.5946	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
2,2,4 TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol (ethanol)		32.0076	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=\{0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**50.35**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	438,772.46	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^* M_v K_c)/12$ months	L_R	**1.93**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**33.00**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**4.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**10.80**	lb/month

HAPS Speciation — Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.280	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0212	lb/month
benzene		0.0296	lb/month
TMP		0.0525	lb/month
toluene		0.0809	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0721	lb/month
naphthalene		0.0041	lb/month
cumene		0.0050	lb/month
ethyl alcohol (ethanol)		41.4353	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0113	lb/month
benzene		0.0118	lb/month
TMP		0.0129	lb/month
toluene		0.0116	lb/month
ethylbenzene		0.0006	lb/month
xylenes		0.0028	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		9.4277	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0099	lb/month
benzene		0.0178	lb/month
TMP		0.0396	lb/month
toluene		0.0693	lb/month
ethylbenzene		0.0139	lb/month
xylenes		0.0693	lb/month
naphthalene		0.0041	lb/month
cumene		0.0049	lb/month
ethyl alcohol (ethanol)		32.0076	lb/month

Vapor Weight Concentration $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=\{0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 114			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 15	
Vapor Molecular weight	M_v	**60**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.60**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4937.93**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**15.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**95,000,000**	gal/yr
Turnovers	N	**24.41**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	116	1.2	
Legs (IFR type)	IFR type, Adjustable	0	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		172.60	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**6,631.82**	lb/year
		3.32	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	7.117	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.166	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**720.50**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1663668	NA
Tank diameter	D	120.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**149.31**	lb/yr
Annual throughput	Q	2,261,905	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	120.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1,727.20**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	172.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.17	
Average vapor molecular weight	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**4,034.81**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	120.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.17	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			blendstock
Total HAP Annual Average Emissions				459.99
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				331.998 lb/yr
benzene				30.696 lb/yr
2,2,4 TMP				33.964 lb/yr
toluene				39.861 lb/yr
ethylbenzene				5.314 lb/yr
xylenes				17.532 lb/yr
naphthalene				0.630 lb/yr
cumene				1.010 lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_V$				
		M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60		0.04808
benzene	78.11	60		0.00427
2,2,4 TMP	114.23	60		0.00432
toluene	92.14	60		0.00442
ethylbenzene	106.17	60		0.00036
xylenes	106.17	60		0.00109
naphthalene	128.17	60		0.00000
cumene	120.19	60		0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**
hexane	0.238853		7.117	0.03356
benzene	0.023428		7.117	0.00329
2,2,4 TMP	0.016183		7.117	0.00227
toluene	0.020544		7.117	0.00289
ethylbenzene	0.001448		7.117	0.00020
xylenes	0.004404		7.117	0.00062
naphthalene	0.000005		7.117	0.00000
cumene	0.000145		7.117	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.0	96	128.17	0.00311
cumene	0.0	96	120.19	0.00399
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**114**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**15.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**7,916,667**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**116**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	14.38	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**283.82**	lb/month
		0.14	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.143	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.084	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**30.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**72.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**168.91**	lb/month
HAPS Speciation			
Product - select from list		blendstock	
Total HAP Monthly Emissions		17.596	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		11.9264	lb/month
benzene		1.1121	lb/month
TMP		1.3417	lb/month
toluene		1.7415	lb/month
ethylbenzene		0.3071	lb/month
xylenes		1.0468	lb/month
naphthalene		0.0518	lb/month
cumene		0.0683	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		10.2342	lb/month
benzene		0.8633	lb/month
TMP		0.8440	lb/month
toluene		0.8083	lb/month
ethylbenzene		0.0582	lb/month
xylenes		0.1759	lb/month
naphthalene		0.0002	lb/month
cumene		0.0061	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.03771
benzene	78.11	60	0.00318
2,2,4 TMP	114.23	60	0.00311
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00021
xylenes	106.17	60	0.00065
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.109042	4.143	0.02632
benzene	0.010148	4.143	0.00245
2,2,4 TMP	0.006784	4.143	0.00164
toluene	0.008055	4.143	0.00194
ethylbenzene	0.000504	4.143	0.00012
xylenes	0.001521	4.143	0.00037
naphthalene	0.000001	4.143	0.00000
cumene	0.000046	4.143	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**308.15**	lb/month
		0.15	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.452	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.091	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**32.87**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**78.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**184.05**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		19.288	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		13.2226	lb/month
benzene		1.2285	lb/month
TMP		1.4597	lb/month
toluene		1.8628	lb/month
ethylbenzene		0.3169	lb/month
xylenes		1.0767	lb/month
naphthalene		0.0519	lb/month
cumene		0.0694	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		11.5305	lb/month
benzene		0.9796	lb/month
TMP		0.9620	lb/month
toluene		0.9296	lb/month
ethylbenzene		0.0681	lb/month
xylenes		0.2058	lb/month
naphthalene		0.0002	lb/month
cumene		0.0072	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.03899
benzene	78.11	60	0.00331
2,2,4 TMP	114.23	60	0.00325
toluene	92.14	60	0.00314
ethylbenzene	106.17	60	0.00023
xylenes	106.17	60	0.00070
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.121172	4.452	0.02722
benzene	0.011358	4.452	0.00255
2,2,4 TMP	0.007627	4.452	0.00171
toluene	0.009137	4.452	0.00205
ethylbenzene	0.000581	4.452	0.00013
xylenes	0.001755	4.452	0.00039
naphthalene	0.000002	4.452	0.00000
cumene	0.000054	4.452	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**392.75**	lb/month
		0.20	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.462	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.117	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**42.27**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**101.33**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**236.71**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		25.525	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		17.9664	lb/month
benzene		1.6595	lb/month
2,2,4 TMP		1.9002	lb/month
toluene		2.3232	lb/month
ethylbenzene		0.3554	lb/month
xylenes		1.1940	lb/month
naphthalene		0.0520	lb/month
cumene		0.0738	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		16.2743	lb/month
benzene		1.4106	lb/month
2,2,4 TMP		1.4025	lb/month
toluene		1.3900	lb/month
ethylbenzene		0.1066	lb/month
xylenes		0.3230	lb/month
naphthalene		0.0004	lb/month
cumene		0.0116	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.04279
benzene	78.11	60	0.00371
2,2,4 TMP	114.23	60	0.00369
toluene	92.14	60	0.00366
ethylbenzene	106.17	60	0.00028
xylenes	106.17	60	0.00085
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.163139	5.462	0.02987
benzene	0.015602	5.462	0.00286
2,2,4 TMP	0.010607	5.462	0.00194
toluene	0.013033	5.462	0.00239
ethylbenzene	0.000867	5.462	0.00016
xylenes	0.002628	5.462	0.00048
naphthalene	0.000003	5.462	0.00000
cumene	0.000083	5.462	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**557.91**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.167	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.168	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**60.63**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**145.34**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**339.51**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		38.860	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		27.9979	lb/month
benzene		2.5890	lb/month
2,2,4 TMP		2.8626	lb/month
toluene		3.3569	lb/month
ethylbenzene		0.4460	lb/month
xylenes		1.4707	lb/month
naphthalene		0.0525	lb/month
cumene		0.0845	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		26.3058	lb/month
benzene		2.3401	lb/month
2,2,4 TMP		2.3649	lb/month
toluene		2.4237	lb/month
ethylbenzene		0.1971	lb/month
xylenes		0.5997	lb/month
naphthalene		0.0009	lb/month
cumene		0.0223	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04823
benzene	78.11	60	0.00429
2,2,4 TMP	114.23	60	0.00434
toluene	92.14	60	0.00444
ethylbenzene	106.17	60	0.00036
xylenes	106.17	60	0.00110
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.241230	7.167	0.03366
benzene	0.023676	7.167	0.00330
2,2,4 TMP	0.016361	7.167	0.00228
toluene	0.020788	7.167	0.00290
ethylbenzene	0.001467	7.167	0.00020
xylenes	0.004464	7.167	0.00062
naphthalene	0.000005	7.167	0.00000
cumene	0.000147	7.167	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**755.84**	lb/month
		0.38	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.822	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.229	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**82.63**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**198.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**462.70**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		56.131	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		40.8561	lb/month
benzene		3.8009	lb/month
2,2,4 TMP		4.1319	lb/month
toluene		4.7540	lb/month
ethylbenzene		0.5734	lb/month
xylenes		1.8616	lb/month
naphthalene		0.0533	lb/month
cumene		0.1001	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		39.1640	lb/month
benzene		3.5521	lb/month
2,2,4 TMP		3.6342	lb/month
toluene		3.8208	lb/month
ethylbenzene		0.3246	lb/month
xylenes		0.9906	lb/month
naphthalene		0.0016	lb/month
cumene		0.0379	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.05268
benzene	78.11	60	0.00478
2,2,4 TMP	114.23	60	0.00489
toluene	92.14	60	0.00514
ethylbenzene	106.17	60	0.00044
xylenes	106.17	60	0.00133
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.324400	8.822	0.03677
benzene	0.032462	8.822	0.00368
2,2,4 TMP	0.022711	8.822	0.00257
toluene	0.029601	8.822	0.00336
ethylbenzene	0.002182	8.822	0.00025
xylenes	0.006660	8.822	0.00075
naphthalene	0.000009	8.822	0.00000
cumene	0.000225	8.822	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,019.56**	lb/month
		0.51	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.516	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.310	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**111.94**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**268.34**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**626.85**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		80.346	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		58.7476	lb/month
benzene		5.5073	lb/month
2,2,4 TMP		5.9336	lb/month
toluene		6.7723	lb/month
ethylbenzene		0.7629	lb/month
xylenes		2.4444	lb/month
naphthalene		0.0545	lb/month
cumene		0.1237	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		57.0554	lb/month
benzene		5.2584	lb/month
2,2,4 TMP		5.4359	lb/month
toluene		5.8391	lb/month
ethylbenzene		0.5140	lb/month
xylenes		1.5734	lb/month
naphthalene		0.0028	lb/month
cumene		0.0615	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.05665
benzene	78.11	60	0.00522
2,2,4 TMP	114.23	60	0.00540
toluene	92.14	60	0.00580
ethylbenzene	106.17	60	0.00051
xylenes	106.17	60	0.00156
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.415820	10.516	0.03954
benzene	0.042283	10.516	0.00402
2,2,4 TMP	0.029889	10.516	0.00284
toluene	0.039803	10.516	0.00378
ethylbenzene	0.003041	10.516	0.00029
xylenes	0.009308	10.516	0.00089
naphthalene	0.000014	10.516	0.00000
cumene	0.000321	10.516	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,166.29**	lb/month
		0.58	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.258	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.355	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**128.24**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_t)/D]^*[1+(N_c F_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**307.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**718.17**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		94.136	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_I L_W$			
		L_{TI}	
hexane		68.8965	lb/month
benzene		6.4808	lb/month
2,2,4 TMP		6.9658	lb/month
toluene		7.9300	lb/month
ethylbenzene		0.8741	lb/month
xylenes		2.7869	lb/month
naphthalene		0.0552	lb/month
cumene		0.1377	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		67.2044	lb/month
benzene		6.2320	lb/month
2,2,4 TMP		6.4681	lb/month
toluene		7.0059	lb/month
ethylbenzene		0.6252	lb/month
xylenes		1.9159	lb/month
naphthalene		0.0036	lb/month
cumene		0.0755	lb/month
Individual HAP Monthly Emissions Working losses = $Z_I L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	60	0.05824
benzene	78.11	60	0.00540
2,2,4 TMP	114.23	60	0.00561
toluene	92.14	60	0.00607
ethylbenzene	106.17	60	0.00054
xylenes	106.17	60	0.00166
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.457671	11.258	0.04065
benzene	0.046826	11.258	0.00416
2,2,4 TMP	0.033232	11.258	0.00295
toluene	0.044625	11.258	0.00396
ethylbenzene	0.003456	11.258	0.00031
xylenes	0.010591	11.258	0.00094
naphthalene	0.000016	11.258	0.00000
cumene	0.000369	11.258	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI} M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,087.48**	lb/month
		0.54	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is know	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.875	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.331	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**119.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_t)/D]^*[1+(N_c F_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**286.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**669.12**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		86.710	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_I L_W$			
		L_{TI}	
hexane		63.4339	lb/month
benzene		5.9565	lb/month
2,2,4 TMP		6.4096	lb/month
toluene		7.3096	lb/month
ethylbenzene		0.8140	lb/month
xylenes		2.6018	lb/month
naphthalene		0.0548	lb/month
cumene		0.1301	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		61.7418	lb/month
benzene		5.7076	lb/month
2,2,4 TMP		5.9119	lb/month
toluene		6.3764	lb/month
ethylbenzene		0.5651	lb/month
xylenes		1.7308	lb/month
naphthalene		0.0032	lb/month
cumene		0.0679	lb/month
Individual HAP Monthly Emissions Working losses = $Z_I L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	60	0.05743
benzene	78.11	60	0.00531
2,2,4 TMP	114.23	60	0.00550
toluene	92.14	60	0.00593
ethylbenzene	106.17	60	0.00053
xylenes	106.17	60	0.00161
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.435944	10.875	0.04009
benzene	0.044464	10.875	0.00409
2,2,4 TMP	0.031492	10.875	0.00290
toluene	0.042110	10.875	0.00387
ethylbenzene	0.003239	10.875	0.00030
xylenes	0.009920	10.875	0.00091
naphthalene	0.000015	10.875	0.00000
cumene	0.000344	10.875	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI} M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**814.10**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.242	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.247	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**89.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_t)/D]^*[1+(N_c F_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**213.59**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**498.96**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		61.391	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_I L_W$			
		L_{TI}	
hexane		44.7526	lb/month
benzene		4.1710	lb/month
2,2,4 TMP		4.5216	lb/month
toluene		5.1878	lb/month
ethylbenzene		0.6137	lb/month
xylenes		1.9854	lb/month
naphthalene		0.0535	lb/month
cumene		0.1051	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		43.0605	lb/month
benzene		3.9222	lb/month
2,2,4 TMP		4.0239	lb/month
toluene		4.2547	lb/month
ethylbenzene		0.3649	lb/month
xylenes		1.1145	lb/month
naphthalene		0.0019	lb/month
cumene		0.0429	lb/month
Individual HAP Monthly Emissions Working losses = $Z_I L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	60	0.05371
benzene	78.11	60	0.00489
2,2,4 TMP	114.23	60	0.00502
toluene	92.14	60	0.00531
ethylbenzene	106.17	60	0.00046
xylenes	106.17	60	0.00139
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.346484	9.242	0.03749
benzene	0.034820	9.242	0.00377
2,2,4 TMP	0.024428	9.242	0.00264
toluene	0.032020	9.242	0.00346
ethylbenzene	0.002383	9.242	0.00026
xylenes	0.007279	9.242	0.00079
naphthalene	0.000010	9.242	0.00000
cumene	0.000247	9.242	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI} M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**559.75**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.184	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.169	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**60.83**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**145.83**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**340.65**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		39.015	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		28.1140	lb/month
benzene		2.5998	lb/month
2,2,4 TMP		2.8739	lb/month
toluene		3.3692	lb/month
ethylbenzene		0.4471	lb/month
xylenes		1.4740	lb/month
naphthalene		0.0525	lb/month
cumene		0.0847	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		26.4218	lb/month
benzene		2.3510	lb/month
2,2,4 TMP		2.3762	lb/month
toluene		2.4360	lb/month
ethylbenzene		0.1982	lb/month
xylenes		0.6031	lb/month
naphthalene		0.0009	lb/month
cumene		0.0224	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04828
benzene	78.11	60	0.00430
2,2,4 TMP	114.23	60	0.00434
toluene	92.14	60	0.00445
ethylbenzene	106.17	60	0.00036
xylenes	106.17	60	0.00110
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.242059	7.184	0.03369
benzene	0.023763	7.184	0.00331
2,2,4 TMP	0.016424	7.184	0.00229
toluene	0.020873	7.184	0.00291
ethylbenzene	0.001474	7.184	0.00021
xylenes	0.004485	7.184	0.00062
naphthalene	0.000005	7.184	0.00000
cumene	0.000147	7.184	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**422.74**	lb/month
		0.21	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.797	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.126	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**45.60**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**109.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**255.37**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		27.846	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		19.7223	lb/month
benzene		1.8207	lb/month
2,2,4 TMP		2.0661	lb/month
toluene		2.4991	lb/month
ethylbenzene		0.3705	lb/month
xylenes		1.2399	lb/month
naphthalene		0.0521	lb/month
cumene		0.0755	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		18.0301	lb/month
benzene		1.5718	lb/month
2,2,4 TMP		1.5684	lb/month
toluene		1.5659	lb/month
ethylbenzene		0.1216	lb/month
xylenes		0.3690	lb/month
naphthalene		0.0005	lb/month
cumene		0.0133	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
2,2,4 TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04394
benzene	78.11	60	0.00383
2,2,4 TMP	114.23	60	0.00382
toluene	92.14	60	0.00382
ethylbenzene	106.17	60	0.00030
xylenes	106.17	60	0.00090
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.177788	5.797	0.03067
benzene	0.017101	5.797	0.00295
2,2,4 TMP	0.011668	5.797	0.00201
toluene	0.014442	5.797	0.00249
ethylbenzene	0.000974	5.797	0.00017
xylenes	0.002953	5.797	0.00051
naphthalene	0.000003	5.797	0.00000
cumene	0.000094	5.797	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**321.30**	lb/month
		0.16	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.616	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**34.33**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**12.44**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**82.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**192.24**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		20.224	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		13.9372	lb/month
benzene		1.2929	lb/month
TMP		1.5252	lb/month
toluene		1.9305	lb/month
ethylbenzene		0.3225	lb/month
xylenes		1.0937	lb/month
naphthalene		0.0519	lb/month
cumene		0.0700	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		12.2450	lb/month
benzene		1.0441	lb/month
TMP		1.0275	lb/month
toluene		0.9974	lb/month
ethylbenzene		0.0736	lb/month
xylenes		0.2227	lb/month
naphthalene		0.0003	lb/month
cumene		0.0078	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.6922	lb/month
benzene		0.2488	lb/month
TMP		0.4977	lb/month
toluene		0.9332	lb/month
ethylbenzene		0.2488	lb/month
xylenes		0.8710	lb/month
naphthalene		0.0516	lb/month
cumene		0.0622	lb/month
Vapor Weight Concentratior $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.03965
benzene	78.11	60	0.00338
2,2,4 TMP	114.23	60	0.00333
toluene	92.14	60	0.00323
ethylbenzene	106.17	60	0.00024
xylenes	106.17	60	0.00072
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.127730	4.616	0.02767
benzene	0.012016	4.616	0.00260
2,2,4 TMP	0.008086	4.616	0.00175
toluene	0.009731	4.616	0.00211
ethylbenzene	0.000624	4.616	0.00014
xylenes	0.001886	4.616	0.00041
naphthalene	0.000002	4.616	0.00000
cumene	0.000058	4.616	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 114			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**56,746,995**	gal/yr
Turnovers	N	**14.58**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	116	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		172.60 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**3,529.13**	lb/year
		1.76	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	9.026	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.237	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**341.98**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_VW_V/D)*[1+(N_FF_C/D)]$	**LW**	**452.31**	lb/yr
Annual throughput	Q	1,351,119	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	120.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**819.79**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	172.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.24	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1,915.06**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	120.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.24	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Crude Oil	
Total HAP Annual Average Emissions		41.00	
Individual HAP Annual Average Emist Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
	hexane	10.710	lb/yr
	benzene	10.785	lb/yr
	2,2,4 TMP	1.132	lb/yr
	toluene	8.234	lb/yr
	ethylbenzene	2.261	lb/yr
	xylenes	7.707	lb/yr
	naphthalene	0.166	lb/yr
	cumene	0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	50	0.00289
benzene	78.11	50	0.00262
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00121
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.015148	9.026	0.00168
benzene	0.015155	9.026	0.00168
2,2,4 TMP	0.000872	9.026	0.00010
toluene	0.005906	9.026	0.00065
ethylbenzene	0.000624	9.026	0.00007
xylenes	0.001899	9.026	0.00021
naphthalene	0.000001	9.026	0.00000
cumene	0.000000	9.026	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0	207	128.17	0.00059
cumene	0.0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**114**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**4,728,916**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**116**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	14.38	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**171.27**	lb/month
		0.09	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.702	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.124	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**14.85**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**35.59**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**83.14**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		2.166	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{TI}**	
hexane		0.4300	lb/month
benzene		0.4664	lb/month
TMP		0.0573	lb/month
toluene		0.4769	lb/month
ethylbenzene		0.1616	lb/month
xylenes		0.5603	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.2792	lb/month
benzene		0.2402	lb/month
TMP		0.0196	lb/month
toluene		0.1000	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0326	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00209
benzene	78.11	50	0.00180
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00075
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006915	5.702	0.00121
benzene	0.006565	5.702	0.00115
2,2,4 TMP	0.000366	5.702	0.00006
toluene	0.002316	5.702	0.00041
ethylbenzene	0.000217	5.702	0.00004
xylenes	0.000656	5.702	0.00012
naphthalene	0.000000	5.702	0.00000
cumene	0.000000	5.702	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**182.28**	lb/month
		0.09	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.062	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**16.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**38.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**90.00**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.263	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{TI}**	
hexane		0.4667	lb/month
benzene		0.4999	lb/month
TMP		0.0601	lb/month
toluene		0.4924	lb/month
ethylbenzene		0.1635	lb/month
xylenes		0.5660	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.3159	lb/month
benzene		0.2738	lb/month
TMP		0.0224	lb/month
toluene		0.1155	lb/month
ethylbenzene		0.0127	lb/month
xylenes		0.0383	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00218
benzene	78.11	50	0.00189
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00080
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007685	6.062	0.00127
benzene	0.007347	6.062	0.00121
2,2,4 TMP	0.000411	6.062	0.00007
toluene	0.002627	6.062	0.00043
ethylbenzene	0.000250	6.062	0.00004
xylenes	0.000757	6.062	0.00012
naphthalene	0.000000	6.062	0.00000
cumene	0.000000	6.062	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**220.60**	lb/month
		0.11	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.210	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.169	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**20.33**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**48.73**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**113.85**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.626	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{TI}**	
hexane		0.6032	lb/month
benzene		0.6261	lb/month
2,2,4 TMP		0.0708	lb/month
toluene		0.5521	lb/month
ethylbenzene		0.1709	lb/month
xylenes		0.5888	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4524	lb/month
benzene		0.4000	lb/month
2,2,4 TMP		0.0331	lb/month
toluene		0.1752	lb/month
ethylbenzene		0.0201	lb/month
xylenes		0.0611	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00247
benzene	78.11	50	0.00219
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00096
ethylbenzene	106.17	50	0.00011
xylenes	106.17	50	0.00033
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010346	7.210	0.00143
benzene	0.010092	7.210	0.00140
2,2,4 TMP	0.000572	7.210	0.00008
toluene	0.003747	7.210	0.00052
ethylbenzene	0.000374	7.210	0.00005
xylenes	0.001133	7.210	0.00016
naphthalene	0.000001	7.210	0.00000
cumene	0.000000	7.210	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**296.55**	lb/month
		0.15	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.079	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.240	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**28.77**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**68.97**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**161.12**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.444	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.9026	lb/month
benzene		0.9084	lb/month
2,2,4 TMP		0.0951	lb/month
toluene		0.6910	lb/month
ethylbenzene		0.1891	lb/month
xylenes		0.6442	lb/month
naphthalene		0.0140	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7518	lb/month
benzene		0.6822	lb/month
2,2,4 TMP		0.0575	lb/month
toluene		0.3140	lb/month
ethylbenzene		0.0383	lb/month
xylenes		0.1166	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00290
benzene	78.11	50	0.00264
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00121
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015299	9.079	0.00169
benzene	0.015316	9.079	0.00169
2,2,4 TMP	0.000882	9.079	0.00010
toluene	0.005977	9.079	0.00066
ethylbenzene	0.000633	9.079	0.00007
xylenes	0.001925	9.079	0.00021
naphthalene	0.000001	9.079	0.00000
cumene	0.000000	9.079	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**392.16**	lb/month
		0.20	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.830	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**39.40**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**94.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**220.63**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.588	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.3114	lb/month
benzene		1.2999	lb/month
2,2,4 TMP		1.1292	lb/month
toluene		0.8902	lb/month
ethylbenzene		0.2162	lb/month
xylenes		0.7273	lb/month
naphthalene		0.0140	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1607	lb/month
benzene		1.0737	lb/month
2,2,4 TMP		0.0915	lb/month
toluene		0.5133	lb/month
ethylbenzene		0.0654	lb/month
xylenes		0.1996	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020573	10.830	0.00190
benzene	0.020999	10.830	0.00194
2,2,4 TMP	0.001224	10.830	0.00011
toluene	0.008510	10.830	0.00079
ethylbenzene	0.000941	10.830	0.00009
xylenes	0.002872	10.830	0.00027
naphthalene	0.000002	10.830	0.00000
cumene	0.000000	10.830	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**535.43**	lb/month
		0.27	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.570	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.461	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**55.32**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**132.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**309.80**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.405	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.9506	lb/month
benzene		1.9181	lb/month
2,2,4 TMP		0.1835	lb/month
toluene		1.2120	lb/month
ethylbenzene		0.2610	lb/month
xylenes		0.8652	lb/month
naphthalene		0.0142	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7999	lb/month
benzene		1.6920	lb/month
2,2,4 TMP		0.1458	lb/month
toluene		0.8350	lb/month
ethylbenzene		0.1103	lb/month
xylenes		0.3375	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00340
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026371	12.570	0.00210
benzene	0.027352	12.570	0.00218
2,2,4 TMP	0.001611	12.570	0.00013
toluene	0.011443	12.570	0.00091
ethylbenzene	0.001311	12.570	0.00010
xylenes	0.004014	12.570	0.00032
naphthalene	0.000003	12.570	0.00000
cumene	0.000000	12.570	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**630.72**	lb/month
		0.32	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	13.318	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.549	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**65.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**158.01**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**369.11**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		7.627	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.3783	lb/month
benzene		2.3331	lb/month
2,2,4 TMP		0.2199	lb/month
toluene		1.4296	lb/month
ethylbenzene		0.2917	lb/month
xylenes		0.9595	lb/month
naphthalene		0.0142	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.2276	lb/month
benzene		2.1070	lb/month
2,2,4 TMP		0.1822	lb/month
toluene		1.0527	lb/month
ethylbenzene		0.1409	lb/month
xylenes		0.4318	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00376
benzene	78.11	50	0.00355
2,2,4 TMP	114.23	50	0.00031
toluene	92.14	50	0.00178
ethylbenzene	106.17	50	0.00024
xylenes	106.17	50	0.00073
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029025	13.318	0.00218
benzene	0.030290	13.318	0.00227
2,2,4 TMP	0.001791	13.318	0.00013
toluene	0.012830	13.318	0.00096
ethylbenzene	0.001490	13.318	0.00011
xylenes	0.004567	13.318	0.00034
naphthalene	0.000003	13.318	0.00000
cumene	0.000000	13.318	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**577.50**	lb/month
		0.29	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.933	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.500	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**60.00**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**143.83**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**335.98**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.945	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.1397	lb/month
benzene		2.1016	lb/month
2,2,4 TMP		0.1996	lb/month
toluene		1.3081	lb/month
ethylbenzene		0.2746	lb/month
xylenes		0.9068	lb/month
naphthalene		0.0142	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9889	lb/month
benzene		1.8754	lb/month
2,2,4 TMP		0.1619	lb/month
toluene		0.9312	lb/month
ethylbenzene		0.1238	lb/month
xylenes		0.3791	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00368
benzene	78.11	50	0.00347
2,2,4 TMP	114.23	50	0.00030
toluene	92.14	50	0.00173
ethylbenzene	106.17	50	0.00023
xylenes	106.17	50	0.00070
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.027647	12.933	0.00214
benzene	0.028763	12.933	0.00222
2,2,4 TMP	0.001698	12.933	0.00013
toluene	0.012107	12.933	0.00094
ethylbenzene	0.001397	12.933	0.00011
xylenes	0.004278	12.933	0.00033
naphthalene	0.000003	12.933	0.00000
cumene	0.000000	12.933	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**421.83**	lb/month
		0.21	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.265	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.356	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**42.69**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**102.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**239.09**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.958	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		1.4423	lb/month
benzene		1.4260	lb/month
2,2,4 TMP		0.1403	lb/month
toluene		0.9554	lb/month
ethylbenzene		0.2252	lb/month
xylenes		0.7550	lb/month
naphthalene		0.0141	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2915	lb/month
benzene		1.1999	lb/month
2,2,4 TMP		0.1026	lb/month
toluene		0.5785	lb/month
ethylbenzene		0.0744	lb/month
xylenes		0.2273	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00336
benzene	78.11	50	0.00312
2,2,4 TMP	114.23	50	0.00027
toluene	92.14	50	0.00151
ethylbenzene	106.17	50	0.00019
xylenes	106.17	50	0.00059
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.021974	11.265	0.00195
benzene	0.022524	11.265	0.00200
2,2,4 TMP	0.001317	11.265	0.00012
toluene	0.009206	11.265	0.00082
ethylbenzene	0.001028	11.265	0.00009
xylenes	0.003139	11.265	0.00028
naphthalene	0.000002	11.265	0.00000
cumene	0.000000	11.265	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**297.42**	lb/month
		0.15	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.097	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.241	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**28.87**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**69.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**161.66**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.454	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.9062	lb/month
benzene		0.9117	lb/month
2,2,4 TMP		0.0954	lb/month
toluene		0.6926	lb/month
ethylbenzene		0.1893	lb/month
xylenes		0.6449	lb/month
naphthalene		0.0140	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7554	lb/month
benzene		0.6856	lb/month
2,2,4 TMP		0.0577	lb/month
toluene		0.3157	lb/month
ethylbenzene		0.0385	lb/month
xylenes		0.1172	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00291
benzene	78.11	50	0.00264
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00122
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.015351	9.097	0.00169
benzene	0.015372	9.097	0.00169
2,2,4 TMP	0.000885	9.097	0.00010
toluene	0.006001	9.097	0.00066
ethylbenzene	0.000636	9.097	0.00007
xylenes	0.001934	9.097	0.00021
naphthalene	0.000001	9.097	0.00000
cumene	0.000000	9.097	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**234.24**	lb/month
		0.12	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.583	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.182	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**21.85**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**52.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**122.34**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.764	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.6545	lb/month
benzene		0.6741	lb/month
2,2,4 TMP		0.0749	lb/month
toluene		0.5753	lb/month
ethylbenzene		0.1739	lb/month
xylenes		0.5978	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.5037	lb/month
benzene		0.4479	lb/month
2,2,4 TMP		0.0372	lb/month
toluene		0.1983	lb/month
ethylbenzene		0.0231	lb/month
xylenes		0.0701	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00256
benzene	78.11	50	0.00228
2,2,4 TMP	114.23	50	0.00019
toluene	92.14	50	0.00101
ethylbenzene	106.17	50	0.00012
xylenes	106.17	50	0.00036
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.011275	7.583	0.00149
benzene	0.011062	7.583	0.00146
2,2,4 TMP	0.000629	7.583	0.00008
toluene	0.004152	7.583	0.00055
ethylbenzene	0.000420	7.583	0.00006
xylenes	0.001274	7.583	0.00017
naphthalene	0.000001	7.583	0.00000
cumene	0.000000	7.583	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**188.23**	lb/month
		0.09	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	112,593.24	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.250	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.139	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**16.73**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**37.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**40.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**93.70**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.316	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.4870	lb/month
benzene		0.5186	lb/month
TMP		0.0617	lb/month
toluene		0.5011	lb/month
ethylbenzene		0.1645	lb/month
xylenes		0.5693	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.3363	lb/month
benzene		0.2925	lb/month
TMP		0.0240	lb/month
toluene		0.1242	lb/month
ethylbenzene		0.0138	lb/month
xylenes		0.0416	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1508	lb/month
benzene		0.2262	lb/month
TMP		0.0377	lb/month
toluene		0.3769	lb/month
ethylbenzene		0.1508	lb/month
xylenes		0.5277	lb/month
naphthalene		0.0139	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00223
benzene	78.11	50	0.00194
2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00082
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00028
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.008101	6.250	0.00130
benzene	0.007773	6.250	0.00124
2,2,4 TMP	0.000436	6.250	0.00007
toluene	0.002798	6.250	0.00045
ethylbenzene	0.000269	6.250	0.00004
xylenes	0.000813	6.250	0.00013
naphthalene	0.000000	6.250	0.00000
cumene	0.000000	6.250	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 114			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**175,285,161**	gal/yr
Turnovers	N	**45.04**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	116	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		172.60	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**356.63**	lb/year
		0.18	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.82**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000873	NA
Tank diameter	D	120.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**349.28**	lb/yr
Annual throughput	Q	4,173,456	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	120.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1.96**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	172.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**4.57**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	120.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = (ITAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:	Diesel	
Total HAP Annual Average Emissions	2.08	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		
	L_{TI}	
hexane	0.004	lb/yr
benzene	0.019	lb/yr
2,2,4 TMP	0.000	lb/yr
toluene	0.288	lb/yr
ethylbenzene	0.067	lb/yr
xylenes	1.435	lb/yr
naphthalene	0.267	lb/yr
cumene	0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02396
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05747
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00361
2,2,4 TMP	0.000000	0.005	-
toluene	0.000172	0.005	0.03380
ethylbenzene	0.000018	0.005	0.00363
xylenes	0.000357	0.005	0.07036
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**114**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**14,607,097**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**116**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	14.38	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.34**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_FF_F/D)]$	L_W	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.14**	lb/month
HAPS Speciation			
Total HAP Monthly Emissions		0.139	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0002	lb/month
benzene		0.0008	lb/month
TMP		0.0000	lb/month
toluene		0.0151	lb/month
ethylbenzene		0.0044	lb/month
xylenes		0.0968	lb/month
naphthalene		0.0221	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0001	lb/month
benzene		0.0006	lb/month
TMP		0.0000	lb/month
toluene		0.0058	lb/month
ethylbenzene		0.0006	lb/month
xylenes		0.0122	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00250
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02493
ethylbenzene	106.17	130	0.00274
xylenes	106.17	130	0.05267
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00082
benzene	0.000008	0.002	0.00415
2,2,4 TMP	0.000000	0.002	-
toluene	0.000067	0.002	0.03518
ethylbenzene	0.000006	0.002	0.00335
xylenes	0.000123	0.002	0.06449
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.37**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_FF_F/D)]$	L_W	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.16**	lb/month
HAPS Speciation			
Total HAP Monthly Emissions		0.142	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0158	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.0984	lb/month
naphthalene		0.0221	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0001	lb/month
benzene		0.0006	lb/month
TMP		0.0000	lb/month
toluene		0.0065	lb/month
ethylbenzene		0.0007	lb/month
xylenes		0.0140	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-*l* $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00053
benzene	78.11	130	0.00245
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02483
ethylbenzene	106.17	130	0.00277
xylenes	106.17	130	0.05338
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00408
2,2,4 TMP	0.000000	0.002	-
toluene	0.000076	0.002	0.03504
ethylbenzene	0.000007	0.002	0.00339
xylenes	0.000142	0.002	0.06536
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.49**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]*[1+(N_FF_F/D)]$	L_W	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.24**	lb/month
HAPS Speciation			
Total HAP Monthly Emissions		0.152	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{TI}		
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0186	lb/month
ethylbenzene		0.0049	lb/month
xylenes		0.1054	lb/month
naphthalene		0.0221	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0210	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00049
benzene	78.11	130	0.00233
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02450
ethylbenzene	106.17	130	0.00286
xylenes	106.17	130	0.05528
naphthalene	128.17	130	0.00030
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00075
benzene	0.000012	0.003	0.00388
2,2,4 TMP	0.000000	0.003	-
toluene	0.000109	0.003	0.03457
ethylbenzene	0.000011	0.003	0.00350
xylenes	0.000213	0.003	0.06769
naphthalene	0.000001	0.003	0.00031
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.73**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.17**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.39**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.174	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0003	lb/month
benzene		0.0016	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0242	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.1201	lb/month
naphthalene		0.0222	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0148	lb/month
ethylbenzene		0.0018	lb/month
xylenes		0.0357	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02394
ethylbenzene	106.17	130	0.00297
xylenes	106.17	130	0.05752
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000019	0.005	0.00361
2,2,4 TMP	0.000000	0.005	-
toluene	0.000174	0.005	0.03378
ethylbenzene	0.000019	0.005	0.00363
xylenes	0.000362	0.005	0.07043
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.01**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.56**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.199	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0004	lb/month
benzene		0.0021	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0305	lb/month
ethylbenzene		0.0065	lb/month
xylenes		0.1376	lb/month
naphthalene		0.0224	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0018	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0211	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0532	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.35**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.33**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.77**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.230	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0026	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0377	lb/month
ethylbenzene		0.0076	lb/month
xylenes		0.1588	lb/month
naphthalene		0.0226	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0024	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0284	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0744	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02295
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06006
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00323
2,2,4 TMP	0.000000	0.010	-
toluene	0.000333	0.010	0.03239
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000755	0.010	0.07354
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.51**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.012	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_r/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.87**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.245	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0006	lb/month
benzene		0.0029	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0412	lb/month
ethylbenzene		0.0081	lb/month
xylenes		0.1691	lb/month
naphthalene		0.0227	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0319	lb/month
ethylbenzene		0.0043	lb/month
xylenes		0.0847	lb/month
naphthalene		0.0007	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00038
benzene	78.11	130	0.00190
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02276
ethylbenzene	106.17	130	0.00309
xylenes	106.17	130	0.06043
naphthalene	128.17	130	0.00050
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000007	0.012	0.00057
benzene	0.000037	0.012	0.00316
2,2,4 TMP	0.000000	0.012	-
toluene	0.000373	0.012	0.03211
ethylbenzene	0.000044	0.012	0.00379
xylenes	0.000859	0.012	0.07399
naphthalene	0.000006	0.012	0.00050
cumene	0.000000	0.012	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.42**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.011	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_r/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.82**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.237	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0028	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0394	lb/month
ethylbenzene		0.0078	lb/month
xylenes		0.1637	lb/month
naphthalene		0.0227	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0025	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0301	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0793	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00038
benzene	78.11	130	0.00192
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02286
ethylbenzene	106.17	130	0.00309
xylenes	106.17	130	0.06024
naphthalene	128.17	130	0.00049
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.011	0.00058
benzene	0.000035	0.011	0.00319
2,2,4 TMP	0.000000	0.011	-
toluene	0.000352	0.011	0.03225
ethylbenzene	0.000041	0.011	0.00378
xylenes	0.000805	0.011	0.07376
naphthalene	0.000005	0.011	0.00049
cumene	0.000000	0.011	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.09**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.008	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_r/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.61**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.207	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0022	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0322	lb/month
ethylbenzene		0.0068	lb/month
xylenes		0.1426	lb/month
naphthalene		0.0224	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0229	lb/month
ethylbenzene		0.0030	lb/month
xylenes		0.0582	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00041
benzene	78.11	130	0.00201
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02331
ethylbenzene	106.17	130	0.00305
xylenes	106.17	130	0.05929
naphthalene	128.17	130	0.00044
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000005	0.008	0.00061
benzene	0.000027	0.008	0.00335
2,2,4 TMP	0.000000	0.008	-
toluene	0.000268	0.008	0.03289
ethylbenzene	0.000030	0.008	0.00373
xylenes	0.000591	0.008	0.07260
naphthalene	0.000004	0.008	0.00044
cumene	0.000000	0.008	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.73**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.17**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.39**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.174	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0016	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0242	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.1202	lb/month
naphthalene		0.0222	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0149	lb/month
ethylbenzene		0.0018	lb/month
xylenes		0.0358	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02394
ethylbenzene	106.17	130	0.00297
xylenes	106.17	130	0.05754
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00067
benzene	0.000019	0.005	0.00360
2,2,4 TMP	0.000000	0.005	-
toluene	0.000174	0.005	0.03377
ethylbenzene	0.000019	0.005	0.00363
xylenes	0.000364	0.005	0.07045
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.53**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.004	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.26**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.156	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0012	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0196	lb/month
ethylbenzene		0.0050	lb/month
xylenes		0.1080	lb/month
naphthalene		0.0222	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0103	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0236	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00048
benzene	78.11	130	0.00230
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02439
ethylbenzene	106.17	130	0.00289
xylenes	106.17	130	0.05580
naphthalene	128.17	130	0.00032
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.004	0.00073
benzene	0.000013	0.004	0.00382
2,2,4 TMP	0.000000	0.004	-
toluene	0.000121	0.004	0.03441
ethylbenzene	0.000012	0.004	0.00353
xylenes	0.000240	0.004	0.06832
naphthalene	0.000001	0.004	0.00032
cumene	0.000000	0.004	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.39**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.11**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.17**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.143	lb/month
Individual HAP Monthly Em 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0163	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0995	lb/month
naphthalene		0.0221	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0001	lb/month
benzene		0.0007	lb/month
TMP		0.0000	lb/month
toluene		0.0069	lb/month
ethylbenzene		0.0008	lb/month
xylenes		0.0151	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0093	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0220	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00052
benzene	78.11	130	0.00243
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02478
ethylbenzene	106.17	130	0.00279
xylenes	106.17	130	0.05373
naphthalene	128.17	130	0.00027
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00079
benzene	0.000009	0.002	0.00405
2,2,4 TMP	0.000000	0.002	-
toluene	0.000081	0.002	0.03496
ethylbenzene	0.000008	0.002	0.00341
xylenes	0.000153	0.002	0.06579
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		114	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**175,285,161**	gal/yr
Turnovers	N	**45.04**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type		Mechanical-shoe seal | Rim-mounted secondary	
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	116	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		172.60 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**360.93**	lb/year
		0.18	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.20**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000873	NA
Tank diameter	D	120.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$ID)/[1+(N,F$_P$/D)]	**LW**	**359.12**	lb/yr
Annual throughput	Q	4,173,456	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	120.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**0.48**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	172.60	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1.13**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	120.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	510.25	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	biodiesel	
Total HAP Annual Average Emissions		15.92	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_C) + Z_{Li}L_{WF}$			
		L_{Ti}	
hexane		0.000	lb/yr
benzene		0.000	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.000	lb/yr
ethylbenzene		0.000	lb/yr
xylenes		0.000	lb/yr
naphthalene		0.000	lb/yr
cumene		7.962	lb/yr
methanol		7.962	lb/yr

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.99885

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
cumene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
methanol	0.020308	0.005	3.99885

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362
methanol	8.079	1581.3	239.65	1.1728

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**114**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**120.00**	ft
Throughput	Q	**14,607,097**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD		

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**116**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	14.38 per month

1 Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.98**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_CF_C/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.04**	lb/month
HAPS Speciation			
Product - select from list		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2981	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2382	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.18930

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008015	0.002	4.18930

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116
methanol	8.079	1581.3	239.65	0.4629

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**29.99**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_CF_C/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.04**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3297	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2698	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16680

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009079	0.002	4.16680

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135
methanol	8.079	1581.3	239.65	0.5243

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.02**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D]^*[1+(N_CF_C/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.06**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4436	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3837	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3837	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.09805

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.012910	0.003	4.09805

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208
methanol	8.079	1581.3	239.65	0.7456

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**30.08**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6706	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6108	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.99612	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.020549	0.005	3.99612	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$				
	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367
methanol	8.079	1581.3	239.65	1.1867

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**30.15**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.14**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9295	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8697	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.91062	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.007	-	
benzene	0.000000	0.007	-	
2,2,4 TMP	0.000000	0.007	-	
toluene	0.000000	0.007	-	
ethylbenzene	0.000000	0.007	-	
xylenes	0.000000	0.007	-	
naphthalene	0.000000	0.007	-	
cumene	0.000000	0.007	-	
methanol	0.029255	0.007	3.91062	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$				
	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	1.6895

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**30.23**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.19**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2303	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1704	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.83376	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.010	-	
benzene	0.000000	0.010	-	
2,2,4 TMP	0.000000	0.010	-	
toluene	0.000000	0.010	-	
ethylbenzene	0.000000	0.010	-	
xylenes	0.000000	0.010	-	
naphthalene	0.000000	0.010	-	
cumene	0.000000	0.010	-	
methanol	0.039376	0.010	3.83376	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$				
	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805
methanol	8.079	1581.3	239.65	2.2737

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.27**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.012	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.21**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3729	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3130	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.80286

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.012	-
benzene	0.000000	0.012	-
2,2,4 TMP	0.000000	0.012	-
toluene	0.000000	0.012	-
ethylbenzene	0.000000	0.012	-
xylenes	0.000000	0.012	-
naphthalene	0.000000	0.012	-
cumene	0.000000	0.012	-
methanol	0.044164	0.012	3.80286

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923
methanol	8.079	1581.3	239.65	2.5505

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.25**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is know	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.011	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.20**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2985	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2386	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.81861

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.011	-
benzene	0.000000	0.011	-
2,2,4 TMP	0.000000	0.011	-
toluene	0.000000	0.011	-
ethylbenzene	0.000000	0.011	-
xylenes	0.000000	0.011	-
naphthalene	0.000000	0.011	-
cumene	0.000000	0.011	-
methanol	0.041664	0.011	3.81861

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5369
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861
methanol	8.079	1581.3	239.65	2.4061

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.17**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.008	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.15**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.0007	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9409	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.89069

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.008	-
benzene	0.000000	0.008	-
2,2,4 TMP	0.000000	0.008	-
toluene	0.000000	0.008	-
ethylbenzene	0.000000	0.008	-
xylenes	0.000000	0.008	-
naphthalene	0.000000	0.008	-
cumene	0.000000	0.008	-
methanol	0.031651	0.008	3.89069

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619
methanol	8.079	1581.3	239.65	1.8278

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**30.08**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation — Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6731	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6133	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.99517

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.020633	0.005	3.99517

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369
methanol	8.079	1581.3	239.65	1.1916

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**30.03**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.004	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.06**	lb/month

HAPS Speciation — Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4848	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4249	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.07675

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.004	-
benzene	0.000000	0.004	-
2,2,4 TMP	0.000000	0.004	-
toluene	0.000000	0.004	-
ethylbenzene	0.000000	0.004	-
xylenes	0.000000	0.004	-
naphthalene	0.000000	0.004	-
cumene	0.000000	0.004	-
methanol	0.014297	0.004	4.07675

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236
methanol	8.079	1581.3	239.65	0.8256

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**30.00**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	347,788.02	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**29.93**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.04**	lb/month

HAPS Speciation — Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3470	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.2872	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0599	lb/month

Vapor Weight Concentrations $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.15518

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009663	0.002	4.15518

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146
methanol	8.079	1581.3	239.65	0.5580

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 115			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**329,415,828**	gal/yr
Turnovers	N	**54.17**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{2}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	180	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		249.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**8,443.55**	lb/year
		4.22	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	6.051	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.134	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**745.45**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1335938	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_L/D)*[1+(N_FF_C/D)]$	**LW**	**414.19**	lb/yr
Annual throughput	Q	7,843,234	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,065.73**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	249.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**5,218.17**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

		Product - select from list:		Gasoline
Total HAP Annual Average Emissions				244.47
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$				L_{TI}
hexane				35.188 lb/yr
benzene				41.238 lb/yr
2,2,4 TMP				54.485 lb/yr
toluene				65.232 lb/yr
ethylbenzene				8.006 lb/yr
xylenes				38.585 lb/yr
naphthalene				1.733 lb/yr
cumene				2.427 lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$				
		M_i	**M_V**	**Z_{VI}**
hexane		86.18	62	0.00387
benzene		78.11	62	0.00421
2,2,4 TMP		114.23	62	0.00472
toluene		92.14	62	0.00451
ethylbenzene		106.17	62	0.00027
xylenes		106.17	62	0.00119
naphthalene		128.17	62	0.00000
cumene		120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
		$P_i = P_{VA}(x_i)$		**P_{VA}** **y_i**
hexane		0.016831	6.051	0.00278
benzene		0.020207	6.051	0.00334
2,2,4 TMP		0.015509	6.051	0.00256
toluene		0.018375	6.051	0.00304
ethylbenzene		0.000971	6.051	0.00016
xylenes		0.004221	6.051	0.00070
naphthalene		0.000005	6.051	0.00000
cumene		0.000139	6.051	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$				
		Z_{Li}	**M_L**	**M_i** **X_i**
hexane		0.01	92	86.18 0.01068
benzene		0.018	92	78.11 0.02120
2,2,4 TMP		0.04	92	114.23 0.03222
toluene		0.07	92	92.14 0.06989
ethylbenzene		0.014	92	106.17 0.01213
xylenes		0.07	92	106.17 0.06066
naphthalene		0.0	92	128.17 0.00298
cumene		0.0	92	120.19 0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$				
		A	**B**	**C** **P_{VAi}**
hexane		6.878	1171.5	224.37 1.5766
benzene		6.906	1211	220.79 0.9531
2,2,4 TMP		6.812	1257.8	220.74 0.4814
toluene		7.017	1377.6	222.64 0.2629
ethylbenzene		6.95	1419.3	212.61 0.0801
xylenes		7.009	1462.3	215.11 0.0696
naphthalene		7.146	1831.6	211.82 0.0017
cumene		6.929	1455.8	207.2 0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**115**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**27,451,319**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**180**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	20.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**440.62**	lb/month
		0.22	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.143	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.084	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**37.70**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L/D)^*[1+(N_FF_F/D)]$	L_W	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**104.48**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**263.92**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		12.993	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.4713	lb/month
benzene		1.7840	lb/month
TMP		2.6436	lb/month
toluene		3.5451	lb/month
ethylbenzene		0.5442	lb/month
xylenes		2.6792	lb/month
naphthalene		0.1435	lb/month
cumene		0.1816	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1261	lb/month
benzene		1.1627	lb/month
TMP		1.2630	lb/month
toluene		1.1290	lb/month
ethylbenzene		0.0610	lb/month
xylenes		0.2632	lb/month
naphthalene		0.0003	lb/month
cumene		0.0091	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00277
benzene	78.11	60	0.00286
2,2,4 TMP	114.23	60	0.00311
toluene	92.14	60	0.00278
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00065
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008018	4.143	0.00194
benzene	0.009134	4.143	0.00220
2,2,4 TMP	0.006784	4.143	0.00164
toluene	0.007518	4.143	0.00181
ethylbenzene	0.000353	4.143	0.00009
xylenes	0.001521	4.143	0.00037
naphthalene	0.000001	4.143	0.00000
cumene	0.000046	4.143	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**477.02**	lb/month
		0.24	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.452	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.091	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**41.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L/D)^*[1+(N_FF_F/D)]$	L_W	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**113.84**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**287.58**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		13.695	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.6139	lb/month
benzene		1.9406	lb/month
TMP		2.8202	lb/month
toluene		3.7144	lb/month
ethylbenzene		0.5545	lb/month
xylenes		2.7240	lb/month
naphthalene		0.1436	lb/month
cumene		0.1833	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2687	lb/month
benzene		1.3194	lb/month
TMP		1.4395	lb/month
toluene		1.2984	lb/month
ethylbenzene		0.0713	lb/month
xylenes		0.3079	lb/month
naphthalene		0.0003	lb/month
cumene		0.0107	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00287
benzene	78.11	60	0.00298
2,2,4 TMP	114.23	60	0.00325
toluene	92.14	60	0.00293
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00070
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008910	4.452	0.00200
benzene	0.010223	4.452	0.00230
2,2,4 TMP	0.007627	4.452	0.00171
toluene	0.008528	4.452	0.00192
ethylbenzene	0.000406	4.452	0.00009
xylenes	0.001755	4.452	0.00039
naphthalene	0.000002	4.452	0.00000
cumene	0.000054	4.452	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**537.47**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.826	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.100	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**46.69**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L/D)^*[1+(N_FF_F/D)]$	L_W	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**129.40**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**326.86**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		15.737	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		2.0103	lb/month
benzene		2.3879	lb/month
2,2,4 TMP		3.3323	lb/month
toluene		4.2214	lb/month
ethylbenzene		0.5870	lb/month
xylenes		2.8656	lb/month
naphthalene		0.1438	lb/month
cumene		0.1887	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.6652	lb/month
benzene		1.7667	lb/month
2,2,4 TMP		1.9516	lb/month
toluene		1.8053	lb/month
ethylbenzene		0.1038	lb/month
xylenes		0.4495	lb/month
naphthalene		0.0006	lb/month
cumene		0.0161	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00331
benzene	78.11	62	0.00351
2,2,4 TMP	114.23	62	0.00388
toluene	92.14	62	0.00359
ethylbenzene	106.17	62	0.00021
xylenes	106.17	62	0.00089
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.011496	4.826	0.00238
benzene	0.013456	4.826	0.00279
2,2,4 TMP	0.010165	4.826	0.00211
toluene	0.011657	4.826	0.00242
ethylbenzene	0.000582	4.826	0.00012
xylenes	0.002519	4.826	0.00052
naphthalene	0.000003	4.826	0.00000
cumene	0.000080	4.826	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH	April		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**709.85**	lb/month
		0.35	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.093	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**62.70**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**173.75**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**438.89**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.743	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.9638	lb/month
benzene		3.4726	lb/month
2,2,4 TMP		4.5823	lb/month
toluene		5.4786	lb/month
ethylbenzene		0.6700	lb/month
xylenes		3.2280	lb/month
naphthalene		0.1444	lb/month
cumene		0.2028	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.6187	lb/month
benzene		2.8513	lb/month
2,2,4 TMP		3.2017	lb/month
toluene		3.0625	lb/month
ethylbenzene		0.1868	lb/month
xylenes		0.8119	lb/month
naphthalene		0.0012	lb/month
cumene		0.0302	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00388
benzene	78.11	62	0.00422
2,2,4 TMP	114.23	62	0.00474
toluene	92.14	62	0.00453
ethylbenzene	106.17	62	0.00028
xylenes	106.17	62	0.00120
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.016998	6.093	0.00279
benzene	0.020421	6.093	0.00335
2,2,4 TMP	0.015680	6.093	0.00257
toluene	0.018594	6.093	0.00305
ethylbenzene	0.000984	6.093	0.00016
xylenes	0.004278	6.093	0.00070
naphthalene	0.000005	6.093	0.00000
cumene	0.000141	6.093	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH	May		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**613.89**	lb/month
		0.31	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.023	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.105	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**53.79**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**149.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**376.53**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		24.844	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.6868	lb/month
benzene		4.3309	lb/month
2,2,4 TMP		5.5978	lb/month
toluene		6.5542	lb/month
ethylbenzene		0.7468	lb/month
xylenes		3.5656	lb/month
naphthalene		0.1451	lb/month
cumene		0.2165	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.3416	lb/month
benzene		3.7097	lb/month
2,2,4 TMP		4.2172	lb/month
toluene		4.1381	lb/month
ethylbenzene		0.2636	lb/month
xylenes		1.1495	lb/month
naphthalene		0.0019	lb/month
cumene		0.0439	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00577
benzene	78.11	68	0.00640
2,2,4 TMP	114.23	68	0.00728
toluene	92.14	68	0.00714
ethylbenzene	106.17	68	0.00046
xylenes	106.17	68	0.00198
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022859	5.023	0.00455
benzene	0.027999	5.023	0.00557
2,2,4 TMP	0.021765	5.023	0.00433
toluene	0.026477	5.023	0.00527
ethylbenzene	0.001464	5.023	0.00029
xylenes	0.006383	5.023	0.00127
naphthalene	0.000009	5.023	0.00000
cumene	0.000216	5.023	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH	June		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**771.18**	lb/month
		0.39	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.068	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**68.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**189.52**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**478.75**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		31.416	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.8533	lb/month
benzene		5.7068	lb/month
2,2,4 TMP		7.2219	lb/month
toluene		8.2723	lb/month
ethylbenzene		0.8699	lb/month
xylenes		4.1068	lb/month
naphthalene		0.1463	lb/month
cumene		0.2387	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.5081	lb/month
benzene		5.0855	lb/month
2,2,4 TMP		5.8413	lb/month
toluene		5.8562	lb/month
ethylbenzene		0.3867	lb/month
xylenes		1.6908	lb/month
naphthalene		0.0030	lb/month
cumene		0.0661	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00612
benzene	78.11	68	0.00690
2,2,4 TMP	114.23	68	0.00793
toluene	92.14	68	0.00795
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029301	6.068	0.00483
benzene	0.036469	6.068	0.00601
2,2,4 TMP	0.028643	6.068	0.00472
toluene	0.035601	6.068	0.00587
ethylbenzene	0.002040	6.068	0.00034
xylenes	0.008920	6.068	0.00147
naphthalene	0.000013	6.068	0.00000
cumene	0.000308	6.068	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**846.59**	lb/month
		0.42	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.530	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.148	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**75.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**208.92**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**527.76**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		34.711	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		5.4278	lb/month
benzene		6.3903	lb/month
2,2,4 TMP		8.0335	lb/month
toluene		9.1417	lb/month
ethylbenzene		0.9334	lb/month
xylenes		4.3867	lb/month
naphthalene		0.1469	lb/month
cumene		0.2502	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.0827	lb/month
benzene		5.7690	lb/month
2,2,4 TMP		6.6529	lb/month
toluene		6.7256	lb/month
ethylbenzene		0.4502	lb/month
xylenes		1.9707	lb/month
naphthalene		0.0037	lb/month
cumene		0.0777	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	68	0.00626
benzene	78.11	68	0.00710
2,2,4 TMP	114.23	68	0.00819
toluene	92.14	68	0.00828
ethylbenzene	106.17	68	0.00055
xylenes	106.17	68	0.00243
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00010
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.032250	6.530	0.00494
benzene	0.040387	6.530	0.00618
2,2,4 TMP	0.031847	6.530	0.00488
toluene	0.039914	6.530	0.00611
ethylbenzene	0.002319	6.530	0.00036
xylenes	0.010150	6.530	0.00155
naphthalene	0.000016	6.530	0.00000
cumene	0.000353	6.530	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$	**LT**	**807.14**	lb/month
		0.40	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.292	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.141	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**71.73**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**198.77**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**502.12**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		32.977	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		5.1261	lb/month
benzene		6.0310	lb/month
2,2,4 TMP		7.6065	lb/month
toluene		8.6836	lb/month
ethylbenzene		0.8998	lb/month
xylenes		4.2388	lb/month
naphthalene		0.1466	lb/month
cumene		0.2441	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.7810	lb/month
benzene		5.4097	lb/month
2,2,4 TMP		6.2259	lb/month
toluene		6.2675	lb/month
ethylbenzene		0.4166	lb/month
xylenes		1.8227	lb/month
naphthalene		0.0033	lb/month
cumene		0.0715	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	68	0.00619
benzene	78.11	68	0.00700
2,2,4 TMP	114.23	68	0.00806
toluene	92.14	68	0.00811
ethylbenzene	106.17	68	0.00054
xylenes	106.17	68	0.00236
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.030719	6.292	0.00488
benzene	0.038350	6.292	0.00610
2,2,4 TMP	0.030180	6.292	0.00480
toluene	0.037665	6.292	0.00599
ethylbenzene	0.002173	6.292	0.00035
xylenes	0.009506	6.292	0.00151
naphthalene	0.000014	6.292	0.00000
cumene	0.000330	6.292	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,002.71**	lb/month
		0.50	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	7.901	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.193	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**89.89**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**249.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**629.21**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		29.133	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		4.5040	lb/month
benzene		5.2579	lb/month
2,2,4 TMP		6.6661	lb/month
toluene		7.6320	lb/month
ethylbenzene		0.8187	lb/month
xylenes		3.8799	lb/month
naphthalene		0.1457	lb/month
cumene		0.2289	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.1588	lb/month
benzene		4.6366	lb/month
2,2,4 TMP		5.2854	lb/month
toluene		5.2159	lb/month
ethylbenzene		0.3355	lb/month
xylenes		1.4639	lb/month
naphthalene		0.0025	lb/month
cumene		0.0563	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00430
benzene	78.11	62	0.00479
2,2,4 TMP	114.23	62	0.00546
toluene	92.14	62	0.00539
ethylbenzene	106.17	62	0.00035
xylenes	106.17	62	0.00151
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.024415	7.901	0.00309
benzene	0.030033	7.901	0.00380
2,2,4 TMP	0.023410	7.901	0.00296
toluene	0.028641	7.901	0.00363
ethylbenzene	0.001599	7.901	0.00020
xylenes	0.006976	7.901	0.00088
naphthalene	0.000010	7.901	0.00000
cumene	0.000237	7.901	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**751.48**	lb/month
		0.38	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.375	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.143	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**66.56**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**184.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**465.95**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.980	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.0115	lb/month
benzene		3.5251	lb/month
2,2,4 TMP		4.6417	lb/month
toluene		5.5364	lb/month
ethylbenzene		0.6736	lb/month
xylenes		3.2437	lb/month
naphthalene		0.1444	lb/month
cumene		0.2034	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.6663	lb/month
benzene		2.9039	lb/month
2,2,4 TMP		3.2611	lb/month
toluene		3.1203	lb/month
ethylbenzene		0.1904	lb/month
xylenes		0.8277	lb/month
naphthalene		0.0012	lb/month
cumene		0.0308	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00372
benzene	78.11	62	0.00405
2,2,4 TMP	114.23	62	0.00455
toluene	92.14	62	0.00435
ethylbenzene	106.17	62	0.00027
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.017057	6.375	0.00268
benzene	0.020496	6.375	0.00321
2,2,4 TMP	0.015739	6.375	0.00247
toluene	0.018670	6.375	0.00293
ethylbenzene	0.000989	6.375	0.00016
xylenes	0.004298	6.375	0.00067
naphthalene	0.000005	6.375	0.00000
cumene	0.000141	6.375	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**648.50**	lb/month
		0.32	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.797	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.126	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**57.00**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**157.96**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**399.02**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.313	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.3291	lb/month
benzene		2.7382	lb/month
2,2,4 TMP		3.7276	lb/month
toluene		4.6032	lb/month
ethylbenzene		0.6106	lb/month
xylenes		2.9682	lb/month
naphthalene		0.1440	lb/month
cumene		0.1925	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9839	lb/month
benzene		2.1170	lb/month
2,2,4 TMP		2.3470	lb/month
toluene		2.1871	lb/month
ethylbenzene		0.1274	lb/month
xylenes		0.5522	lb/month
naphthalene		0.0007	lb/month
cumene		0.0200	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
2,2,4 TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00323
benzene	78.11	60	0.00345
2,2,4 TMP	114.23	60	0.00382
toluene	92.14	60	0.00356
ethylbenzene	106.17	60	0.00021
xylenes	106.17	60	0.00090
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.013073	5.797	0.00226
benzene	0.015391	5.797	0.00266
2,2,4 TMP	0.011668	5.797	0.00201
toluene	0.013479	5.797	0.00233
ethylbenzene	0.000682	5.797	0.00012
xylenes	0.002953	5.797	0.00051
naphthalene	0.000003	5.797	0.00000
cumene	0.000094	5.797	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**496.70**	lb/month
		0.25	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.616	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**42.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**34.52**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**118.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**300.37**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		14.085	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.6925	lb/month
benzene		2.0274	lb/month
TMP		2.9182	lb/month
toluene		3.8091	lb/month
ethylbenzene		0.5604	lb/month
xylenes		2.7493	lb/month
naphthalene		0.1436	lb/month
cumene		0.1842	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3474	lb/month
benzene		1.4061	lb/month
TMP		1.5376	lb/month
toluene		1.3930	lb/month
ethylbenzene		0.0771	lb/month
xylenes		0.3333	lb/month
naphthalene		0.0004	lb/month
cumene		0.0117	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3452	lb/month
benzene		0.6213	lb/month
TMP		1.3806	lb/month
toluene		2.4161	lb/month
ethylbenzene		0.4832	lb/month
xylenes		2.4161	lb/month
naphthalene		0.1432	lb/month
cumene		0.1726	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00292
benzene	78.11	60	0.00304
2,2,4 TMP	114.23	60	0.00333
toluene	92.14	60	0.00301
ethylbenzene	106.17	60	0.00017
xylenes	106.17	60	0.00072
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.009392	4.616	0.00203
benzene	0.010814	4.616	0.00234
2,2,4 TMP	0.008086	4.616	0.00175
toluene	0.009082	4.616	0.00197
ethylbenzene	0.000436	4.616	0.00009
xylenes	0.001886	4.616	0.00041
naphthalene	0.000002	4.616	0.00000
cumene	0.000058	4.616	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.		115	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**329,415,828**	gal/yr
Turnovers	N	**54.17**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type, Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1] **Type**		**Qty**	**Kf (Table 7.1-12)**
Access Hatch — Bolted cover, gasketed		2	1.6
Column Well — Built-up column, gasketed sliding cover		0	33.0
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve		0	8.6
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve		0	11.0
Gauge-float well (auto gauge) — Bolted cover, gasketed		0	2.8
Gauge-hatch/sample port — Slit fabric seal, 10% open area		2	12.0
Vacuum Breaker — Weighted mechanical actuation, gasketed		1	6.2
Deck drain — Stub drain (1-inch diameter)		180	1.2
Legs (IFR type) — IFR type, Adjustable		0	7.9
Rim Vent — Weighted mechanical actuation, gasketed		0	0.7
Ladder — Sliding cover, gasketed		0	56.0
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover		0	60.0
Total deck fitting loss factor Eq. 2-14:			249.40 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**1,143.66**	lb/year
		0.57	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.803	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.014	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**62.37**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0141831	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_v$W$_L$/D)*[1+(N,F$_p$/D)]	**LW**	**471.88**	lb/yr
Annual throughput	Q	7,843,234	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/ft
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**172.83**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	249.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: Ethanol

Total HAP Annual Average Emissions	870.28	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R+L_F+L_D)+Z_{vL}L_W$	L_{Ti}	
hexane	0.537	lb/yr
benzene	0.686	lb/yr
2,2,4 TMP	1.050	lb/yr
toluene	1.453	lb/yr
ethylbenzene	0.226	lb/yr
xylenes	1.113	lb/yr
naphthalene	0.059	lb/yr
cumene	0.075	lb/yr
ethyl alcohol (ethanol)	865.083	lb/yr

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60639

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000268	0.803	0.00033
benzene	0.000322	0.803	0.00040
2,2,4 TMP	0.000247	0.803	0.00031
toluene	0.000293	0.803	0.00036
ethylbenzene	0.000015	0.803	0.00002
xylenes	0.000067	0.803	0.00008
naphthalene	0.000000	0.803	0.00000
cumene	0.000002	0.803	0.00000
Ethyl alcohol (ethanol)	0.516121	0.803	0.64312

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.5017

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**115**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**27,451,319**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data		**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**180**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	20.78 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**61.59**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ds I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.325	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra}+K_{Rb}\sqrt{})DP^*M_vK_C)12$ months	L_R	**2.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_CF_C/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**5.73**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**14.47**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.339	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$	L_{TI}		
hexane		0.0266	lb/month
benzene		0.0365	lb/month
TMP		0.0638	lb/month
toluene		0.0974	lb/month
ethylbenzene		0.0173	lb/month
xylenes		0.0860	lb/month
naphthalene		0.0049	lb/month
cumene		0.0060	lb/month
ethyl alcohol {ethanol}		49.9602	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0148	lb/month
benzene		0.0153	lb/month
TMP		0.0166	lb/month
toluene		0.0148	lb/month
ethylbenzene		0.0008	lb/month
xylenes		0.0035	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		11.8170	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$	**Working losses**		
hexane		0.0118	lb/month
benzene		0.0212	lb/month
TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol {ethanol}		38.1433	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53071

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000122	0.325	0.00038
benzene	0.000139	0.325	0.00043
2,2,4 TMP	0.000104	0.325	0.00032
toluene	0.000115	0.325	0.00035
ethylbenzene	0.000005	0.325	0.00002
xylenes	0.000023	0.325	0.00007
naphthalene	0.000000	0.325	0.00000
cumene	0.000001	0.325	0.00000
ethyl alcohol {ethanol}	0.182727	0.325	0.56285

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1776

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**64.48**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ds I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.366	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra}+K_{Rb}\sqrt{})DP^*M_vK_C)12$ months	L_R	**2.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_CF_C/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**6.47**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**16.35**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.347	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$	L_{TI}		
hexane		0.0283	lb/month
benzene		0.0384	lb/month
TMP		0.0659	lb/month
toluene		0.0994	lb/month
ethylbenzene		0.0174	lb/month
xylenes		0.0866	lb/month
naphthalene		0.0049	lb/month
cumene		0.0060	lb/month
ethyl alcohol {ethanol}		51.7474	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0165	lb/month
benzene		0.0171	lb/month
TMP		0.0187	lb/month
toluene		0.0169	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0040	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		13.6041	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$	**Working losses**		
hexane		0.0118	lb/month
benzene		0.0212	lb/month
TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol {ethanol}		38.1433	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.54082

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000136	0.366	0.00037
benzene	0.000156	0.366	0.00043
2,2,4 TMP	0.000116	0.366	0.00032
toluene	0.000130	0.366	0.00036
ethylbenzene	0.000006	0.366	0.00002
xylenes	0.000027	0.366	0.00007
naphthalene	0.000000	0.366	0.00000
cumene	0.000001	0.366	0.00000
ethyl alcohol {ethanol}	0.210056	0.366	0.57357

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2042

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**74.92**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ds I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.515	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.009	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra}+K_{Rb}\sqrt{})DP^*M_vK_C)12$ months	L_R	**3.30**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_CF_C/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**9.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**23.13**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.377	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$	L_{TI}		
hexane		0.0341	lb/month
benzene		0.0449	lb/month
2,2,4 TMP		0.0733	lb/month
toluene		0.1068	lb/month
ethylbenzene		0.0179	lb/month
xylenes		0.0886	lb/month
naphthalene		0.0049	lb/month
cumene		0.0061	lb/month
ethyl alcohol {ethanol}		58.4126	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0223	lb/month
benzene		0.0237	lb/month
2,2,4 TMP		0.0261	lb/month
toluene		0.0242	lb/month
ethylbenzene		0.0014	lb/month
xylenes		0.0060	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol {ethanol}		20.2693	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$	**Working losses**		
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol {ethanol}		38.1433	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56948

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000183	0.515	0.00036
benzene	0.000214	0.515	0.00042
2,2,4 TMP	0.000162	0.515	0.00031
toluene	0.000186	0.515	0.00036
ethylbenzene	0.000009	0.515	0.00002
xylenes	0.000040	0.515	0.00008
naphthalene	0.000000	0.515	0.00000
cumene	0.000001	0.515	0.00000
ethyl alcohol {ethanol}	0.311333	0.515	0.60397

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.3026

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**95.98**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.812	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**5.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**14.58**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**36.82**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.435	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0451	lb/month
benzene		0.0575	lb/month
2,2,4 TMP		0.0879	lb/month
toluene		0.1216	lb/month
ethylbenzene		0.0189	lb/month
xylenes		0.0929	lb/month
naphthalene		0.0049	lb/month
cumene		0.0063	lb/month
ethyl alcohol (ethanol)		72.5510	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0333	lb/month
benzene		0.0363	lb/month
2,2,4 TMP		0.0408	lb/month
toluene		0.0390	lb/month
ethylbenzene		0.0024	lb/month
xylenes		0.0103	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		34.4078	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60735

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000271	0.812	0.00033
benzene	0.000325	0.812	0.00040
2,2,4 TMP	0.000250	0.812	0.00031
toluene	0.000296	0.812	0.00036
ethylbenzene	0.000016	0.812	0.00002
xylenes	0.000068	0.812	0.00008
naphthalene	0.000000	0.812	0.00000
cumene	0.000002	0.812	0.00000
ethyl alcohol (ethanol)	0.522951	0.812	0.64413

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.5083

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**120.51**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**7.54**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**20.89**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**52.76**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.502	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0572	lb/month
benzene		0.0716	lb/month
2,2,4 TMP		0.1045	lb/month
toluene		0.1388	lb/month
ethylbenzene		0.0201	lb/month
xylenes		0.0982	lb/month
naphthalene		0.0049	lb/month
cumene		0.0065	lb/month
ethyl alcohol (ethanol)		89.7730	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0454	lb/month
benzene		0.0504	lb/month
2,2,4 TMP		0.0573	lb/month
toluene		0.0562	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0156	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol (ethanol)		51.6297	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.63596

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol (ethanol)	0.775173	1.149	0.67447

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.7535

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**149.81**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.542	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**10.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**28.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**71.81**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.579	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0708	lb/month
benzene		0.0878	lb/month
2,2,4 TMP		0.1237	lb/month
toluene		0.1592	lb/month
ethylbenzene		0.0216	lb/month
xylenes		0.1047	lb/month
naphthalene		0.0049	lb/month
cumene		0.0068	lb/month
ethyl alcohol (ethanol)		111.0392	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0590	lb/month
benzene		0.0666	lb/month
2,2,4 TMP		0.0765	lb/month
toluene		0.0767	lb/month
ethylbenzene		0.0051	lb/month
xylenes		0.0221	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol (ethanol)		72.8960	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65975

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000467	1.542	0.00030
benzene	0.000581	1.542	0.00038
2,2,4 TMP	0.000456	1.542	0.00030
toluene	0.000567	1.542	0.00037
ethylbenzene	0.000033	1.542	0.00002
xylenes	0.000142	1.542	0.00009
naphthalene	0.000000	1.542	0.00000
cumene	0.000005	1.542	0.00000
ethyl alcohol (ethanol)	1.078714	1.542	0.69971

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0486

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**164.03**	lb/month
		0.08	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.728	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.032	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**11.58**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**32.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**81.04**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.617	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0772	lb/month
benzene		0.0955	lb/month
2,2,4 TMP		0.1328	lb/month
toluene		0.1691	lb/month
ethylbenzene		0.0223	lb/month
xylenes		0.1079	lb/month
naphthalene		0.0049	lb/month
cumene		0.0069	lb/month
ethyl alcohol (ethanol)		121.5557	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0654	lb/month
benzene		0.0742	lb/month
2,2,4 TMP		0.0856	lb/month
toluene		0.0866	lb/month
ethylbenzene		0.0058	lb/month
xylenes		0.0254	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol (ethanol)		83.4125	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00052
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.66888
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000514	1.728	0.00030
benzene	0.000643	1.728	0.00037
2,2,4 TMP	0.000507	1.728	0.00029
toluene	0.000636	1.728	0.00037
ethylbenzene	0.000037	1.728	0.00002
xylenes	0.000162	1.728	0.00009
naphthalene	0.000000	1.728	0.00000
cumene	0.000006	1.728	0.00000
ethyl alcohol (ethanol)	1.225733	1.728	0.70938
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.1915

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**156.59**	lb/month
		0.08	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temper	T_{AX}	539.70	°R
Average daily minimum ambient temper	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.631	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.030	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**10.89**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**30.17**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**76.21**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.597	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0739	lb/month
benzene		0.0915	lb/month
2,2,4 TMP		0.1280	lb/month
toluene		0.1640	lb/month
ethylbenzene		0.0219	lb/month
xylenes		0.1062	lb/month
naphthalene		0.0049	lb/month
cumene		0.0068	lb/month
ethyl alcohol (ethanol)		116.0357	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0621	lb/month
benzene		0.0702	lb/month
2,2,4 TMP		0.0808	lb/month
toluene		0.0814	lb/month
ethylbenzene		0.0054	lb/month
xylenes		0.0237	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol (ethanol)		77.8924	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.66426
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000489	1.631	0.00030
benzene	0.000611	1.631	0.00037
2,2,4 TMP	0.000481	1.631	0.00029
toluene	0.000600	1.631	0.00037
ethylbenzene	0.000035	1.631	0.00002
xylenes	0.000151	1.631	0.00009
naphthalene	0.000000	1.631	0.00000
cumene	0.000005	1.631	0.00000
ethyl alcohol (ethanol)	1.148813	1.631	0.70448
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5369
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.1167

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**127.37**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.242	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.022	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**8.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**22.65**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**57.22**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.520	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0604	lb/month
benzene		0.0755	lb/month
2,2,4 TMP		0.1090	lb/month
toluene		0.1436	lb/month
ethylbenzene		0.0204	lb/month
xylenes		0.0997	lb/month
naphthalene		0.0049	lb/month
cumene		0.0066	lb/month
ethyl alcohol (ethanol)		94.6922	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0486	lb/month
benzene		0.0542	lb/month
2,2,4 TMP		0.0618	lb/month
toluene		0.0610	lb/month
ethylbenzene		0.0039	lb/month
xylenes		0.0171	lb/month
naphthalene		0.0000	lb/month
cumene		0.0007	lb/month
ethyl alcohol (ethanol)		56.5490	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00055
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.64229
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000389	1.242	0.00031
benzene	0.000478	1.242	0.00039
2,2,4 TMP	0.000373	1.242	0.00030
toluene	0.000456	1.242	0.00037
ethylbenzene	0.000025	1.242	0.00002
xylenes	0.000111	1.242	0.00009
naphthalene	0.000000	1.242	0.00000
cumene	0.000004	1.242	0.00000
ethyl alcohol (ethanol)	0.846147	1.242	0.68119
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.8225

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**96.21**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.815	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**5.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**14.64**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**36.97**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.436	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0452	lb/month
benzene		0.0577	lb/month
2,2,4 TMP		0.0881	lb/month
toluene		0.1217	lb/month
ethylbenzene		0.0189	lb/month
xylenes		0.0930	lb/month
naphthalene		0.0049	lb/month
cumene		0.0063	lb/month
ethyl alcohol (ethanol)		72.7122	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0335	lb/month
benzene		0.0364	lb/month
2,2,4 TMP		0.0409	lb/month
toluene		0.0391	lb/month
ethylbenzene		0.0024	lb/month
xylenes		0.0104	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		34.5689	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60768
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000272	0.815	0.00033
benzene	0.000327	0.815	0.00040
2,2,4 TMP	0.000251	0.815	0.00031
toluene	0.000297	0.815	0.00036
ethylbenzene	0.000016	0.815	0.00002
xylenes	0.000068	0.815	0.00008
naphthalene	0.000000	0.815	0.00000
cumene	0.000002	0.815	0.00000
ethyl alcohol (ethanol)	0.525339	0.815	0.64449
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.5107

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**78.71**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.569	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**3.66**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**10.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**25.60**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.387	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0362	lb/month
benzene		0.0472	lb/month
2,2,4 TMP		0.0760	lb/month
toluene		0.1094	lb/month
ethylbenzene		0.0181	lb/month
xylenes		0.0894	lb/month
naphthalene		0.0049	lb/month
cumene		0.0061	lb/month
ethyl alcohol (ethanol)		60.9014	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0244	lb/month
benzene		0.0260	lb/month
2,2,4 TMP		0.0288	lb/month
toluene		0.0268	lb/month
ethylbenzene		0.0016	lb/month
xylenes		0.0068	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		22.7581	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
2,2,4 TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57780
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000200	0.569	0.00035
benzene	0.000235	0.569	0.00041
2,2,4 TMP	0.000178	0.569	0.00031
toluene	0.000206	0.569	0.00036
ethylbenzene	0.000010	0.569	0.00002
xylenes	0.000045	0.569	0.00008
naphthalene	0.000000	0.569	0.00000
cumene	0.000001	0.569	0.00000
ethyl alcohol (ethanol)	0.348894	0.569	0.61279
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3391

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**66.06**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	653,602.83	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.389	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**2.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**39.32**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**6.88**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**17.38**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.351	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0292	lb/month
benzene		0.0394	lb/month
TMP		0.0670	lb/month
toluene		0.1006	lb/month
ethylbenzene		0.0175	lb/month
xylenes		0.0869	lb/month
naphthalene		0.0049	lb/month
cumene		0.0060	lb/month
ethyl alcohol (ethanol)		52.7410	lb/month
Individual HAP Monthly Emi Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0174	lb/month
benzene		0.0181	lb/month
TMP		0.0198	lb/month
toluene		0.0180	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0043	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		14.5977	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0118	lb/month
benzene		0.0212	lb/month
TMP		0.0472	lb/month
toluene		0.0826	lb/month
ethylbenzene		0.0165	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0049	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		38.1433	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54588
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000143	0.389	0.00037
benzene	0.000165	0.389	0.00042
2,2,4 TMP	0.000123	0.389	0.00032
toluene	0.000139	0.389	0.00036
ethylbenzene	0.000007	0.389	0.00002
xylenes	0.000029	0.389	0.00007
naphthalene	0.000000	0.389	0.00000
cumene	0.000001	0.389	0.00000
ethyl alcohol (ethanol)	0.225218	0.389	0.57894
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2189

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 115			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 15	
Vapor Molecular weight	M_v	**60**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.60**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4937.93**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**15.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**95,000,000**	gal/yr
Turnovers	N	**15.62**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	180	1.2	
Legs (IFR type)	IFR type, Adjustable	0	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		249.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**9,820.20**	lb/year
		4.91	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	7.117	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.166	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**900.63**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.1663668	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_f/D)]$	**LW**	**119.45**	lb/yr
Annual throughput	Q	2,261,905	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,495.74**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	249.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.17	
Average vapor molecular weight	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**6,304.39**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.17	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	60.15	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:				blendstock
Total HAP Annual Average Emissions				650.39
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				482.676 lb/yr
benzene				43.855 lb/yr
2,2,4 TMP				46.665 lb/yr
toluene				51.851 lb/yr
ethylbenzene				5.872 lb/yr
xylenes				18.957 lb/yr
naphthalene				0.511 lb/yr
cumene				0.991 lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_v$				
		M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60		0.04808
benzene	78.11	60		0.00427
2,2,4 TMP	114.23	60		0.00432
toluene	92.14	60		0.00442
ethylbenzene	106.17	60		0.00036
xylenes	106.17	60		0.00109
naphthalene	128.17	60		0.00000
cumene	120.19	60		0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$		**P_{VA}**	**y_i**
hexane	0.238853		7.117	0.03356
benzene	0.023428		7.117	0.00329
2,2,4 TMP	0.016183		7.117	0.00227
toluene	0.020544		7.117	0.00289
ethylbenzene	0.001448		7.117	0.00020
xylenes	0.004404		7.117	0.00062
naphthalene	0.000005		7.117	0.00000
cumene	0.000145		7.117	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.0	96	128.17	0.00311
cumene	0.0	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
		A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**115**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**15.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**7,916,667**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**180**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	20.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**416.06**	lb/month
		0.21	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.143	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.084	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**37.70**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_c/D)]$	L_W	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**104.48**	lb-mole/ft-yr
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**263.92**	lb/month
HAPS Speciation			
Product - select from list		blendstock	
Total HAP Monthly Emissions		23.124	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		16.6687	lb/month
benzene		1.4910	lb/month
TMP		1.6612	lb/month
toluene		1.9562	lb/month
ethylbenzene		0.2862	lb/month
xylenes		0.9599	lb/month
naphthalene		0.0416	lb/month
cumene		0.0588	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		15.3150	lb/month
benzene		1.2919	lb/month
TMP		1.2630	lb/month
toluene		1.2096	lb/month
ethylbenzene		0.0871	lb/month
xylenes		0.2632	lb/month
naphthalene		0.0003	lb/month
cumene		0.0091	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.03771
benzene	78.11	60	0.00318
2,2,4 TMP	114.23	60	0.00311
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00021
xylenes	106.17	60	0.00065
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.109042	4.143	0.02632
benzene	0.010148	4.143	0.00245
2,2,4 TMP	0.006784	4.143	0.00164
toluene	0.008055	4.143	0.00194
ethylbenzene	0.000504	4.143	0.00012
xylenes	0.001521	4.143	0.00037
naphthalene	0.000001	4.143	0.00000
cumene	0.000046	4.143	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**452.46**	lb/month
		0.23	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.452	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.091	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**41.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_c/D)]$	L_W	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**113.84**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**287.58**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		25.657	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		18.6085	lb/month
benzene		1.6650	lb/month
TMP		1.8377	lb/month
toluene		2.1376	lb/month
ethylbenzene		0.3009	lb/month
xylenes		1.0047	lb/month
naphthalene		0.0417	lb/month
cumene		0.0605	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		17.2548	lb/month
benzene		1.4660	lb/month
TMP		1.4395	lb/month
toluene		1.3911	lb/month
ethylbenzene		0.1019	lb/month
xylenes		0.3079	lb/month
naphthalene		0.0003	lb/month
cumene		0.0107	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.03899
benzene	78.11	60	0.00331
2,2,4 TMP	114.23	60	0.00325
toluene	92.14	60	0.00314
ethylbenzene	106.17	60	0.00023
xylenes	106.17	60	0.00070
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.121172	4.452	0.02722
benzene	0.011358	4.452	0.00255
2,2,4 TMP	0.007627	4.452	0.00171
toluene	0.009137	4.452	0.00205
ethylbenzene	0.000581	4.452	0.00013
xylenes	0.001755	4.452	0.00039
naphthalene	0.000002	4.452	0.00000
cumene	0.000054	4.452	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**579.06**	lb/month
		0.29	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.462	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.117	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**52.84**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_c/D)]$	L_W	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**146.42**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**369.85**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		34.989	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		25.7074	lb/month
benzene		2.3100	lb/month
2,2,4 TMP		2.4969	lb/month
toluene		2.8267	lb/month
ethylbenzene		0.3586	lb/month
xylenes		1.1801	lb/month
naphthalene		0.0419	lb/month
cumene		0.0671	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		24.3536	lb/month
benzene		2.1109	lb/month
2,2,4 TMP		2.0988	lb/month
toluene		2.0801	lb/month
ethylbenzene		0.1595	lb/month
xylenes		0.4834	lb/month
naphthalene		0.0006	lb/month
cumene		0.0173	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.04279
benzene	78.11	60	0.00371
2,2,4 TMP	114.23	60	0.00369
toluene	92.14	60	0.00366
ethylbenzene	106.17	60	0.00028
xylenes	106.17	60	0.00085
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.163139	5.462	0.02987
benzene	0.015602	5.462	0.00286
2,2,4 TMP	0.010607	5.462	0.00194
toluene	0.013033	5.462	0.00239
ethylbenzene	0.000867	5.462	0.00016
xylenes	0.002628	5.462	0.00048
naphthalene	0.000003	5.462	0.00000
cumene	0.000083	5.462	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**826.22**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.167	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.168	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**75.78**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**210.00**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**530.48**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		54.944	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		40.7190	lb/month
benzene		3.7009	lb/month
2,2,4 TMP		3.9371	lb/month
toluene		4.3735	lb/month
ethylbenzene		0.4940	lb/month
xylenes		1.5942	lb/month
naphthalene		0.0426	lb/month
cumene		0.0832	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		39.3653	lb/month
benzene		3.5019	lb/month
2,2,4 TMP		3.5389	lb/month
toluene		3.6269	lb/month
ethylbenzene		0.2950	lb/month
xylenes		0.8974	lb/month
naphthalene		0.0013	lb/month
cumene		0.0334	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.04823
benzene	78.11	60	0.00429
2,2,4 TMP	114.23	60	0.00434
toluene	92.14	60	0.00444
ethylbenzene	106.17	60	0.00036
xylenes	106.17	60	0.00110
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.241230	7.167	0.03366
benzene	0.023676	7.167	0.00330
2,2,4 TMP	0.016361	7.167	0.00228
toluene	0.020788	7.167	0.00290
ethylbenzene	0.001467	7.167	0.00020
xylenes	0.004464	7.167	0.00062
naphthalene	0.000005	7.167	0.00000
cumene	0.000147	7.167	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,122.41**	lb/month
		0.56	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.822	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.229	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**103.28**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**286.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**722.97**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		80.790	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		59.9606	lb/month
benzene		5.5146	lb/month
2,2,4 TMP		5.8366	lb/month
toluene		6.4642	lb/month
ethylbenzene		0.6848	lb/month
xylenes		2.1791	lb/month
naphthalene		0.0437	lb/month
cumene		0.1064	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		58.6069	lb/month
benzene		5.3155	lb/month
2,2,4 TMP		5.4385	lb/month
toluene		5.7177	lb/month
ethylbenzene		0.4857	lb/month
xylenes		1.4824	lb/month
naphthalene		0.0024	lb/month
cumene		0.0567	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05268
benzene	78.11	60	0.00478
2,2,4 TMP	114.23	60	0.00489
toluene	92.14	60	0.00514
ethylbenzene	106.17	60	0.00044
xylenes	106.17	60	0.00133
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.324400	8.822	0.03677
benzene	0.032462	8.822	0.00368
2,2,4 TMP	0.022711	8.822	0.00257
toluene	0.029601	8.822	0.00336
ethylbenzene	0.002182	8.822	0.00025
xylenes	0.006660	8.822	0.00075
naphthalene	0.000009	8.822	0.00000
cumene	0.000225	8.822	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**1,517.06**	lb/month
		0.76	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.516	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.310	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**139.92**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**387.74**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**979.45**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		117.027	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		86.7343	lb/month
benzene		8.0681	lb/month
2,2,4 TMP		8.5327	lb/month
toluene		9.4845	lb/month
ethylbenzene		0.9683	lb/month
xylenes		3.0513	lb/month
naphthalene		0.0455	lb/month
cumene		0.1418	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		85.3806	lb/month
benzene		7.8690	lb/month
2,2,4 TMP		8.1346	lb/month
toluene		8.7379	lb/month
ethylbenzene		0.7692	lb/month
xylenes		2.3545	lb/month
naphthalene		0.0042	lb/month
cumene		0.0920	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05665
benzene	78.11	60	0.00522
2,2,4 TMP	114.23	60	0.00540
toluene	92.14	60	0.00580
ethylbenzene	106.17	60	0.00051
xylenes	106.17	60	0.00156
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.415820	10.516	0.03954
benzene	0.042283	10.516	0.00402
2,2,4 TMP	0.029889	10.516	0.00284
toluene	0.039803	10.516	0.00378
ethylbenzene	0.003041	10.516	0.00029
xylenes	0.009308	10.516	0.00089
naphthalene	0.000014	10.516	0.00000
cumene	0.000321	10.516	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,736.63**	lb/month
		0.87	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.258	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.355	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**160.31**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**444.23**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1,122.14**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		137.662	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		101.9217	lb/month
benzene		9.5250	lb/month
2,2,4 TMP		10.0773	lb/month
toluene		11.2304	lb/month
ethylbenzene		1.1347	lb/month
xylenes		3.5639	lb/month
naphthalene		0.0467	lb/month
cumene		0.1628	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		100.5680	lb/month
benzene		9.3259	lb/month
2,2,4 TMP		9.6791	lb/month
toluene		10.4839	lb/month
ethylbenzene		0.9356	lb/month
xylenes		2.8671	lb/month
naphthalene		0.0054	lb/month
cumene		0.1130	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05824
benzene	78.11	60	0.00540
2,2,4 TMP	114.23	60	0.00561
toluene	92.14	60	0.00607
ethylbenzene	106.17	60	0.00054
xylenes	106.17	60	0.00166
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.457671	11.258	0.04065
benzene	0.046826	11.258	0.00416
2,2,4 TMP	0.033232	11.258	0.00295
toluene	0.044625	11.258	0.00396
ethylbenzene	0.003456	11.258	0.00031
xylenes	0.010591	11.258	0.00094
naphthalene	0.000016	11.258	0.00000
cumene	0.000369	11.258	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,618.69**	lb/month
		0.81	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is know	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.875	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.331	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**149.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**413.88**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1,045.49**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		126.550	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		93.7472	lb/month
benzene		8.7403	lb/month
2,2,4 TMP		9.2450	lb/month
toluene		10.2886	lb/month
ethylbenzene		1.0448	lb/month
xylenes		3.2868	lb/month
naphthalene		0.0461	lb/month
cumene		0.1514	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		92.3935	lb/month
benzene		8.5412	lb/month
2,2,4 TMP		8.8468	lb/month
toluene		9.5420	lb/month
ethylbenzene		0.8457	lb/month
xylenes		2.5900	lb/month
naphthalene		0.0047	lb/month
cumene		0.1016	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40 2 $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05743
benzene	78.11	60	0.00531
2,2,4 TMP	114.23	60	0.00550
toluene	92.14	60	0.00593
ethylbenzene	106.17	60	0.00053
xylenes	106.17	60	0.00161
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.435944	10.875	0.04009
benzene	0.044464	10.875	0.00409
2,2,4 TMP	0.031492	10.875	0.00290
toluene	0.042110	10.875	0.00387
ethylbenzene	0.003239	10.875	0.00030
xylenes	0.009920	10.875	0.00091
naphthalene	0.000015	10.875	0.00000
cumene	0.000344	10.875	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,209.59**	lb/month
		0.60	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.242	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.247	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**111.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**308.63**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**779.63**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		88.661	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		65.7916	lb/month
benzene		6.0685	lb/month
2,2,4 TMP		6.4198	lb/month
toluene		7.1134	lb/month
ethylbenzene		0.7451	lb/month
xylenes		2.3645	lb/month
naphthalene		0.0441	lb/month
cumene		0.1139	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		64.4378	lb/month
benzene		5.8694	lb/month
2,2,4 TMP		6.0216	lb/month
toluene		6.3669	lb/month
ethylbenzene		0.5460	lb/month
xylenes		1.6678	lb/month
naphthalene		0.0028	lb/month
cumene		0.0641	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	60	0.05371
benzene	78.11	60	0.00489
2,2,4 TMP	114.23	60	0.00502
toluene	92.14	60	0.00531
ethylbenzene	106.17	60	0.00046
xylenes	106.17	60	0.00139
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.346484	9.242	0.03749
benzene	0.034820	9.242	0.00377
2,2,4 TMP	0.024428	9.242	0.00264
toluene	0.032020	9.242	0.00346
ethylbenzene	0.002383	9.242	0.00026
xylenes	0.007279	9.242	0.00079
naphthalene	0.000010	9.242	0.00000
cumene	0.000247	9.242	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**828.98**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.184	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.169	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**76.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**210.71**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**532.27**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		55.177	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		40.8927	lb/month
benzene		3.7172	lb/month
2,2,4 TMP		3.9540	lb/month
toluene		4.3919	lb/month
ethylbenzene		0.4957	lb/month
xylenes		1.5992	lb/month
naphthalene		0.0426	lb/month
cumene		0.0834	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		39.5389	lb/month
benzene		3.5181	lb/month
2,2,4 TMP		3.5559	lb/month
toluene		3.6453	lb/month
ethylbenzene		0.2966	lb/month
xylenes		0.9025	lb/month
naphthalene		0.0013	lb/month
cumene		0.0336	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04828
benzene	78.11	60	0.00430
2,2,4 TMP	114.23	60	0.00434
toluene	92.14	60	0.00445
ethylbenzene	106.17	60	0.00036
xylenes	106.17	60	0.00110
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.242059	7.184	0.03369
benzene	0.023763	7.184	0.00331
2,2,4 TMP	0.016424	7.184	0.00229
toluene	0.020873	7.184	0.00291
ethylbenzene	0.001474	7.184	0.00021
xylenes	0.004485	7.184	0.00062
naphthalene	0.000005	7.184	0.00000
cumene	0.000147	7.184	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**623.94**	lb/month
		0.31	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.797	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.126	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**57.00**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**157.96**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**399.02**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		38.463	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		28.3349	lb/month
benzene		2.5512	lb/month
2,2,4 TMP		2.7450	lb/month
toluene		3.0899	lb/month
ethylbenzene		0.3811	lb/month
xylenes		1.2489	lb/month
naphthalene		0.0420	lb/month
cumene		0.0697	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		26.9812	lb/month
benzene		2.3522	lb/month
2,2,4 TMP		2.3470	lb/month
toluene		2.3433	lb/month
ethylbenzene		0.1820	lb/month
xylenes		0.5522	lb/month
naphthalene		0.0007	lb/month
cumene		0.0200	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
2,2,4 TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.04394
benzene	78.11	60	0.00383
2,2,4 TMP	114.23	60	0.00382
toluene	92.14	60	0.00382
ethylbenzene	106.17	60	0.00030
xylenes	106.17	60	0.00090
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.177788	5.797	0.03067
benzene	0.017101	5.797	0.00295
2,2,4 TMP	0.011668	5.797	0.00201
toluene	0.014442	5.797	0.00249
ethylbenzene	0.000974	5.797	0.00017
xylenes	0.002953	5.797	0.00051
naphthalene	0.000003	5.797	0.00000
cumene	0.000094	5.797	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**472.14**	lb/month
		0.24	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	188,492.06	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.616	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**42.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**9.95**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**118.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**300.37**	lb/month
HAPS Speciation			
Product - same as January		blendstock	
Total HAP Monthly Emissions		27.056	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		19.6778	lb/month
benzene		1.7615	lb/month
TMP		1.9357	lb/month
toluene		2.2391	lb/month
ethylbenzene		0.3093	lb/month
xylenes		1.0300	lb/month
naphthalene		0.0417	lb/month
cumene		0.0614	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		18.3240	lb/month
benzene		1.5624	lb/month
TMP		1.5376	lb/month
toluene		1.4925	lb/month
ethylbenzene		0.1102	lb/month
xylenes		0.3333	lb/month
naphthalene		0.0004	lb/month
cumene		0.0117	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		1.3537	lb/month
benzene		0.1991	lb/month
TMP		0.3982	lb/month
toluene		0.7465	lb/month
ethylbenzene		0.1991	lb/month
xylenes		0.6968	lb/month
naphthalene		0.0413	lb/month
cumene		0.0498	lb/month
Vapor Weight Concentratior $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.03965
benzene	78.11	60	0.00338
2,2,4 TMP	114.23	60	0.00333
toluene	92.14	60	0.00323
ethylbenzene	106.17	60	0.00024
xylenes	106.17	60	0.00072
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.127730	4.616	0.02767
benzene	0.012016	4.616	0.00260
2,2,4 TMP	0.008086	4.616	0.00175
toluene	0.009731	4.616	0.00211
ethylbenzene	0.000624	4.616	0.00014
xylenes	0.001886	4.616	0.00041
naphthalene	0.000002	4.616	0.00000
cumene	0.000058	4.616	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.136	96	86.18	0.15150
benzene	0.02	96	78.11	0.02458
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.075	96	92.14	0.07814
ethylbenzene	0.02	96	106.17	0.01808
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 115			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**84,531,278**	gal/yr
Turnovers	N	**13.90**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	180	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			249.40 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**5,143.33**	lb/year
		2.57	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	9.026	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.237	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**427.47**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.2374828	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_f/D)]$	**LW**	**539.01**	lb/yr
Annual throughput	Q	2,012,649	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	150.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1,184.56**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	249.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.24	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**2,992.28**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.24	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Crude Oil
Total HAP Annual Average Emissions		55.92
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$		
		L_{TI}
hexane		15.475 lb/yr
benzene		15.312 lb/yr
2,2,4 TMP		1.556 lb/yr
toluene		10.943 lb/yr
ethylbenzene		2.832 lb/yr
xylenes		9.604 lb/yr
naphthalene		0.200 lb/yr
cumene		0.000 lb/yr

Vapor Weight Concentrations Eq. 40-t $Z_{VI}= y_iM_i / M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	50	0.00289
benzene	78.11	50	0.00262
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00121
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.015148	9.026	0.00168
benzene	0.015155	9.026	0.00168
2,2,4 TMP	0.000872	9.026	0.00010
toluene	0.005906	9.026	0.00065
ethylbenzene	0.000624	9.026	0.00007
xylenes	0.001899	9.026	0.00021
naphthalene	0.000001	9.026	0.00000
cumene	0.000000	9.026	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0	207	128.17	0.00059
cumene	0.0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**115**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**7,044,273**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**180**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	20.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**244.81**	lb/month
		0.12	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.702	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.124	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**18.56**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**51.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**129.91**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		2.790	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		0.5975	lb/month
benzene		0.6290	lb/month
TMP		0.0742	lb/month
toluene		0.5988	lb/month
ethylbenzene		0.1958	lb/month
xylenes		0.6777	lb/month
naphthalene		0.0166	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.4178	lb/month
benzene		0.3595	lb/month
TMP		0.0293	lb/month
toluene		0.1496	lb/month
ethylbenzene		0.0162	lb/month
xylenes		0.0488	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00209
benzene	78.11	50	0.00180
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00075
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006915	5.702	0.00121
benzene	0.006565	5.702	0.00115
2,2,4 TMP	0.000366	5.702	0.00006
toluene	0.002316	5.702	0.00041
ethylbenzene	0.000217	5.702	0.00004
xylenes	0.000656	5.702	0.00012
naphthalene	0.000000	5.702	0.00000
cumene	0.000000	5.702	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**261.29**	lb/month
		0.13	tons/month
Product Type			
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.062	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**20.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**55.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**140.62**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.934	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		0.6524	lb/month
benzene		0.6792	lb/month
TMP		0.0784	lb/month
toluene		0.6220	lb/month
ethylbenzene		0.1987	lb/month
xylenes		0.6862	lb/month
naphthalene		0.0166	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.4728	lb/month
benzene		0.4097	lb/month
TMP		0.0335	lb/month
toluene		0.1728	lb/month
ethylbenzene		0.0190	lb/month
xylenes		0.0574	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00218
benzene	78.11	50	0.00189
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00080
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007685	6.062	0.00127
benzene	0.007347	6.062	0.00121
2,2,4 TMP	0.000411	6.062	0.00007
toluene	0.002627	6.062	0.00043
ethylbenzene	0.000250	6.062	0.00004
xylenes	0.000757	6.062	0.00012
naphthalene	0.000000	6.062	0.00000
cumene	0.000000	6.062	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**318.63**	lb/month
		0.16	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.210	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.169	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**25.41**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**70.42**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**177.88**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.477	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		0.8567	lb/month
benzene		0.8680	lb/month
2,2,4 TMP		0.0945	lb/month
toluene		0.7113	lb/month
ethylbenzene		0.2098	lb/month
xylenes		0.7202	lb/month
naphthalene		0.0166	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.6770	lb/month
benzene		0.5985	lb/month
2,2,4 TMP		0.0496	lb/month
toluene		0.2621	lb/month
ethylbenzene		0.0301	lb/month
xylenes		0.0914	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00247
benzene	78.11	50	0.00219
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00096
ethylbenzene	106.17	50	0.00011
xylenes	106.17	50	0.00033
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010346	7.210	0.00143
benzene	0.010092	7.210	0.00140
2,2,4 TMP	0.000572	7.210	0.00008
toluene	0.003747	7.210	0.00052
ethylbenzene	0.000374	7.210	0.00005
xylenes	0.001133	7.210	0.00016
naphthalene	0.000001	7.210	0.00000
cumene	0.000000	7.210	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**432.29**	lb/month
		0.22	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.079	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.240	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} V^n)DP* M_v K_c)/12 months	**L_R**	**35.96**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**99.66**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**251.75**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.702	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.3048	lb/month
benzene		1.2904	lb/month
2,2,4 TMP		0.1309	lb/month
toluene		0.9191	lb/month
ethylbenzene		0.2370	lb/month
xylenes		0.8033	lb/month
naphthalene		0.0167	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1251	lb/month
benzene		1.0209	lb/month
2,2,4 TMP		0.0860	lb/month
toluene		0.4699	lb/month
ethylbenzene		0.0573	lb/month
xylenes		0.1744	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	50	0.00290
benzene	78.11	50	0.00264
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00121
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015299	9.079	0.00169
benzene	0.015316	9.079	0.00169
2,2,4 TMP	0.000882	9.079	0.00010
toluene	0.005977	9.079	0.00066
ethylbenzene	0.000633	9.079	0.00007
xylenes	0.001925	9.079	0.00021
naphthalene	0.000001	9.079	0.00000
cumene	0.000000	9.079	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**575.36**	lb/month
		0.29	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.830	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} V^n)DP* M_v K_c)/12 months	**L_R**	**49.25**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**136.47**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**344.73**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.414	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.9165	lb/month
benzene		1.8763	lb/month
2,2,4 TMP		1.1819	lb/month
toluene		1.2173	lb/month
ethylbenzene		0.2775	lb/month
xylenes		0.9276	lb/month
naphthalene		0.0168	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7369	lb/month
benzene		1.6068	lb/month
2,2,4 TMP		0.1370	lb/month
toluene		0.7682	lb/month
ethylbenzene		0.0979	lb/month
xylenes		0.2987	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020573	10.830	0.00190
benzene	0.020999	10.830	0.00194
2,2,4 TMP	0.001224	10.830	0.00011
toluene	0.008510	10.830	0.00079
ethylbenzene	0.000941	10.830	0.00009
xylenes	0.002872	10.830	0.00027
naphthalene	0.000002	10.830	0.00000
cumene	0.000000	10.830	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**789.76**	lb/month
		0.39	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.570	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.461	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + K_{Rb} V^n)DP* M_v K_c)/12 months	**L_R**	**69.15**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$)/D)]*[1+(N$_c$F$_c$/D)]	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**191.63**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**484.06**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.132	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.8731	lb/month
benzene		2.8015	lb/month
2,2,4 TMP		0.2630	lb/month
toluene		1.6988	lb/month
ethylbenzene		0.3447	lb/month
xylenes		1.1339	lb/month
naphthalene		0.0170	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.6934	lb/month
benzene		2.5320	lb/month
2,2,4 TMP		0.2181	lb/month
toluene		1.2496	lb/month
ethylbenzene		0.1650	lb/month
xylenes		0.5051	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{VI}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00340
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026371	12.570	0.00210
benzene	0.027352	12.570	0.00218
2,2,4 TMP	0.001611	12.570	0.00013
toluene	0.011443	12.570	0.00091
ethylbenzene	0.001311	12.570	0.00010
xylenes	0.004014	12.570	0.00032
naphthalene	0.000003	12.570	0.00000
cumene	0.000000	12.570	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**932.36**	lb/month
		0.47	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	13.318	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.549	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**82.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**228.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**576.74**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		10.960	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_I L_W$			
		L_{TI}	
hexane		3.5131	lb/month
benzene		3.4225	lb/month
2,2,4 TMP		0.3176	lb/month
toluene		2.0245	lb/month
ethylbenzene		0.3906	lb/month
xylenes		1.2751	lb/month
naphthalene		0.0171	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.3335	lb/month
benzene		3.1530	lb/month
2,2,4 TMP		0.2727	lb/month
toluene		1.5753	lb/month
ethylbenzene		0.2109	lb/month
xylenes		0.6462	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_I L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	50	0.00376
benzene	78.11	50	0.00355
2,2,4 TMP	114.23	50	0.00031
toluene	92.14	50	0.00178
ethylbenzene	106.17	50	0.00024
xylenes	106.17	50	0.00073
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029025	13.318	0.00218
benzene	0.030290	13.318	0.00227
2,2,4 TMP	0.001791	13.318	0.00013
toluene	0.012830	13.318	0.00096
ethylbenzene	0.001490	13.318	0.00011
xylenes	0.004567	13.318	0.00034
naphthalene	0.000003	13.318	0.00000
cumene	0.000000	13.318	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$	**LT**	**852.71**	lb/month
		0.43	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.933	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.500	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**75.00**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**207.82**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**524.97**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.940	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_I L_W$			
		L_{TI}	
hexane		3.1560	lb/month
benzene		3.0760	lb/month
2,2,4 TMP		0.2872	lb/month
toluene		1.8427	lb/month
ethylbenzene		0.3649	lb/month
xylenes		1.1962	lb/month
naphthalene		0.0170	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.9763	lb/month
benzene		2.8065	lb/month
2,2,4 TMP		0.2422	lb/month
toluene		1.3935	lb/month
ethylbenzene		0.1853	lb/month
xylenes		0.5674	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_I L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	50	0.00368
benzene	78.11	50	0.00347
2,2,4 TMP	114.23	50	0.00030
toluene	92.14	50	0.00173
ethylbenzene	106.17	50	0.00023
xylenes	106.17	50	0.00070
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.027647	12.933	0.00214
benzene	0.028763	12.933	0.00222
2,2,4 TMP	0.001698	12.933	0.00013
toluene	0.012107	12.933	0.00094
ethylbenzene	0.001397	12.933	0.00011
xylenes	0.004278	12.933	0.00033
naphthalene	0.000003	12.933	0.00000
cumene	0.000000	12.933	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.9763
benzene	6.906	1211	220.79	2.8065
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**619.75**	lb/month
		0.31	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.265	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.356	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**53.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**147.89**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**373.58**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.968	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_I L_W$			
		L_{TI}	
hexane		2.1123	lb/month
benzene		2.0651	lb/month
2,2,4 TMP		0.1984	lb/month
toluene		1.3149	lb/month
ethylbenzene		0.2910	lb/month
xylenes		0.9690	lb/month
naphthalene		0.0168	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9327	lb/month
benzene		1.7956	lb/month
2,2,4 TMP		0.1535	lb/month
toluene		0.8657	lb/month
ethylbenzene		0.1114	lb/month
xylenes		0.3401	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_I L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	50	0.00336
benzene	78.11	50	0.00312
2,2,4 TMP	114.23	50	0.00027
toluene	92.14	50	0.00151
ethylbenzene	106.17	50	0.00019
xylenes	106.17	50	0.00059
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.021974	11.265	0.00195
benzene	0.022524	11.265	0.00200
2,2,4 TMP	0.001317	11.265	0.00012
toluene	0.009206	11.265	0.00082
ethylbenzene	0.001028	11.265	0.00009
xylenes	0.003139	11.265	0.00028
naphthalene	0.000002	11.265	0.00000
cumene	0.000000	11.265	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**433.58**	lb/month
		0.22	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.097	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.241	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**36.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**99.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**252.59**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.717	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.3101	lb/month
benzene		1.2955	lb/month
2,2,4 TMP		0.1313	lb/month
toluene		0.9216	lb/month
ethylbenzene		0.2373	lb/month
xylenes		0.8043	lb/month
naphthalene		0.0167	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.1304	lb/month
benzene		1.0259	lb/month
2,2,4 TMP		0.0864	lb/month
toluene		0.4725	lb/month
ethylbenzene		0.0577	lb/month
xylenes		0.1754	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00291
benzene	78.11	50	0.00264
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00122
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.015351	9.097	0.00169
benzene	0.015372	9.097	0.00169
2,2,4 TMP	0.000885	9.097	0.00010
toluene	0.006001	9.097	0.00066
ethylbenzene	0.000636	9.097	0.00007
xylenes	0.001934	9.097	0.00021
naphthalene	0.000001	9.097	0.00000
cumene	0.000000	9.097	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**339.05**	lb/month
		0.17	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.583	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.182	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**27.31**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**75.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**191.15**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.684	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.9335	lb/month
benzene		0.9398	lb/month
2,2,4 TMP		0.1007	lb/month
toluene		0.7460	lb/month
ethylbenzene		0.2143	lb/month
xylenes		0.7337	lb/month
naphthalene		0.0166	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.7538	lb/month
benzene		0.6703	lb/month
2,2,4 TMP		0.0557	lb/month
toluene		0.2968	lb/month
ethylbenzene		0.0346	lb/month
xylenes		0.1049	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
2,2,4 TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00256
benzene	78.11	50	0.00228
2,2,4 TMP	114.23	50	0.00019
toluene	92.14	50	0.00101
ethylbenzene	106.17	50	0.00012
xylenes	106.17	50	0.00036
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.011275	7.583	0.00149
benzene	0.011062	7.583	0.00146
2,2,4 TMP	0.000629	7.583	0.00008
toluene	0.004152	7.583	0.00055
ethylbenzene	0.000420	7.583	0.00006
xylenes	0.001274	7.583	0.00017
naphthalene	0.000001	7.583	0.00000
cumene	0.000000	7.583	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**270.20**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	167,720.79	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.250	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.139	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**20.92**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**44.92**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**57.96**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**146.41**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.014	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.6829	lb/month
benzene		0.7072	lb/month
TMP		0.0808	lb/month
toluene		0.6350	lb/month
ethylbenzene		0.2002	lb/month
xylenes		0.6911	lb/month
naphthalene		0.0166	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.5032	lb/month
benzene		0.4376	lb/month
TMP		0.0359	lb/month
toluene		0.1858	lb/month
ethylbenzene		0.0206	lb/month
xylenes		0.0622	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1797	lb/month
benzene		0.2695	lb/month
TMP		0.0449	lb/month
toluene		0.4492	lb/month
ethylbenzene		0.1797	lb/month
xylenes		0.6288	lb/month
naphthalene		0.0165	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00223
benzene	78.11	50	0.00194
2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00082
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00028
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.008101	6.250	0.00130
benzene	0.007773	6.250	0.00124
2,2,4 TMP	0.000436	6.250	0.00007
toluene	0.002798	6.250	0.00045
ethylbenzene	0.000269	6.250	0.00004
xylenes	0.000813	6.250	0.00013
naphthalene	0.000000	6.250	0.00000
cumene	0.000000	6.250	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

	Symbol		Units
Tank No. 115			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**261,107,725**	gal/yr
Turnovers	N	**42.94**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Mechanical-shoe seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.400**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	180	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		249.40 (per year)

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**427.24**	lb/year
		0.21	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**1.02**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000873	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_L/D)*[1+(N_cF_c/D)]$	**LW**	**416.24**	lb/yr
Annual throughput	Q	6,216,851	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2.83**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	249.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**7.15**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	150.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel	
Total HAP Annual Average Emissions		2.67	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
hexane		0.005	lb/yr
benzene		0.027	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.397	lb/yr
ethylbenzene		0.087	lb/yr
xylenes		1.839	lb/yr
naphthalene		0.319	lb/yr
cumene		0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02396
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05747
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00361
2,2,4 TMP	0.000000	0.005	-
toluene	0.000172	0.005	0.03380
ethylbenzene	0.000018	0.005	0.00363
xylenes	0.000357	0.005	0.07036
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**115**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**21,758,977**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type:		**Mechanical-shoe seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**180**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	20.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.03**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.22**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.172	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0197	lb/month
ethylbenzene		0.0055	lb/month
xylenes		0.1188	lb/month
naphthalene		0.0263	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0086	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0182	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00250
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02493
ethylbenzene	106.17	130	0.00274
xylenes	106.17	130	0.05267
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00082
benzene	0.000008	0.002	0.00415
2,2,4 TMP	0.000000	0.002	-
toluene	0.000067	0.002	0.03518
ethylbenzene	0.000006	0.002	0.00335
xylenes	0.000123	0.002	0.06449
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.08**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.26**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.176	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0002	lb/month
benzene		0.0012	lb/month
TMP		0.0000	lb/month
toluene		0.0209	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.1216	lb/month
naphthalene		0.0263	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0210	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00053
benzene	78.11	130	0.00245
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02483
ethylbenzene	106.17	130	0.00277
xylenes	106.17	130	0.05338
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00408
2,2,4 TMP	0.000000	0.002	-
toluene	0.000076	0.002	0.03504
ethylbenzene	0.000007	0.002	0.00339
xylenes	0.000142	0.002	0.06536
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.25**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.15**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.37**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.192	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0016	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0250	lb/month
ethylbenzene		0.0061	lb/month
xylenes		0.1320	lb/month
naphthalene		0.0264	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0139	lb/month
ethylbenzene		0.0016	lb/month
xylenes		0.0314	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00049
benzene	78.11	130	0.00233
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02450
ethylbenzene	106.17	130	0.00286
xylenes	106.17	130	0.05528
naphthalene	128.17	130	0.00030
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00075
benzene	0.000012	0.003	0.00388
2,2,4 TMP	0.000000	0.003	-
toluene	0.000109	0.003	0.03457
ethylbenzene	0.000011	0.003	0.00350
xylenes	0.000213	0.003	0.06769
naphthalene	0.000001	0.003	0.00031
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.61**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣS I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.60**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.224	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0023	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0333	lb/month
ethylbenzene		0.0073	lb/month
xylenes		0.1540	lb/month
naphthalene		0.0266	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0222	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0534	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02394
ethylbenzene	106.17	130	0.00297
xylenes	106.17	130	0.05752
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000019	0.005	0.00361
2,2,4 TMP	0.000000	0.005	-
toluene	0.000174	0.005	0.03378
ethylbenzene	0.000019	0.005	0.00363
xylenes	0.000362	0.005	0.07043
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.04**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣS I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.13**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.88**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.262	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0006	lb/month
benzene		0.0030	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0427	lb/month
ethylbenzene		0.0086	lb/month
xylenes		0.1802	lb/month
naphthalene		0.0268	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0028	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0316	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0797	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.54**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 ΣS I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.48**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1.20**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.308	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0008	lb/month
benzene		0.0039	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0536	lb/month
ethylbenzene		0.0102	lb/month
xylenes		0.2119	lb/month
naphthalene		0.0271	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0036	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0425	lb/month
ethylbenzene		0.0057	lb/month
xylenes		0.1113	lb/month
naphthalene		0.0009	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02295
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06006
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00323
2,2,4 TMP	0.000000	0.010	-
toluene	0.000333	0.010	0.03239
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000755	0.010	0.07354
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**36.78**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.012	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**0.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.54**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1.36**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.329	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0008	lb/month
benzene		0.0043	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0588	lb/month
ethylbenzene		0.0110	lb/month
xylenes		0.2273	lb/month
naphthalene		0.0273	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0008	lb/month
benzene		0.0040	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0477	lb/month
ethylbenzene		0.0065	lb/month
xylenes		0.1267	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00038
benzene	78.11	130	0.00190
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02276
ethylbenzene	106.17	130	0.00309
xylenes	106.17	130	0.06043
naphthalene	128.17	130	0.00050
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000007	0.012	0.00057
benzene	0.000037	0.012	0.00316
2,2,4 TMP	0.000000	0.012	-
toluene	0.000373	0.012	0.03211
ethylbenzene	0.000044	0.012	0.00379
xylenes	0.000859	0.012	0.07399
naphthalene	0.000006	0.012	0.00050
cumene	0.000000	0.012	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**36.66**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.011	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**0.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.51**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**1.28**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.318	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0008	lb/month
benzene		0.0041	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0561	lb/month
ethylbenzene		0.0106	lb/month
xylenes		0.2192	lb/month
naphthalene		0.0272	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0008	lb/month
benzene		0.0038	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0450	lb/month
ethylbenzene		0.0061	lb/month
xylenes		0.1186	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00038
benzene	78.11	130	0.00192
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02286
ethylbenzene	106.17	130	0.00309
xylenes	106.17	130	0.06024
naphthalene	128.17	130	0.00049
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000006	0.011	0.00058
benzene	0.000035	0.011	0.00319
2,2,4 TMP	0.000000	0.011	-
toluene	0.000352	0.011	0.03225
ethylbenzene	0.000041	0.011	0.00378
xylenes	0.000805	0.011	0.07376
naphthalene	0.000005	0.011	0.00049
cumene	0.000000	0.011	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**36.15**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.008	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^b)DP^* M_v K_c)/12$ months	**L_R**	**0.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.38**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.95**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.273	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0006	lb/month
benzene		0.0032	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0453	lb/month
ethylbenzene		0.0090	lb/month
xylenes		0.1876	lb/month
naphthalene		0.0269	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0030	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0342	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.0871	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	130	0.00041
benzene	78.11	130	0.00201
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02331
ethylbenzene	106.17	130	0.00305
xylenes	106.17	130	0.05929
naphthalene	128.17	130	0.00044
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000005	0.008	0.00061
benzene	0.000027	0.008	0.00335
2,2,4 TMP	0.000000	0.008	-
toluene	0.000268	0.008	0.03289
ethylbenzene	0.000030	0.008	0.00373
xylenes	0.000591	0.008	0.07260
naphthalene	0.000004	0.008	0.00044
cumene	0.000000	0.008	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.62**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**512.87**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_P/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.61**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.224	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0023	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0334	lb/month
ethylbenzene		0.0073	lb/month
xylenes		0.1542	lb/month
naphthalene		0.0266	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0223	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0536	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02394
ethylbenzene	106.17	130	0.00297
xylenes	106.17	130	0.05754
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00067
benzene	0.000019	0.005	0.00360
2,2,4 TMP	0.000000	0.005	-
toluene	0.000174	0.005	0.03377
ethylbenzene	0.000019	0.005	0.00363
xylenes	0.000364	0.005	0.07045
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.32**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**501.69**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.004	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_P/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.41**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.197	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0017	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0265	lb/month
ethylbenzene		0.0063	lb/month
xylenes		0.1359	lb/month
naphthalene		0.0264	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0154	lb/month
ethylbenzene		0.0018	lb/month
xylenes		0.0353	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00048
benzene	78.11	130	0.00230
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02439
ethylbenzene	106.17	130	0.00289
xylenes	106.17	130	0.05580
naphthalene	128.17	130	0.00032
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.004	0.00073
benzene	0.000013	0.004	0.00382
2,2,4 TMP	0.000000	0.004	-
toluene	0.000121	0.004	0.03441
ethylbenzene	0.000012	0.004	0.00353
xylenes	0.000240	0.004	0.06832
naphthalene	0.000001	0.004	0.00032
cumene	0.000000	0.004	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.11**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**490.34**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_FF_P/D)]$	**L_W**	**34.69**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.27**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.178	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
TMP		0.0000	lb/month
toluene		0.0215	lb/month
ethylbenzene		0.0057	lb/month
xylenes		0.1231	lb/month
naphthalene		0.0264	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0104	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0225	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0003	lb/month
TMP		0.0000	lb/month
toluene		0.0111	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.1006	lb/month
naphthalene		0.0262	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00052
benzene	78.11	130	0.00243
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02478
ethylbenzene	106.17	130	0.00279
xylenes	106.17	130	0.05373
naphthalene	128.17	130	0.00027
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00079
benzene	0.000009	0.002	0.00405
2,2,4 TMP	0.000000	0.002	-
toluene	0.000081	0.002	0.03496
ethylbenzene	0.000008	0.002	0.00341
xylenes	0.000153	0.002	0.06579
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA	Symbol		Units
Input data in Green. Select Cells in Red to open the drop down selection list.			
Tank No. 115			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**261,107,725**	gal/yr
Turnovers	N	**42.94**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type Mechanical-shoe seal	Rim-mounted secondary		
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ea}	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Eb}	**0.400**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	180	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		249.40 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**430.67**	lb/year
		0.22	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.25**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	0.60	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.40	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	1.00	NA
Vapor pressure function	P*	0.0000873	NA
Tank diameter	D	150.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$ID)/[1+(N,F$_F$/D)]	**LW**	**427.96**	lb/yr
Annual throughput	Q	6,216,851	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	150.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**0.70**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	249.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	510.25	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: biodiesel

Total HAP Annual Average Emissions	3.19
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_{WF}$	L_{Ti}
hexane	0.000 lb/yr
benzene	0.000 lb/yr
2,2,4 TMP	0.000 lb/yr
toluene	0.000 lb/yr
ethylbenzene	0.000 lb/yr
xylenes	0.000 lb/yr
naphthalene	0.000 lb/yr
cumene	1.596 lb/yr
methanol	1.596 lb/yr

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	0.27298

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.001386	0.005	0.27298

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362
ethylbenzene	6.95	1419.3	212.61	0.0801

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**115**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**150.00**	ft
Throughput	Q	**21,758,977**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Mechanical-shoe seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**0.6**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.4**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**1.0**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD		

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**180**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	**F_F**	20.78 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.75**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**0.06**	lb/month

HAPS Speciation — Product - select from list — biodiesel

Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4278	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3565	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.18930

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008015	0.002	4.18930

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116
methanol	8.079	1581.3	239.65	0.4629

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.76**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**0.06**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4751	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4038	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16680

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009079	0.002	4.16680

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135
methanol	8.079	1581.3	239.65	0.5243

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.80**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_C)/12$ months	**LD**	**0.09**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$		L_{TI}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6455	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5742	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.09805

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.012910	0.003	4.09805

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208
methanol	8.079	1581.3	239.65	0.7456

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.89**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	^oR
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	^oR
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.74**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.15**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9140	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9140	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.99612	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.020549	0.005	3.99612	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$				
	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367
methanol	8.079	1581.3	239.65	1.1867

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.00**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	^oR
Average daily maximum ambient temperature, Table	T_{AX}	528.40	^oR
Average daily minimum ambient temperature, Table	T_{AN}	507.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.05**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.22**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3727	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3014	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.91062	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.007	-	
benzene	0.000000	0.007	-	
2,2,4 TMP	0.000000	0.007	-	
toluene	0.000000	0.007	-	
ethylbenzene	0.000000	0.007	-	
xylenes	0.000000	0.007	-	
naphthalene	0.000000	0.007	-	
cumene	0.000000	0.007	-	
methanol	0.029255	0.007	3.91062	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$				
	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	1.6895

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.12**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.01**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.30**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.8228	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7515	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	3.83376	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i	
hexane	0.000000	0.010	-	
benzene	0.000000	0.010	-	
2,2,4 TMP	0.000000	0.010	-	
toluene	0.000000	0.010	-	
ethylbenzene	0.000000	0.010	-	
xylenes	0.000000	0.010	-	
naphthalene	0.000000	0.010	-	
cumene	0.000000	0.010	-	
methanol	0.039370	0.010	3.83376	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$				
	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805
methanol	8.079	1581.3	239.65	2.2737

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.18**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.012	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.34**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		2.0362	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.9649	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.80286
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.012	-
benzene	0.000000	0.012	-
2,2,4 TMP	0.000000	0.012	-
toluene	0.000000	0.012	-
ethylbenzene	0.000000	0.012	-
xylenes	0.000000	0.012	-
naphthalene	0.000000	0.012	-
cumene	0.000000	0.012	-
methanol	0.044164	0.012	3.80286
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923
methanol	8.079	1581.3	239.65	2.5505

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.15**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is know	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.011	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.05**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.32**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.9249	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.8536	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.81861
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.011	-
benzene	0.000000	0.011	-
2,2,4 TMP	0.000000	0.011	-
toluene	0.000000	0.011	-
ethylbenzene	0.000000	0.011	-
xylenes	0.000000	0.011	-
naphthalene	0.000000	0.011	-
cumene	0.000000	0.011	-
methanol	0.041664	0.011	3.81861
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5369
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861
methanol	8.079	1581.3	239.65	2.4061

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**36.03**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.008	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**0.24**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.4793	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.4080	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.89069
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.008	-
benzene	0.000000	0.008	-
2,2,4 TMP	0.000000	0.008	-
toluene	0.000000	0.008	-
ethylbenzene	0.000000	0.008	-
xylenes	0.000000	0.008	-
naphthalene	0.000000	0.008	-
cumene	0.000000	0.008	-
methanol	0.031651	0.008	3.89069
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619
methanol	8.079	1581.3	239.65	1.8278

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.89**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.15**	lb/month

HAPS Speciation — Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9891	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.9178	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.99517

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.020633	0.005	3.99517

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369
methanol	8.079	1581.3	239.65	1.1916

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.82**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.004	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation — Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7072	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6359	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.07675

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.004	-
benzene	0.000000	0.004	-
2,2,4 TMP	0.000000	0.004	-
toluene	0.000000	0.004	-
ethylbenzene	0.000000	0.004	-
xylenes	0.000000	0.004	-
naphthalene	0.000000	0.004	-
cumene	0.000000	0.004	-
methanol	0.014297	0.004	4.07675

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236
methanol	8.079	1581.3	239.65	0.8256

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**35.77**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	518,070.88	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.01**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**35.66**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month

HAPS Speciation — Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5011	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4298	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0713	lb/month

Vapor Weight Concentrations $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.15518

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{vai}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009663	0.002	4.15518

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146
methanol	8.079	1581.3	239.65	0.5580

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 31			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**221,953,981**	gal/yr
Turnovers	N	**56.22**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:		513.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**9,931.62**	lb/year
		4.97	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**2,146.18**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.1258755	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_f/D)]$	**LW**	**364.35**	lb/yr
Annual throughput	Q	5,284,619	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	125.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**4,006.72**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**3,414.37**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:	Gasoline	
Total HAP Annual Average Emissions	257.48	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$		
	L_{Ti}	
hexane	39.958	lb/yr
benzene	45.907	lb/yr
2,2,4 TMP	58.621	lb/yr
toluene	67.369	lb/yr
ethylbenzene	7.626	lb/yr
xylenes	36.473	lb/yr
naphthalene	1.528	lb/yr
cumene	2.227	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_V$

	M_i	M_V	Z_{Vi}
hexane	86.18	62	0.00380
benzene	78.11	62	0.00411
2,2,4 TMP	114.23	62	0.00460
toluene	92.14	62	0.00438
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.015782	5.779	0.00273
benzene	0.018867	5.779	0.00326
2,2,4 TMP	0.014442	5.779	0.00250
toluene	0.017017	5.779	0.00294
ethylbenzene	0.000891	5.779	0.00015
xylenes	0.003869	5.779	0.00067
naphthalene	0.000005	5.779	0.00000
cumene	0.000126	5.779	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	31		
Nearest US Location		Albany, NY	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**18,496,165**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	42.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**530.46**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**112.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L/D)]*[1+(N_FF_F/D)]$	L_W	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**209.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**178.47**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		13.106	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.6759	lb/month
benzene		1.9602	lb/month
TMP		2.7480	lb/month
toluene		3.4923	lb/month
ethylbenzene		0.4985	lb/month
xylenes		2.4423	lb/month
naphthalene		0.1263	lb/month
cumene		0.1627	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3722	lb/month
benzene		1.4136	lb/month
TMP		1.5335	lb/month
toluene		1.3669	lb/month
ethylbenzene		0.0735	lb/month
xylenes		0.3169	lb/month
naphthalene		0.0003	lb/month
cumene		0.0109	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**568.32**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**120.68**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L/D)]*[1+(N_FF_F/D)]$	L_W	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**225.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**191.99**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		13.826	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.8227	lb/month
benzene		2.1211	lb/month
TMP		2.9290	lb/month
toluene		3.6654	lb/month
ethylbenzene		0.5090	lb/month
xylenes		2.4878	lb/month
naphthalene		0.1264	lb/month
cumene		0.1644	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.5191	lb/month
benzene		1.5746	lb/month
TMP		1.7145	lb/month
toluene		1.5400	lb/month
ethylbenzene		0.0840	lb/month
xylenes		0.3624	lb/month
naphthalene		0.0004	lb/month
cumene		0.0126	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**632.73**	lb/month
		0.32	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**135.13**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L/D)]*[1+(N_FF_F/D)]$	L_W	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**252.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**214.97**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		16.069	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		2.2602	lb/month
benzene		2.6135	lb/month
2,2,4 TMP		3.4918	lb/month
toluene		4.2206	lb/month
ethylbenzene		0.5444	lb/month
xylenes		2.6417	lb/month
naphthalene		0.1266	lb/month
cumene		0.1702	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9566	lb/month
benzene		2.0670	lb/month
2,2,4 TMP		2.2773	lb/month
toluene		2.0952	lb/month
ethylbenzene		0.1193	lb/month
xylenes		0.5163	lb/month
naphthalene		0.0006	lb/month
cumene		0.0184	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**822.32**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**177.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**331.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**282.63**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		21.502	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.3034	lb/month
benzene		3.7953	lb/month
2,2,4 TMP		4.8501	lb/month
toluene		5.5787	lb/month
ethylbenzene		0.6332	lb/month
xylenes		3.0291	lb/month
naphthalene		0.1273	lb/month
cumene		0.1852	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.9997	lb/month
benzene		3.2487	lb/month
2,2,4 TMP		3.6355	lb/month
toluene		3.4533	lb/month
ethylbenzene		0.2081	lb/month
xylenes		0.9037	lb/month
naphthalene		0.0013	lb/month
cumene		0.0334	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**704.30**	lb/month
		0.35	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**151.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**282.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**240.52**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		26.010	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.1067	lb/month
benzene		4.7439	lb/month
2,2,4 TMP		5.9682	lb/month
toluene		6.7539	lb/month
ethylbenzene		0.7161	lb/month
xylenes		3.3931	lb/month
naphthalene		0.1280	lb/month
cumene		0.1999	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.8031	lb/month
benzene		4.1973	lb/month
2,2,4 TMP		4.7537	lb/month
toluene		4.6285	lb/month
ethylbenzene		0.2910	lb/month
xylenes		1.2677	lb/month
naphthalene		0.0020	lb/month
cumene		0.0481	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**881.25**	lb/month
		0.44	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**190.88**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**356.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**303.67**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		33.219	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		5.3988	lb/month
benzene		6.2605	lb/month
2,2,4 TMP		7.7527	lb/month
toluene		8.6284	lb/month
ethylbenzene		0.8488	lb/month
xylenes		3.9764	lb/month
naphthalene		0.1292	lb/month
cumene		0.2236	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.0952	lb/month
benzene		5.7140	lb/month
2,2,4 TMP		6.5382	lb/month
toluene		6.5030	lb/month
ethylbenzene		0.4238	lb/month
xylenes		1.8510	lb/month
naphthalene		0.0032	lb/month
cumene		0.0718	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**966.48**	lb/month
		0.48	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n DP^* M_v K_c)/12$ months	**L_R**	**209.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**392.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**334.08**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		36.853	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		6.0389	lb/month
benzene		7.0184	lb/month
2,2,4 TMP		8.6496	lb/month
toluene		9.5827	lb/month
ethylbenzene		0.9178	lb/month
xylenes		4.2800	lb/month
naphthalene		0.1299	lb/month
cumene		0.2361	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.7352	lb/month
benzene		6.4718	lb/month
2,2,4 TMP		7.4351	lb/month
toluene		7.4573	lb/month
ethylbenzene		0.4927	lb/month
xylenes		2.1546	lb/month
naphthalene		0.0039	lb/month
cumene		0.0842	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$	**LT**	**931.69**	lb/month
		0.47	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n DP^* M_v K_c)/12$ months	**L_R**	**202.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**377.47**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**321.67**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		35.358	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		5.7764	lb/month
benzene		6.7072	lb/month
2,2,4 TMP		8.2810	lb/month
toluene		9.1896	lb/month
ethylbenzene		0.8893	lb/month
xylenes		4.1545	lb/month
naphthalene		0.1296	lb/month
cumene		0.2309	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.4728	lb/month
benzene		6.1606	lb/month
2,2,4 TMP		7.0664	lb/month
toluene		7.0642	lb/month
ethylbenzene		0.4642	lb/month
xylenes		2.0291	lb/month
naphthalene		0.0036	lb/month
cumene		0.0791	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,172.21**	lb/month
		0.59	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n DP^* M_v K_c)/12$ months	**L_R**	**256.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**478.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**407.50**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		31.317	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		5.1182	lb/month
benzene		5.8912	lb/month
2,2,4 TMP		7.2903	lb/month
toluene		8.0870	lb/month
ethylbenzene		0.8049	lb/month
xylenes		3.7813	lb/month
naphthalene		0.1287	lb/month
cumene		0.2151	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.8146	lb/month
benzene		5.3447	lb/month
2,2,4 TMP		6.0758	lb/month
toluene		5.9616	lb/month
ethylbenzene		0.3798	lb/month
xylenes		1.6559	lb/month
naphthalene		0.0027	lb/month
cumene		0.0633	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**897.11**	lb/month
		0.45	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**194.43**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**362.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**309.33**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		22.432	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.4823	lb/month
benzene		3.9975	lb/month
2,2,4 TMP		5.0824	lb/month
toluene		5.8111	lb/month
ethylbenzene		0.6484	lb/month
xylenes		3.0956	lb/month
naphthalene		0.1274	lb/month
cumene		0.1878	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.1787	lb/month
benzene		3.4510	lb/month
2,2,4 TMP		3.8679	lb/month
toluene		3.6857	lb/month
ethylbenzene		0.2233	lb/month
xylenes		0.9702	lb/month
naphthalene		0.0014	lb/month
cumene		0.0359	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00367
benzene	78.11	62	0.00398
2,2,4 TMP	114.23	62	0.00446
toluene	92.14	62	0.00425
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00112
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.016259	6.162	0.00264
benzene	0.019475	6.162	0.00316
2,2,4 TMP	0.014926	6.162	0.00242
toluene	0.017633	6.162	0.00286
ethylbenzene	0.000927	6.162	0.00015
xylenes	0.004028	6.162	0.00065
naphthalene	0.000005	6.162	0.00000
cumene	0.000132	6.162	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**786.01**	lb/month
		0.39	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**169.51**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**316.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**269.68**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		18.360	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.7224	lb/month
benzene		3.1222	lb/month
2,2,4 TMP		4.0665	lb/month
toluene		4.7761	lb/month
ethylbenzene		0.5788	lb/month
xylenes		2.7913	lb/month
naphthalene		0.1269	lb/month
cumene		0.1758	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4188	lb/month
benzene		2.5757	lb/month
2,2,4 TMP		2.8520	lb/month
toluene		2.6507	lb/month
ethylbenzene		0.1537	lb/month
xylenes		0.6659	lb/month
naphthalene		0.0008	lb/month
cumene		0.0240	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00320
benzene	78.11	60	0.00341
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00351
ethylbenzene	106.17	60	0.00020
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.012679	5.675	0.00223
benzene	0.014897	5.675	0.00262
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.012997	5.675	0.00229
ethylbenzene	0.000654	5.675	0.00012
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**602.63**	lb/month
		0.30	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**128.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**239.66**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**204.23**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		14.497	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.9586	lb/month
benzene		2.2707	lb/month
TMP		3.0978	lb/month
toluene		3.8279	lb/month
ethylbenzene		0.5190	lb/month
xylenes		2.5310	lb/month
naphthalene		0.1265	lb/month
cumene		0.1660	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.6549	lb/month
benzene		1.7242	lb/month
TMP		1.8833	lb/month
toluene		1.7025	lb/month
ethylbenzene		0.0939	lb/month
xylenes		0.4056	lb/month
naphthalene		0.0005	lb/month
cumene		0.0142	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	60	0.00289
benzene	78.11	60	0.00301
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.009155	4.536	0.00202
benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.008810	4.536	0.00194
ethylbenzene	0.000422	4.536	0.00009
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 31			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**221,953,981**	gal/yr
Turnovers	N	**56.22**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	Type	Qty	Loss Factor Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			513.40 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**1,201.57**	lb/year
		0.60	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5))^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**176.42**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	(lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_WW_L)/D)*(1+(N.F_C/D))$	**LW**	**415.10**	lb/yr
Annual throughput	Q	5,284,619	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl*ft
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**329.37**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**280.67**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.01	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: Ethanol

Total HAP Annual Average Emissions				879.80
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				0.593 lb/yr
benzene				0.732 lb/yr
2,2,4 TMP				1.066 lb/yr
toluene				1.412 lb/yr
ethylbenzene				0.207 lb/yr
xylenes				1.013 lb/yr
naphthalene				0.052 lb/yr
cumene				0.067 lb/yr
ethyl alcohol (ethanol)				874.656 lb/yr

Vapor Weight Concentrations Eq. 40-6 $Z_{vi}=y_iM_i/M_v$	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$				
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**31**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**18,496,165**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**10**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**125**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	42.78 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**61.70**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.005	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**6.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**11.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**9.67**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.320	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$	L_{Ti}		
hexane		0.0285	lb/month
benzene		0.0373	lb/month
TMP		0.0618	lb/month
toluene		0.0907	lb/month
ethylbenzene		0.0155	lb/month
xylenes		0.0768	lb/month
naphthalene		0.0043	lb/month
cumene		0.0053	lb/month
ethyl alcohol {ethanol}		47.8540	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0181	lb/month
benzene		0.0187	lb/month
TMP		0.0202	lb/month
toluene		0.0180	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0042	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		14.2998	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$	**Working losses**		
hexane		0.0104	lb/month
benzene		0.0187	lb/month
TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol {ethanol}		33.5542	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol {ethanol}	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{Li}	M_L	M_l	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**64.68**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**6.75**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**12.60**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**10.74**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.329	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$	L_{Ti}		
hexane		0.0302	lb/month
benzene		0.0393	lb/month
TMP		0.0639	lb/month
toluene		0.0928	lb/month
ethylbenzene		0.0156	lb/month
xylenes		0.0774	lb/month
naphthalene		0.0043	lb/month
cumene		0.0054	lb/month
ethyl alcohol {ethanol}		49.6850	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0198	lb/month
benzene		0.0206	lb/month
TMP		0.0224	lb/month
toluene		0.0201	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0047	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol {ethanol}		16.1308	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$	**Working losses**		
hexane		0.0104	lb/month
benzene		0.0187	lb/month
TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol {ethanol}		33.5542	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol {ethanol}	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{Li}	M_L	M_l	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**76.35**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.008	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**9.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**17.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**14.90**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.362	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$	L_{Ti}		
hexane		0.0368	lb/month
benzene		0.0466	lb/month
2,2,4 TMP		0.0723	lb/month
toluene		0.1009	lb/month
ethylbenzene		0.0161	lb/month
xylenes		0.0796	lb/month
naphthalene		0.0043	lb/month
cumene		0.0054	lb/month
ethyl alcohol {ethanol}		57.0800	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0264	lb/month
benzene		0.0279	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0283	lb/month
ethylbenzene		0.0016	lb/month
xylenes		0.0070	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol {ethanol}		23.5258	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$	**Working losses**		
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol {ethanol}		33.5542	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol {ethanol}	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_l$

	Z_{Li}	M_L	M_l	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2781

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**99.56**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	^oR
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	^oR
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**14.57**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**27.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**23.19**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.427	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0491	lb/month
benzene		0.0606	lb/month
2,2,4 TMP		0.0885	lb/month
toluene		0.1173	lb/month
ethylbenzene		0.0172	lb/month
xylenes		0.0843	lb/month
naphthalene		0.0043	lb/month
cumene		0.0056	lb/month
ethyl alcohol (ethanol)		72.4996	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0387	lb/month
benzene		0.0420	lb/month
2,2,4 TMP		0.0470	lb/month
toluene		0.0446	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0117	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		38.9455	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**126.55**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	^oR
Average daily maximum ambient temperature, Table	T_{AX}	528.40	^oR
Average daily minimum ambient temperature, Table	T_{AN}	507.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**20.63**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**38.51**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**32.82**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.501	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0626	lb/month
benzene		0.0763	lb/month
2,2,4 TMP		0.1068	lb/month
toluene		0.1362	lb/month
ethylbenzene		0.0185	lb/month
xylenes		0.0901	lb/month
naphthalene		0.0043	lb/month
cumene		0.0058	lb/month
ethyl alcohol (ethanol)		91.2357	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0522	lb/month
benzene		0.0576	lb/month
2,2,4 TMP		0.0653	lb/month
toluene		0.0636	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0174	lb/month
naphthalene		0.0000	lb/month
cumene		0.0007	lb/month
ethyl alcohol (ethanol)		57.6815	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**159.18**	lb/month
		0.08	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**27.95**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**52.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**44.46**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.588	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0781	lb/month
benzene		0.0946	lb/month
2,2,4 TMP		0.1284	lb/month
toluene		0.1590	lb/month
ethylbenzene		0.0202	lb/month
xylenes		0.0972	lb/month
naphthalene		0.0043	lb/month
cumene		0.0061	lb/month
ethyl alcohol (ethanol)		114.6576	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0677	lb/month
benzene		0.0759	lb/month
2,2,4 TMP		0.0869	lb/month
toluene		0.0864	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.0246	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol (ethanol)		81.1034	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**175.17**	lb/month
		0.09	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**31.54**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**58.87**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**50.17**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.630	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0854	lb/month
benzene		0.1033	lb/month
2,2,4 TMP		0.1388	lb/month
toluene		0.1702	lb/month
ethylbenzene		0.0210	lb/month
xylenes		0.1008	lb/month
naphthalene		0.0044	lb/month
cumene		0.0063	lb/month
ethyl alcohol (ethanol)		126.3663	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0750	lb/month
benzene		0.0847	lb/month
2,2,4 TMP		0.0973	lb/month
toluene		0.0975	lb/month
ethylbenzene		0.0064	lb/month
xylenes		0.0282	lb/month
naphthalene		0.0001	lb/month
cumene		0.0011	lb/month
ethyl alcohol (ethanol)		92.8121	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol (ethanol)	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**168.63**	lb/month
		0.08	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ month	L_R	**30.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**56.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**47.84**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.613	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0824	lb/month
benzene		0.0998	lb/month
2,2,4 TMP		0.1345	lb/month
toluene		0.1656	lb/month
ethylbenzene		0.0206	lb/month
xylenes		0.0994	lb/month
naphthalene		0.0044	lb/month
cumene		0.0062	lb/month
ethyl alcohol (ethanol)		121.5621	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0720	lb/month
benzene		0.0811	lb/month
2,2,4 TMP		0.0930	lb/month
toluene		0.0930	lb/month
ethylbenzene		0.0061	lb/month
xylenes		0.0267	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol (ethanol)		88.0080	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol (ethanol)	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**137.19**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**23.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**42.97**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**36.62**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.529	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0677	lb/month
benzene		0.0823	lb/month
2,2,4 TMP		0.1139	lb/month
toluene		0.1437	lb/month
ethylbenzene		0.0191	lb/month
xylenes		0.0924	lb/month
naphthalene		0.0043	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		98.7988	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0574	lb/month
benzene		0.0637	lb/month
2,2,4 TMP		0.0724	lb/month
toluene		0.0710	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.0197	lb/month
naphthalene		0.0000	lb/month
cumene		0.0008	lb/month
ethyl alcohol (ethanol)		65.2446	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol (ethanol)	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.7530

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**102.51**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**15.24**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**28.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**24.24**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.435	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0506	lb/month
benzene		0.0624	lb/month
2,2,4 TMP		0.0905	lb/month
toluene		0.1193	lb/month
ethylbenzene		0.0174	lb/month
xylenes		0.0849	lb/month
naphthalene		0.0043	lb/month
cumene		0.0056	lb/month
ethyl alcohol (ethanol)		74.5112	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0403	lb/month
benzene		0.0437	lb/month
2,2,4 TMP		0.0490	lb/month
toluene		0.0467	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0123	lb/month
naphthalene		0.0000	lb/month
cumene		0.0005	lb/month
ethyl alcohol (ethanol)		40.9570	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**82.64**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**10.78**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**20.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**17.15**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.380	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0402	lb/month
benzene		0.0505	lb/month
2,2,4 TMP		0.0767	lb/month
toluene		0.1054	lb/month
ethylbenzene		0.0164	lb/month
xylenes		0.0809	lb/month
naphthalene		0.0043	lb/month
cumene		0.0055	lb/month
ethyl alcohol (ethanol)		61.1731	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0299	lb/month
benzene		0.0318	lb/month
2,2,4 TMP		0.0352	lb/month
toluene		0.0327	lb/month
ethylbenzene		0.0019	lb/month
xylenes		0.0082	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		27.6189	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0021	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**67.42**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**7.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**13.75**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**11.72**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.337	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0318	lb/month
benzene		0.0410	lb/month
TMP		0.0659	lb/month
toluene		0.0947	lb/month
ethylbenzene		0.0157	lb/month
xylenes		0.0779	lb/month
naphthalene		0.0043	lb/month
cumene		0.0054	lb/month
ethyl alcohol (ethanol)		51.3952	lb/month
Individual HAP Monthly Emi Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0214	lb/month
benzene		0.0223	lb/month
TMP		0.0244	lb/month
toluene		0.0220	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0053	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		17.8410	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 31			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**56,955,532**	gal/yr
Turnovers	N	**14.43**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type)	IFR type, Adjustable	0	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		513.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**5,949.34**	lb/year
		2.97	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**1,229.00**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Vapor pressure function	P*	0.2234548	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**470.68**	lb/yr
Annual throughput	Q	1,356,084	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,294.43**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1,955.23**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:			Crude Oil	
Total HAP Annual Average Emissions				58.53	
Individual HAP Annual Average Emist Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$				L_{TI}	
hexane				17.320	lb/yr
benzene				16.763	lb/yr
2,2,4 TMP				1.641	lb/yr
toluene				11.063	lb/yr
ethylbenzene				2.650	lb/yr
xylenes				8.921	lb/yr
naphthalene				0.175	lb/yr
cumene				0.000	lb/yr
Vapor Weight Concentrations Eq. 40-t $Z_{VI}=y_iM_i/M_V$					
	M_i	**M_V**		**Z_{VI}**	
hexane	86.18	50		0.00282	
benzene	78.11	50		0.00254	
2,2,4 TMP	114.23	50		0.00021	
toluene	92.14	50		0.00116	
ethylbenzene	106.17	50		0.00014	
xylenes	106.17	50		0.00043	
naphthalene	128.17	50		0.00000	
cumene	120.19	50		0.00000	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$					
	$P_i = P_{VA}(x_i)$			**P_{VA}**	**y_i**
hexane	0.014204			8.688	0.00163
benzene	0.014150			8.688	0.00163
2,2,4 TMP	0.000812			8.688	0.00009
toluene	0.005470			8.688	0.00063
ethylbenzene	0.000573			8.688	0.00007
xylenes	0.001741			8.688	0.00020
naphthalene	0.000001			8.688	0.00000
cumene	0.000000			8.688	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$					
	Z_{Li}	**M_L**		**M_i**	**X_i**
hexane	0.004	207		86.18	0.00961
benzene	0.006	207		78.11	0.01590
2,2,4 TMP	0.001	207		114.23	0.00181
toluene	0.01	207		92.14	0.02247
ethylbenzene	0.004	207		106.17	0.00780
xylenes	0.014	207		106.17	0.02730
naphthalene	0.0	207		128.17	0.00059
cumene	0.0	207		120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$					
	A	**B**	**C**	**P_{VAi}**	
hexane	6.878	1171.5	224.37	1.4784	
benzene	6.906	1211	220.79	0.8899	
2,2,4 TMP	6.812	1257.8	220.74	0.4483	
toluene	7.017	1377.6	222.64	0.2435	
ethylbenzene	6.95	1419.3	212.61	0.0734	
xylenes	7.009	1462.3	215.11	0.0638	
naphthalene	7.146	1831.6	211.82	0.0015	
cumene	6.929	1455.8	207.2	0.0330	

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	31		
Nearest US Location		Albany, NY	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**4,746,294**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	42.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	LT	285.91	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	P*	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**55.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**103.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	LD	**88.04**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		2.784	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.6654	lb/month
benzene		0.6719	lb/month
TMP		0.0747	lb/month
toluene		0.5731	lb/month
ethylbenzene		0.1763	lb/month
xylenes		0.6078	lb/month
naphthalene		0.0145	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.5085	lb/month
benzene		0.4365	lb/month
TMP		0.0355	lb/month
toluene		0.1809	lb/month
ethylbenzene		0.0194	lb/month
xylenes		0.0587	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	LT	303.06	lb/month
		0.15	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	P*	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**59.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**110.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	LD	**94.16**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.931	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.7218	lb/month
benzene		0.7233	lb/month
TMP		0.0791	lb/month
toluene		0.5968	lb/month
ethylbenzene		0.1792	lb/month
xylenes		0.6165	lb/month
naphthalene		0.0145	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.5649	lb/month
benzene		0.4880	lb/month
TMP		0.0399	lb/month
toluene		0.2045	lb/month
ethylbenzene		0.0223	lb/month
xylenes		0.0674	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	LT	367.79	lb/month
		0.18	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	P*	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**73.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**137.60**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	LD	**117.26**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.532	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		L_{Ti}	
hexane		0.9483	lb/month
benzene		0.9321	lb/month
2,2,4 TMP		0.0968	lb/month
toluene		0.6949	lb/month
ethylbenzene		0.1914	lb/month
xylenes		0.6535	lb/month
naphthalene		0.0145	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.7914	lb/month
benzene		0.6967	lb/month
2,2,4 TMP		0.0576	lb/month
toluene		0.3027	lb/month
ethylbenzene		0.0345	lb/month
xylenes		0.1044	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**492.69**	lb/month
		0.25	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**101.72**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**189.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**161.83**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.843	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.4308	lb/month
benzene		1.3851	lb/month
2,2,4 TMP		0.1357	lb/month
toluene		0.9160	lb/month
ethylbenzene		0.2200	lb/month
xylenes		0.7410	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2739	lb/month
benzene		1.1497	lb/month
2,2,4 TMP		0.0965	lb/month
toluene		0.5238	lb/month
ethylbenzene		0.0631	lb/month
xylenes		0.1919	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	M_V	Z_{VI}
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**644.66**	lb/month
		0.32	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**135.81**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**253.55**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**216.07**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.618	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.0687	lb/month
benzene		1.9936	lb/month
2,2,4 TMP		0.1886	lb/month
toluene		1.2232	lb/month
ethylbenzene		0.2614	lb/month
xylenes		0.8677	lb/month
naphthalene		0.0147	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9118	lb/month
benzene		1.7583	lb/month
2,2,4 TMP		0.1494	lb/month
toluene		0.8310	lb/month
ethylbenzene		0.1045	lb/month
xylenes		0.3186	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_V$			
	M_i	M_V	Z_{VI}
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**859.28**	lb/month
		0.43	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*a*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**183.96**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**343.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**292.66**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.297	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		3.0158	lb/month
benzene		2.9071	lb/month
2,2,4 TMP		0.2685	lb/month
toluene		1.6954	lb/month
ethylbenzene		0.3287	lb/month
xylenes		1.0684	lb/month
naphthalene		0.0148	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.8589	lb/month
benzene		2.6718	lb/month
2,2,4 TMP		0.2293	lb/month
toluene		1.3032	lb/month
ethylbenzene		0.1698	lb/month
xylenes		0.5193	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_V$			
	M_i	M_V	Z_{VI}
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**988.67**	lb/month
		0.49	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**212.98**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v)/D]^*[1+(N_c F_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**397.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**338.84**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		10.953	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		3.5968	lb/month
benzene		3.4701	lb/month
2,2,4 TMP		0.3179	lb/month
toluene		1.9896	lb/month
ethylbenzene		0.3680	lb/month
xylenes		1.1953	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.4399	lb/month
benzene		3.2347	lb/month
2,2,4 TMP		0.2787	lb/month
toluene		1.5974	lb/month
ethylbenzene		0.2111	lb/month
xylenes		0.6461	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**932.98**	lb/month
		0.47	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**200.49**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v)/D]^*[1+(N_c F_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**374.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**318.96**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		10.238	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		3.3464	lb/month
benzene		3.2273	lb/month
2,2,4 TMP		0.2966	lb/month
toluene		1.8626	lb/month
ethylbenzene		0.3501	lb/month
xylenes		1.1404	lb/month
naphthalene		0.0149	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.1895	lb/month
benzene		2.9920	lb/month
2,2,4 TMP		0.2574	lb/month
toluene		1.4703	lb/month
ethylbenzene		0.1932	lb/month
xylenes		0.5913	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**709.62**	lb/month
		0.35	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**150.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_v)/D]^*[1+(N_c F_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**280.76**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**239.25**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		7.414	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.3516	lb/month
benzene		2.2656	lb/month
2,2,4 TMP		0.2123	lb/month
toluene		1.3628	lb/month
ethylbenzene		0.2805	lb/month
xylenes		0.9265	lb/month
naphthalene		0.0147	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.1947	lb/month
benzene		2.0302	lb/month
2,2,4 TMP		0.1731	lb/month
toluene		0.9705	lb/month
ethylbenzene		0.1237	lb/month
xylenes		0.3774	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.1569	lb/month
benzene		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month
toluene		0.3922	lb/month
ethylbenzene		0.1569	lb/month
xylenes		0.5491	lb/month
naphthalene		0.0144	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_l$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**L_T**	**508.71**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**L_T**	**401.71**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**L_T**	**318.59**	lb/month
		0.25	tons/month			0.20	tons/month			0.16	tons/month
Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R	TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R	TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	510.41		TB = TAA + 0.003 as I	T_B	500.20		TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.843	psia	PvA = exp(A-(B/TLA))	**P_{vA}**	7.448	psia	PvA = exp(A-(B/TLA))	**P_{vA}**	6.158	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.230	NA	$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.177	NA	$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	**L_R**	**105.32**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	**L_R**	**81.31**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	**L_R**	**62.67**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**39.22**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**39.22**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**39.22**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c$)	**LF**	**196.62**	lb/month	$L_F = F_F P^* M_v K_c$)	**LF**	**151.81**	lb/month	$L_F = F_F P^* M_v K_c$)	**LF**	**117.00**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**167.55**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**129.36**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**99.70**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Crude Oil		**Product - same as January**		Crude Oil		**Product - same as January**		Crude Oil	
Total HAP Monthly Emissions		5.023	lb/month	**Total HAP Monthly Emissions**		3.870	lb/month	**Total HAP Monthly Emissions**		3.069	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}				**L_{Ti}**				**L_{Ti}**	
hexane		1.4960	lb/month	**hexane**		1.0742	lb/month	**hexane**		0.7743	lb/month
benzene		1.4468	lb/month	**benzene**		1.0494	lb/month	**benzene**		0.7714	lb/month
2,2,4 TMP		0.1411	lb/month	**2,2,4 TMP**		0.1068	lb/month	**TMP**		0.0831	lb/month
toluene		0.9467	lb/month	**toluene**		0.7513	lb/month	**toluene**		0.6191	lb/month
ethylbenzene		0.2241	lb/month	**ethylbenzene**		0.1985	lb/month	**ethylbenzene**		0.1819	lb/month
xylenes		0.7535	lb/month	**xylenes**		0.6754	lb/month	**xylenes**		0.6248	lb/month
naphthalene		0.0146	lb/month	**naphthalene**		0.0145	lb/month	**naphthalene**		0.0145	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		1.3391	lb/month	**hexane**		0.9173	lb/month	**hexane**		0.6174	lb/month
benzene		1.2115	lb/month	**benzene**		0.8141	lb/month	**benzene**		0.5360	lb/month
2,2,4 TMP		0.1018	lb/month	**2,2,4 TMP**		0.0676	lb/month	**TMP**		0.0439	lb/month
toluene		0.5545	lb/month	**toluene**		0.3590	lb/month	**toluene**		0.2268	lb/month
ethylbenzene		0.0672	lb/month	**ethylbenzene**		0.0416	lb/month	**ethylbenzene**		0.0250	lb/month
xylenes		0.2044	lb/month	**xylenes**		0.1263	lb/month	**xylenes**		0.0757	lb/month
naphthalene		0.0001	lb/month	**naphthalene**		0.0001	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses = $Z_{Li}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.1569	lb/month	**hexane**		0.1569	lb/month	**hexane**		0.1569	lb/month
benzene		0.2353	lb/month	**benzene**		0.2353	lb/month	**benzene**		0.2353	lb/month
2,2,4 TMP		0.0392	lb/month	**2,2,4 TMP**		0.0392	lb/month	**TMP**		0.0392	lb/month
toluene		0.3922	lb/month	**toluene**		0.3922	lb/month	**toluene**		0.3922	lb/month
ethylbenzene		0.1569	lb/month	**ethylbenzene**		0.1569	lb/month	**ethylbenzene**		0.1569	lb/month
xylenes		0.5491	lb/month	**xylenes**		0.5491	lb/month	**xylenes**		0.5491	lb/month
naphthalene		0.0144	lb/month	**naphthalene**		0.0144	lb/month	**naphthalene**		0.0144	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentratior** $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00285	hexane	86.18	50	0.00253	hexane	86.18	50	0.00221
benzene	78.11	50	0.00258	benzene	78.11	50	0.00225	benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00022	2,2,4 TMP	114.23	50	0.00019	2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00118	toluene	92.14	50	0.00099	toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00014	ethylbenzene	106.17	50	0.00011	ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00044	xylenes	106.17	50	0.00035	xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000	cumene	120.19	50	0.00000	cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VAi}(X_i)$	**P_{VA}**	**y_i**		**$P_i = P_{VAi}(X_i)$**	**P_{VA}**	**y_i**		**$P_i = P_{VAi}(X_i)$**	**P_{VA}**	**y_i**
hexane	0.014633	8.843	0.00165	hexane	0.010936	7.448	0.00147	hexane	0.007897	6.158	0.00128
benzene	0.014607	8.843	0.00165	benzene	0.010707	7.448	0.00144	benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000840	8.843	0.00009	2,2,4 TMP	0.000608	7.448	0.00008	2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.005668	8.843	0.00064	toluene	0.004003	7.448	0.00054	toluene	0.002714	6.158	0.00044
ethylbenzene	0.000596	8.843	0.00007	ethylbenzene	0.000403	7.448	0.00005	ethylbenzene	0.000260	6.158	0.00004
xylenes	0.001813	8.843	0.00020	xylenes	0.001222	7.448	0.00016	xylenes	0.000785	6.158	0.00013
naphthalene	0.000001	8.843	0.00000	naphthalene	0.000001	7.448	0.00000	naphthalene	0.000000	6.158	0.00000
cumene	0.000000	8.843	-	cumene	0.000000	7.448	-	cumene	0.000000	6.158	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000	0	207	120.19	0.00000	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230	6.878	1171.5	224.37	1.1382	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.9186	6.906	1211	220.79	0.6734	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.4633	6.812	1257.8	220.74	0.3355	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.2523	7.017	1377.6	222.64	0.1782	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0764	6.95	1419.3	212.61	0.0517	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0664	7.009	1462.3	215.11	0.0448	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0016	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0344	6.929	1455.8	207.2	0.0226	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 31			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**175,929,309**	gal/yr
Turnovers	N	**44.56**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.003**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		513.40 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**378.99**	lb/year
		0.19	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**2.88**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_f/D)]$	**LW**	**366.16**	lb/yr
Annual throughput	Q	4,188,793	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**5.37**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**4.58**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel	
Total HAP Annual Average Emissions		2.62	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
hexane		0.006	lb/yr
benzene		0.031	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.426	lb/yr
ethylbenzene		0.085	lb/yr
xylenes		1.794	lb/yr
naphthalene		0.282	lb/yr
cumene		0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

		M_i	M_V	Z_{VI}
hexane	86.18	130		0.00046
benzene	78.11	130		0.00220
2,2,4 TMP	114.23	130		0.00000
toluene	92.14	130		0.02408
ethylbenzene	106.17	130		0.00295
xylenes	106.17	130		0.05712
naphthalene	128.17	130		0.00036
cumene	120.19	130		0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000159	0.005	0.03394
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000328	0.005	0.06994
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	31		
Nearest US Location		Albany, NY	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**14,660,776**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Vapor-mounted seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	42.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.93**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.15**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.161	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0003		lb/month
benzene	0.0013		lb/month
TMP	0.0000		lb/month
toluene	0.0202		lb/month
ethylbenzene	0.0051		lb/month
xylenes	0.1105		lb/month
naphthalene	0.0232		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0002		lb/month
benzene	0.0011		lb/month
TMP	0.0000		lb/month
toluene	0.0105		lb/month
ethylbenzene	0.0011		lb/month
xylenes	0.0220		lb/month
naphthalene	0.0001		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0002		lb/month
TMP	0.0000		lb/month
toluene	0.0098		lb/month
ethylbenzene	0.0040		lb/month
xylenes	0.0885		lb/month
naphthalene	0.0231		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.98**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.17**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.165	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0003		lb/month
benzene	0.0014		lb/month
TMP	0.0000		lb/month
toluene	0.0214		lb/month
ethylbenzene	0.0053		lb/month
xylenes	0.1133		lb/month
naphthalene	0.0232		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0003		lb/month
benzene	0.0012		lb/month
TMP	0.0000		lb/month
toluene	0.0117		lb/month
ethylbenzene	0.0013		lb/month
xylenes	0.0249		lb/month
naphthalene	0.0001		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0002		lb/month
TMP	0.0000		lb/month
toluene	0.0098		lb/month
ethylbenzene	0.0040		lb/month
xylenes	0.0885		lb/month
naphthalene	0.0231		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.18**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.28**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.24**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.182	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0004		lb/month
benzene	0.0018		lb/month
2,2,4 TMP	0.0000		lb/month
toluene	0.0261		lb/month
ethylbenzene	0.0059		lb/month
xylenes	0.1249		lb/month
naphthalene	0.0233		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0003		lb/month
benzene	0.0016		lb/month
2,2,4 TMP	0.0000		lb/month
toluene	0.0163		lb/month
ethylbenzene	0.0019		lb/month
xylenes	0.0364		lb/month
naphthalene	0.0002		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0002		lb/month
2,2,4 TMP	0.0000		lb/month
toluene	0.0098		lb/month
ethylbenzene	0.0040		lb/month
xylenes	0.0885		lb/month
naphthalene	0.0231		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.57**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.24**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.38**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.218	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0026	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0353	lb/month
ethylbenzene		0.0071	lb/month
xylenes		0.1489	lb/month
naphthalene		0.0235	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0023	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0255	lb/month
ethylbenzene		0.0031	lb/month
xylenes		0.0605	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.04**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.64**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.54**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.260	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0007	lb/month
benzene		0.0034	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0457	lb/month
ethylbenzene		0.0086	lb/month
xylenes		0.1777	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0032	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0359	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0892	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.60**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.47**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.87**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.74**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.310	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0009	lb/month
benzene		0.0044	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0580	lb/month
ethylbenzene		0.0104	lb/month
xylenes		0.2129	lb/month
naphthalene		0.0240	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0008	lb/month
benzene		0.0041	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0482	lb/month
ethylbenzene		0.0064	lb/month
xylenes		0.1244	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.87**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.84**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.335	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0009	lb/month
benzene		0.0048	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0639	lb/month
ethylbenzene		0.0112	lb/month
xylenes		0.2302	lb/month
naphthalene		0.0242	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0009	lb/month
benzene		0.0046	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0541	lb/month
ethylbenzene		0.0073	lb/month
xylenes		0.1417	lb/month
naphthalene		0.0011	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02294
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06008
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00322
2,2,4 TMP	0.000000	0.010	-
toluene	0.000335	0.010	0.03237
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000760	0.010	0.07356
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.76**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.50**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.94**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.80**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.325	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0009	lb/month
benzene		0.0046	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0615	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.2231	lb/month
naphthalene		0.0241	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0009	lb/month
benzene		0.0044	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0517	lb/month
ethylbenzene		0.0069	lb/month
xylenes		0.1346	lb/month
naphthalene		0.0011	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00195
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02302
ethylbenzene	106.17	130	0.00307
xylenes	106.17	130	0.05992
naphthalene	128.17	130	0.00047
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00059
benzene	0.000032	0.010	0.00325
2,2,4 TMP	0.000000	0.010	-
toluene	0.000320	0.010	0.03248
ethylbenzene	0.000037	0.010	0.00376
xylenes	0.000722	0.010	0.07337
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.22**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.71**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.61**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.276	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0498	lb/month
ethylbenzene		0.0091	lb/month
xylenes		0.1891	lb/month
naphthalene		0.0238	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0035	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0400	lb/month
ethylbenzene		0.0052	lb/month
xylenes		0.1007	lb/month
naphthalene		0.0007	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.62**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.40**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.222	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0364	lb/month
ethylbenzene		0.0072	lb/month
xylenes		0.1521	lb/month
naphthalene		0.0235	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0024	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0266	lb/month
ethylbenzene		0.0033	lb/month
xylenes		0.0636	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00219
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05728
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00364
2,2,4 TMP	0.000000	0.005	-
toluene	0.000165	0.005	0.03388
ethylbenzene	0.000018	0.005	0.00362
xylenes	0.000341	0.005	0.07014
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.28**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.27**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.192	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0286	lb/month
ethylbenzene		0.0062	lb/month
xylenes		0.1313	lb/month
naphthalene		0.0233	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0018	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0188	lb/month
ethylbenzene		0.0022	lb/month
xylenes		0.0428	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00049
benzene	78.11	130	0.00231
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02443
ethylbenzene	106.17	130	0.00288
xylenes	106.17	130	0.05562
naphthalene	128.17	130	0.00031
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.003	0.00074
benzene	0.000013	0.003	0.00384
2,2,4 TMP	0.000000	0.003	-
toluene	0.000116	0.003	0.03447
ethylbenzene	0.000012	0.003	0.00352
xylenes	0.000230	0.003	0.06810
naphthalene	0.000001	0.003	0.00032
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.03**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.18**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.169	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
TMP		0.0000	lb/month
toluene		0.0225	lb/month
ethylbenzene		0.0054	lb/month
xylenes		0.1160	lb/month
naphthalene		0.0232	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
TMP		0.0000	lb/month
toluene		0.0128	lb/month
ethylbenzene		0.0014	lb/month
xylenes		0.0275	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentratior $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00053
benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.002	-
toluene	0.000079	0.002	0.03500
ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000148	0.002	0.06558
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in** Green. **Select Cells in** Red **to open the drop down selection list.

	Symbol		Units
Tank No.		31	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**175,929,309**	gal/yr
Turnovers	N	**44.56**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		513.40 (per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**376.87**	lb/year
		0.19	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.71**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_{N}$W$_L$ID)/[1+(N,F$_F$/D)]	**LW**	**373.70**	lb/yr
Annual throughput	Q	4,188,793	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1.32**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:		biodiesel	
Total HAP Annual Average Emissions		26.89	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_{WF}$			
		L_{Ti}	
hexane		0.000	lb/yr
benzene		0.000	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.000	lb/yr
ethylbenzene		0.000	lb/yr
xylenes		0.000	lb/yr
naphthalene		0.000	lb/yr
cumene		13.444	lb/yr
methanol		13.444	lb/yr
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01644
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018811	0.005	4.01644
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**31**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**14,660,776**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD		

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**10**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**125**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	42.78 per month

1 Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.25**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.04**	lb/month

HAPS Speciation — Product - select from list — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.4959	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.4336	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0623	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{\wedge}(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.26**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.04**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.5446	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.4824	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0623	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{\wedge}(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.31**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]^*[1+(N_CF_C/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	LD	**0.06**	lb/month

HAPS Speciation — Product - same as January — biodiesel

Total HAP Monthly Emissions	0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$	L_{TI}	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.7355	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.6733	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W	**Working losses**	
hexane	0.0000	lb/month
benzene	0.0000	lb/month
2,2,4 TMP	0.0000	lb/month
toluene	0.0000	lb/month
ethylbenzene	0.0000	lb/month
xylenes	0.0000	lb/month
naphthalene	0.0000	lb/month
cumene	0.0000	lb/month
methanol	0.0623	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VA}=(0.019337)10^{\wedge}(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.40**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.09**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1112	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.0489	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0823	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01842

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018648	0.005	4.01842

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.52**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.13**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.5403	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.4780	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0823	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.93734

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.026274	0.007	3.93734

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.66**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.18**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		2.0468	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.9845	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0623	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.86270

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.009	-
benzene	0.000000	0.009	-
2,2,4 TMP	0.000000	0.009	-
toluene	0.000000	0.009	-
ethylbenzene	0.000000	0.009	-
xylenes	0.000000	0.009	-
naphthalene	0.000000	0.009	-
cumene	0.000000	0.009	-
methanol	0.035276	0.009	3.86270

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July				MONTH August				MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.72**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**31.70**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**31.56**	lb/month
		0.02	tons/month			0.02	tons/month			0.02	tons/month
Product Type		Biodiesel		Product Type		Biodiesel		Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month	Monthly Throughput (only change if actual is know	Q_{month}	349,066.09	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R	Vapor Pressure Equation Constant B	B	8907.00	°R	Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R	Average daily maximum ambient temper	T_{AX}	539.70	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R	Average daily minimum ambient temper	T_{AN}	520.60	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	532.75		TB = TAA + 0.003 as I	T_B	531.38		TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.13**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.12**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.09**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^*M_v K_c)$	LF	**0.24**	lb/month	$L_F = F_F P^*M_v K_c)$	LF	**0.23**	lb/month	$L_F = F_F P^*M_v K_c)$	LF	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.21**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.20**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.15**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		biodiesel		**Product - same as January**		biodiesel		**Product - same as January**		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}		**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}		**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$		L_{Ti}	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		2.2901	lb/month	**methanol**		2.1910	lb/month	**methanol**		1.7070	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}((L_R + L_F + L_D)$		**Standing losses**		**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}((L_R + L_F + L_D)$		**Standing losses**		**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}((L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		2.2279	lb/month	**methanol**		2.1287	lb/month	**methanol**		1.6447	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		0.0623	lb/month	**methanol**		0.0623	lb/month	**methanol**		0.0623	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-4** $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**		**M_i**	**M_v**	**Z_{vi}**		**M_i**	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000	hexane	86.18	32	0.00000	hexane	86.18	32	0.00000
benzene	78.11	32	0.00000	benzene	78.11	32	0.00000	benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000	toluene	92.14	32	0.00000	toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000	cumene	120.19	32	0.00000	cumene	120.19	32	0.00000
methanol	32.04	32	3.83221	methanol	32.04	32	3.84429	methanol	32.04	32	3.91078
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**		**$P_i = P_{vA}(x_i)$**	**P_{vA}**	**y_i**		**$P_i = P_{vA}(x_i)$**	**P_{vA}**	**y_i**
hexane	0.000000	0.010	-	hexane	0.000000	0.010	-	hexane	0.000000	0.007	-
benzene	0.000000	0.010	-	benzene	0.000000	0.010	-	benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.010	-	toluene	0.000000	0.010	-	toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.010	-	xylenes	0.000000	0.010	-	xylenes	0.000000	0.007	-
naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.007	-
cumene	0.000000	0.010	-	cumene	0.000000	0.010	-	cumene	0.000000	0.007	-
methanol	0.039600	0.010	3.83221	methanol	0.037838	0.010	3.84429	methanol	0.029238	0.007	3.91078
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581	6.878	1171.5	224.37	2.6553	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.7291	6.906	1211	220.79	1.6605	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.8939	6.812	1257.8	220.74	0.8571	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.5123	7.017	1377.6	222.64	0.4896	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1692	6.95	1419.3	212.61	0.1609	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1480	7.009	1462.3	215.11	0.1406	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0045	7.146	1831.6	211.82	0.0042	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0810	6.929	1455.8	207.2	0.0767	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	2.2869	8.079	1581.3	239.65	2.1852	8.079	1581.3	239.65	1.6885

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.42**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1585	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.0962	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0623	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.00835	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i	
hexane	0.000000	0.005	-	
benzene	0.000000	0.005	-	
2,2,4 TMP	0.000000	0.005	-	
toluene	0.000000	0.005	-	
ethylbenzene	0.000000	0.005	-	
xylenes	0.000000	0.005	-	
naphthalene	0.000000	0.005	-	
cumene	0.000000	0.005	-	
methanol	0.019489	0.005	4.00835	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.33**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8378	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7755	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0623	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.08439	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i	
hexane	0.000000	0.003	-	
benzene	0.000000	0.003	-	
2,2,4 TMP	0.000000	0.003	-	
toluene	0.000000	0.003	-	
ethylbenzene	0.000000	0.003	-	
xylenes	0.000000	0.003	-	
naphthalene	0.000000	0.003	-	
cumene	0.000000	0.003	-	
methanol	0.013788	0.003	4.08439	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.27**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_cF_c/D)]$	L_W	**31.14**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.05**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5896	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5273	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0623	lb/month

Vapor Weight Concentration $Z_{vi} = y_i M_i / M_v$				
	M_i	M_v	Z_{vi}	
hexane	86.18	32	0.00000	
benzene	78.11	32	0.00000	
2,2,4 TMP	114.23	32	0.00000	
toluene	92.14	32	0.00000	
ethylbenzene	106.17	32	0.00000	
xylenes	106.17	32	0.00000	
naphthalene	128.17	32	0.00000	
cumene	120.19	32	0.00000	
methanol	32.04	32	4.16083	
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i	
hexane	0.000000	0.002	-	
benzene	0.000000	0.002	-	
2,2,4 TMP	0.000000	0.002	-	
toluene	0.000000	0.002	-	
ethylbenzene	0.000000	0.002	-	
xylenes	0.000000	0.002	-	
naphthalene	0.000000	0.002	-	
cumene	0.000000	0.002	-	
methanol	0.009376	0.002	4.16083	
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

		Symbol		Units
Tank No.	32			
Nearest US Location			Albany, NY	
Time Period			**Annual**	
Absolute Pressure		P_A	14.55	psi
Product Information				
Product Type (annual average, see below for monthly calcs)			Gasoline - RVP 13	
Vapor Molecular weight		M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)		A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)		B	**5043.58**	°R
Average organic liquid density		W_L	**5.60**	lb/gal
Average Reid Vapor Pressure		RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00	
Tank design data				
Shell height		Hs	**45.00**	ft
Diameter		D	**125.00**	ft
Throughput		Q	**221,953,981**	gal/yr
Turnovers		N	**56.22**	per year
Maximum Filling Height (use Hs-1 if unknown)		H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)		H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)		H_L	**22.50**	ft
Tank Construction (pick from drop down list)			Riveted	
Tank Color (pick from drop down list)			White	
Tank Shell Condition (pick from drop down list)			Average	
Tank Interior Condition (pick from drop down list)			Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.25**	
Internal floating roof design data				
Rim Seal Type:	Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)			Average	
Number of fixed roof support columns		Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c		Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14		K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8		K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8		K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero		v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8		n	**4.3**	NA
Shell clingage factor; see Table 7.1-10		Cs	0.0015	bbl/1,000 ft^2
Deck Design Data				
Deck Seam (choose Welded or Bolted)			Bolted	
Select Deck Construction Type			Continuous sheet	
If bolted continuous sheet or panel, enter width			5	
If bolted panel, also enter length				
Deck seam length factor; Length of Seam / Area of Deck		SD	**0.20**	ft/ft^2
			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type)	IFR type, Adjustable	0	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
	Total deck fitting loss factor Eq. 2-14:		513.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**9,931.62**	lb/year
		4.97	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	5.779	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.126	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**2,146.18**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.1258755	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_fF_f/D)]$	**LW**	**364.35**	lb/yr
Annual throughput	Q	5,284,619	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	125.00	ft
Constant	0.943	0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**4,006.72**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**3,414.37**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

		Product - select from list:		Gasoline
Total HAP Annual Average Emissions				257.48
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{Vi}(L_R+L_F+L_D)+Z_{Li}L_W$				L_{Ti}
hexane				39.958 lb/yr
benzene				45.907 lb/yr
2,2,4 TMP				58.621 lb/yr
toluene				67.369 lb/yr
ethylbenzene				7.626 lb/yr
xylenes				36.473 lb/yr
naphthalene				1.528 lb/yr
cumene				2.227 lb/yr
Vapor Weight Concentrations Eq. 40-1 $Z_{Vi}=y_iM_i/M_V$				
		M_i	M_V	Z_{Vi}
hexane	86.18	62		0.00380
benzene	78.11	62		0.00411
2,2,4 TMP	114.23	62		0.00460
toluene	92.14	62		0.00438
ethylbenzene	106.17	62		0.00026
xylenes	106.17	62		0.00115
naphthalene	128.17	62		0.00000
cumene	120.19	62		0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
	$P_i = P_{VA}(x_i)$	P_{VA}		y_i
hexane	0.015782	5.779		0.00273
benzene	0.018867	5.779		0.00326
2,2,4 TMP	0.014442	5.779		0.00250
toluene	0.017017	5.779		0.00294
ethylbenzene	0.000891	5.779		0.00015
xylenes	0.003869	5.779		0.00067
naphthalene	0.000005	5.779		0.00000
cumene	0.000126	5.779		0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	32		
Nearest US Location		Albany, NY	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**18,496,165**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	42.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**530.46**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.050	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**112.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**209.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**178.47**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		13.106	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.6759	lb/month
benzene		1.9602	lb/month
TMP		2.7480	lb/month
toluene		3.4923	lb/month
ethylbenzene		0.4985	lb/month
xylenes		2.4423	lb/month
naphthalene		0.1263	lb/month
cumene		0.1627	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.3722	lb/month
benzene		1.4136	lb/month
TMP		1.5335	lb/month
toluene		1.3669	lb/month
ethylbenzene		0.0735	lb/month
xylenes		0.3169	lb/month
naphthalene		0.0003	lb/month
cumene		0.0109	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00274
benzene	78.11	60	0.00283
2,2,4 TMP	114.23	60	0.00307
toluene	92.14	60	0.00273
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00063
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007757	4.050	0.00192
benzene	0.008817	4.050	0.00218
2,2,4 TMP	0.006540	4.050	0.00161
toluene	0.007228	4.050	0.00178
ethylbenzene	0.000337	4.050	0.00008
xylenes	0.001454	4.050	0.00036
naphthalene	0.000001	4.050	0.00000
cumene	0.000044	4.050	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**568.32**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.308	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.088	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**120.68**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**225.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**191.99**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		13.826	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.8227	lb/month
benzene		2.1211	lb/month
TMP		2.9290	lb/month
toluene		3.6654	lb/month
ethylbenzene		0.5090	lb/month
xylenes		2.4878	lb/month
naphthalene		0.1264	lb/month
cumene		0.1644	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.5191	lb/month
benzene		1.5746	lb/month
TMP		1.7145	lb/month
toluene		1.5400	lb/month
ethylbenzene		0.0840	lb/month
xylenes		0.3624	lb/month
naphthalene		0.0004	lb/month
cumene		0.0126	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00282
benzene	78.11	60	0.00293
2,2,4 TMP	114.23	60	0.00319
toluene	92.14	60	0.00286
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00067
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008490	4.308	0.00197
benzene	0.009710	4.308	0.00225
2,2,4 TMP	0.007230	4.308	0.00168
toluene	0.008051	4.308	0.00187
ethylbenzene	0.000381	4.308	0.00009
xylenes	0.001644	4.308	0.00038
naphthalene	0.000001	4.308	0.00000
cumene	0.000050	4.308	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**632.73**	lb/month
		0.32	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	4.615	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**135.13**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	L_W	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**252.27**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**214.97**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		16.069	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		2.2602	lb/month
benzene		2.6135	lb/month
2,2,4 TMP		3.4918	lb/month
toluene		4.2206	lb/month
ethylbenzene		0.5444	lb/month
xylenes		2.6417	lb/month
naphthalene		0.1266	lb/month
cumene		0.1702	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9566	lb/month
benzene		2.0670	lb/month
2,2,4 TMP		2.2773	lb/month
toluene		2.0952	lb/month
ethylbenzene		0.1193	lb/month
xylenes		0.5163	lb/month
naphthalene		0.0006	lb/month
cumene		0.0184	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00325
benzene	78.11	62	0.00343
2,2,4 TMP	114.23	62	0.00378
toluene	92.14	62	0.00348
ethylbenzene	106.17	62	0.00020
xylenes	106.17	62	0.00086
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010785	4.615	0.00234
benzene	0.012571	4.615	0.00272
2,2,4 TMP	0.009471	4.615	0.00205
toluene	0.010802	4.615	0.00234
ethylbenzene	0.000534	4.615	0.00012
xylenes	0.002310	4.615	0.00050
naphthalene	0.000002	4.615	0.00000
cumene	0.000073	4.615	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**822.32**	lb/month
		0.41	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.749	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.125	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**177.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**331.67**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**282.63**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		21.502	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.3034	lb/month
benzene		3.7953	lb/month
2,2,4 TMP		4.8501	lb/month
toluene		5.5787	lb/month
ethylbenzene		0.6332	lb/month
xylenes		3.0291	lb/month
naphthalene		0.1273	lb/month
cumene		0.1852	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.9997	lb/month
benzene		3.2487	lb/month
2,2,4 TMP		3.6355	lb/month
toluene		3.4533	lb/month
ethylbenzene		0.2081	lb/month
xylenes		0.9037	lb/month
naphthalene		0.0013	lb/month
cumene		0.0334	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	62	0.00379
benzene	78.11	62	0.00410
2,2,4 TMP	114.23	62	0.00459
toluene	92.14	62	0.00436
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00114
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015667	5.749	0.00273
benzene	0.018721	5.749	0.00326
2,2,4 TMP	0.014325	5.749	0.00249
toluene	0.016869	5.749	0.00293
ethylbenzene	0.000882	5.749	0.00015
xylenes	0.003831	5.749	0.00067
naphthalene	0.000004	5.749	0.00000
cumene	0.000125	5.749	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**704.30**	lb/month
		0.35	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.692	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.097	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**151.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**282.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**240.52**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		26.010	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.1067	lb/month
benzene		4.7439	lb/month
2,2,4 TMP		5.9682	lb/month
toluene		6.7539	lb/month
ethylbenzene		0.7161	lb/month
xylenes		3.3931	lb/month
naphthalene		0.1280	lb/month
cumene		0.1999	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.8031	lb/month
benzene		4.1973	lb/month
2,2,4 TMP		4.7537	lb/month
toluene		4.6285	lb/month
ethylbenzene		0.2910	lb/month
xylenes		1.2677	lb/month
naphthalene		0.0020	lb/month
cumene		0.0481	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00564
benzene	78.11	68	0.00623
2,2,4 TMP	114.23	68	0.00705
toluene	92.14	68	0.00687
ethylbenzene	106.17	68	0.00043
xylenes	106.17	68	0.00188
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00007
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020891	4.692	0.00445
benzene	0.025438	4.692	0.00542
2,2,4 TMP	0.019700	4.692	0.00420
toluene	0.023780	4.692	0.00507
ethylbenzene	0.001298	4.692	0.00028
xylenes	0.005652	4.692	0.00120
naphthalene	0.000007	4.692	0.00000
cumene	0.000189	4.692	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**881.25**	lb/month
		0.44	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.658	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.122	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**190.88**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**356.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**303.67**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		33.219	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		5.3988	lb/month
benzene		6.2605	lb/month
2,2,4 TMP		7.7527	lb/month
toluene		8.6284	lb/month
ethylbenzene		0.8488	lb/month
xylenes		3.9764	lb/month
naphthalene		0.1292	lb/month
cumene		0.2236	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.0952	lb/month
benzene		5.7140	lb/month
2,2,4 TMP		6.5382	lb/month
toluene		6.5030	lb/month
ethylbenzene		0.4238	lb/month
xylenes		1.8510	lb/month
naphthalene		0.0032	lb/month
cumene		0.0718	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00599
benzene	78.11	68	0.00672
2,2,4 TMP	114.23	68	0.00768
toluene	92.14	68	0.00764
ethylbenzene	106.17	68	0.00050
xylenes	106.17	68	0.00218
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026733	5.658	0.00472
benzene	0.033077	5.658	0.00585
2,2,4 TMP	0.025880	5.658	0.00457
toluene	0.031912	5.658	0.00564
ethylbenzene	0.001805	5.658	0.00032
xylenes	0.007883	5.658	0.00139
naphthalene	0.000011	5.658	0.00000
cumene	0.000270	5.658	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**966.48**	lb/month
		0.48	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.091	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n DP^* M_v K_c)/12$ months	**L_R**	**209.99**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**392.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**334.08**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		36.853	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		6.0389	lb/month
benzene		7.0184	lb/month
2,2,4 TMP		8.6496	lb/month
toluene		9.5827	lb/month
ethylbenzene		0.9178	lb/month
xylenes		4.2800	lb/month
naphthalene		0.1299	lb/month
cumene		0.2361	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.7352	lb/month
benzene		6.4718	lb/month
2,2,4 TMP		7.4351	lb/month
toluene		7.4573	lb/month
ethylbenzene		0.4927	lb/month
xylenes		2.1546	lb/month
naphthalene		0.0039	lb/month
cumene		0.0842	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	68	0.00613
benzene	78.11	68	0.00691
2,2,4 TMP	114.23	68	0.00794
toluene	92.14	68	0.00797
ethylbenzene	106.17	68	0.00053
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029443	6.091	0.00483
benzene	0.036658	6.091	0.00602
2,2,4 TMP	0.028797	6.091	0.00473
toluene	0.035808	6.091	0.00588
ethylbenzene	0.002053	6.091	0.00034
xylenes	0.008979	6.091	0.00147
naphthalene	0.000013	6.091	0.00000
cumene	0.000310	6.091	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**931.69**	lb/month
		0.47	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.916	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.130	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n DP^* M_v K_c)/12$ months	**L_R**	**202.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**377.47**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**321.67**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		35.358	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		5.7764	lb/month
benzene		6.7072	lb/month
2,2,4 TMP		8.2810	lb/month
toluene		9.1896	lb/month
ethylbenzene		0.8893	lb/month
xylenes		4.1545	lb/month
naphthalene		0.1296	lb/month
cumene		0.2309	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		5.4728	lb/month
benzene		6.1606	lb/month
2,2,4 TMP		7.0664	lb/month
toluene		7.0642	lb/month
ethylbenzene		0.4642	lb/month
xylenes		2.0291	lb/month
naphthalene		0.0036	lb/month
cumene		0.0791	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	68	0.00607
benzene	78.11	68	0.00684
2,2,4 TMP	114.23	68	0.00784
toluene	92.14	68	0.00784
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00225
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.028346	5.916	0.00479
benzene	0.035205	5.916	0.00595
2,2,4 TMP	0.027613	5.916	0.00467
toluene	0.034222	5.916	0.00578
ethylbenzene	0.001952	5.916	0.00033
xylenes	0.008531	5.916	0.00144
naphthalene	0.000013	5.916	0.00000
cumene	0.000294	5.916	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**1,172.21**	lb/month
		0.59	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.532	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.180	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n DP^* M_v K_c)/12$ months	**L_R**	**256.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**478.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**407.50**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		31.317	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{TI}	
hexane		5.1182	lb/month
benzene		5.8912	lb/month
2,2,4 TMP		7.2903	lb/month
toluene		8.0870	lb/month
ethylbenzene		0.8049	lb/month
xylenes		3.7813	lb/month
naphthalene		0.1287	lb/month
cumene		0.2151	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.8146	lb/month
benzene		5.3447	lb/month
2,2,4 TMP		6.0758	lb/month
toluene		5.9616	lb/month
ethylbenzene		0.3798	lb/month
xylenes		1.6559	lb/month
naphthalene		0.0027	lb/month
cumene		0.0633	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	62	0.00422
benzene	78.11	62	0.00468
2,2,4 TMP	114.23	62	0.00532
toluene	92.14	62	0.00522
ethylbenzene	106.17	62	0.00033
xylenes	106.17	62	0.00145
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022847	7.532	0.00303
benzene	0.027983	7.532	0.00372
2,2,4 TMP	0.021752	7.532	0.00289
toluene	0.026460	7.532	0.00351
ethylbenzene	0.001463	7.532	0.00019
xylenes	0.006378	7.532	0.00085
naphthalene	0.000009	7.532	0.00000
cumene	0.000215	7.532	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**897.11**	lb/month
		0.45	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.162	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**194.43**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**362.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**309.33**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		22.432	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		3.4823	lb/month
benzene		3.9975	lb/month
2,2,4 TMP		5.0824	lb/month
toluene		5.8111	lb/month
ethylbenzene		0.6484	lb/month
xylenes		3.0956	lb/month
naphthalene		0.1274	lb/month
cumene		0.1878	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.1787	lb/month
benzene		3.4510	lb/month
2,2,4 TMP		3.8679	lb/month
toluene		3.6857	lb/month
ethylbenzene		0.2233	lb/month
xylenes		0.9702	lb/month
naphthalene		0.0014	lb/month
cumene		0.0359	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = yM_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	62	0.00367
benzene	78.11	62	0.00398
2,2,4 TMP	114.23	62	0.00446
toluene	92.14	62	0.00425
ethylbenzene	106.17	62	0.00026
xylenes	106.17	62	0.00112
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(X_I)$	**P_{VA}**	**y_I**
hexane	0.016259	6.162	0.00264
benzene	0.019475	6.162	0.00316
2,2,4 TMP	0.014926	6.162	0.00242
toluene	0.017633	6.162	0.00286
ethylbenzene	0.000927	6.162	0.00015
xylenes	0.004028	6.162	0.00065
naphthalene	0.000005	6.162	0.00000
cumene	0.000132	6.162	0.00002
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**786.01**	lb/month
		0.39	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.675	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.123	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**169.51**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**316.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**269.68**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		18.360	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.7224	lb/month
benzene		3.1222	lb/month
2,2,4 TMP		4.0665	lb/month
toluene		4.7761	lb/month
ethylbenzene		0.5788	lb/month
xylenes		2.7913	lb/month
naphthalene		0.1269	lb/month
cumene		0.1758	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4188	lb/month
benzene		2.5757	lb/month
2,2,4 TMP		2.8520	lb/month
toluene		2.6507	lb/month
ethylbenzene		0.1537	lb/month
xylenes		0.6659	lb/month
naphthalene		0.0008	lb/month
cumene		0.0240	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
2,2,4 TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = yM_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	60	0.00320
benzene	78.11	60	0.00341
2,2,4 TMP	114.23	60	0.00377
toluene	92.14	60	0.00351
ethylbenzene	106.17	60	0.00020
xylenes	106.17	60	0.00088
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(X_I)$	**P_{VA}**	**y_I**
hexane	0.012679	5.675	0.00223
benzene	0.014897	5.675	0.00262
2,2,4 TMP	0.011279	5.675	0.00199
toluene	0.012997	5.675	0.00229
ethylbenzene	0.000654	5.675	0.00012
xylenes	0.002834	5.675	0.00050
naphthalene	0.000003	5.675	0.00000
cumene	0.000090	5.675	0.00002
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**602.63**	lb/month
		0.30	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.536	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.093	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**128.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**239.66**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**204.23**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		14.497	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.9586	lb/month
benzene		2.2707	lb/month
TMP		3.0978	lb/month
toluene		3.8279	lb/month
ethylbenzene		0.5190	lb/month
xylenes		2.5310	lb/month
naphthalene		0.1265	lb/month
cumene		0.1660	lb/month
Individual HAP Monthly Em Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.6549	lb/month
benzene		1.7242	lb/month
TMP		1.8833	lb/month
toluene		1.7025	lb/month
ethylbenzene		0.0939	lb/month
xylenes		0.4056	lb/month
naphthalene		0.0005	lb/month
cumene		0.0142	lb/month
Individual HAP Monthly Em Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.3036	lb/month
benzene		0.5465	lb/month
TMP		1.2145	lb/month
toluene		2.1254	lb/month
ethylbenzene		0.4251	lb/month
xylenes		2.1254	lb/month
naphthalene		0.1260	lb/month
cumene		0.1518	lb/month
Vapor Weight Concentration $Z_{VI} = yM_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	60	0.00289
benzene	78.11	60	0.00301
2,2,4 TMP	114.23	60	0.00329
toluene	92.14	60	0.00298
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00071
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(X_I)$	**P_{VA}**	**y_I**
hexane	0.009155	4.536	0.00202
benzene	0.010524	4.536	0.00232
2,2,4 TMP	0.007860	4.536	0.00173
toluene	0.008810	4.536	0.00194
ethylbenzene	0.000422	4.536	0.00009
xylenes	0.001821	4.536	0.00040
naphthalene	0.000002	4.536	0.00000
cumene	0.000056	4.536	0.00001
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 32			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**221,953,981**	gal/yr
Turnovers	N	**56.22**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	**Type**	**Qty**	**Loss Factor** **Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		513.40 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**1,201.57**	lb/year
		0.60	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.744	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.013	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**176.42**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	(lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0131301	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_v$W$_L$/D)*[1+(N,F$_p$/D)]	**LW**	**415.10**	lb/yr
Annual throughput	Q	5,284,619	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/ft
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**329.37**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**280.67**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.01	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: Ethanol

Total HAP Annual Average Emissions				879.80
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R+L_F+L_D)+Z_{vL}L_W$				L_{Ti}
hexane				0.593 lb/yr
benzene				0.732 lb/yr
2,2,4 TMP				1.066 lb/yr
toluene				1.412 lb/yr
ethylbenzene				0.207 lb/yr
xylenes				1.013 lb/yr
naphthalene				0.052 lb/yr
cumene				0.067 lb/yr
ethyl alcohol (ethanol)				874.656 lb/yr

Vapor Weight Concentrations Eq. 40-6 $Z_{vi}=y_iM_i/M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60016

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000251	0.744	0.00034
benzene	0.000301	0.744	0.00040
2,2,4 TMP	0.000230	0.744	0.00031
toluene	0.000271	0.744	0.00036
ethylbenzene	0.000014	0.744	0.00002
xylenes	0.000062	0.744	0.00008
naphthalene	0.000000	0.744	0.00000
cumene	0.000002	0.744	0.00000
Ethyl alcohol (ethanol)	0.473878	0.744	0.63651

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				
	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4606

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**32**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**18,496,165**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**10**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**125**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	42.78 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**61.70**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.313	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.005	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**6.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**11.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**9.67**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.320	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{TI}		
hexane		0.0285	lb/month
benzene		0.0373	lb/month
TMP		0.0618	lb/month
toluene		0.0907	lb/month
ethylbenzene		0.0155	lb/month
xylenes		0.0768	lb/month
naphthalene		0.0043	lb/month
cumene		0.0053	lb/month
ethyl alcohol (ethanol)		47.8540	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0181	lb/month
benzene		0.0187	lb/month
TMP		0.0202	lb/month
toluene		0.0180	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0042	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		14.2998	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**		
hexane		0.0104	lb/month
benzene		0.0187	lb/month
TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00015
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.52755

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000118	0.313	0.00038
benzene	0.000135	0.313	0.00043
2,2,4 TMP	0.000100	0.313	0.00032
toluene	0.000110	0.313	0.00035
ethylbenzene	0.000005	0.313	0.00002
xylenes	0.000022	0.313	0.00007
naphthalene	0.000000	0.313	0.00000
cumene	0.000001	0.313	0.00000
ethyl alcohol (ethanol)	0.174927	0.313	0.55950

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.1700

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**64.68**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.347	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**6.75**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**12.60**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**10.74**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.329	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{TI}		
hexane		0.0302	lb/month
benzene		0.0393	lb/month
TMP		0.0639	lb/month
toluene		0.0928	lb/month
ethylbenzene		0.0156	lb/month
xylenes		0.0774	lb/month
naphthalene		0.0043	lb/month
cumene		0.0054	lb/month
ethyl alcohol (ethanol)		49.6850	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0198	lb/month
benzene		0.0206	lb/month
TMP		0.0224	lb/month
toluene		0.0201	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0047	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		16.1308	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**		
hexane		0.0104	lb/month
benzene		0.0187	lb/month
TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.53620

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000130	0.347	0.00037
benzene	0.000148	0.347	0.00043
2,2,4 TMP	0.000110	0.347	0.00032
toluene	0.000123	0.347	0.00035
ethylbenzene	0.000006	0.347	0.00002
xylenes	0.000025	0.347	0.00007
naphthalene	0.000000	0.347	0.00000
cumene	0.000001	0.347	0.00000
ethyl alcohol (ethanol)	0.197092	0.347	0.56867

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.1916

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**76.35**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.479	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.008	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}\sqrt{})DP^* M_v K_C)/12$ months	L_R	**9.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_C)$	**LF**	**17.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_C)/12$ months	**LD**	**14.90**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.362	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{TI}		
hexane		0.0368	lb/month
benzene		0.0466	lb/month
2,2,4 TMP		0.0723	lb/month
toluene		0.1009	lb/month
ethylbenzene		0.0161	lb/month
xylenes		0.0796	lb/month
naphthalene		0.0043	lb/month
cumene		0.0054	lb/month
ethyl alcohol (ethanol)		57.0800	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0264	lb/month
benzene		0.0279	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0283	lb/month
ethylbenzene		0.0016	lb/month
xylenes		0.0070	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		23.5258	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**		
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00067
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.56332

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000172	0.479	0.00036
benzene	0.000200	0.479	0.00042
2,2,4 TMP	0.000151	0.479	0.00032
toluene	0.000172	0.479	0.00036
ethylbenzene	0.000009	0.479	0.00002
xylenes	0.000037	0.479	0.00008
naphthalene	0.000000	0.479	0.00000
cumene	0.000001	0.479	0.00000
ethyl alcohol (ethanol)	0.286114	0.479	0.59743

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2781

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**99.56**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.738	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.013	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**14.57**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**27.21**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**23.19**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.427	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0491	lb/month
benzene		0.0606	lb/month
2,2,4 TMP		0.0885	lb/month
toluene		0.1173	lb/month
ethylbenzene		0.0172	lb/month
xylenes		0.0843	lb/month
naphthalene		0.0043	lb/month
cumene		0.0056	lb/month
ethyl alcohol (ethanol)		72.4996	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0387	lb/month
benzene		0.0420	lb/month
2,2,4 TMP		0.0470	lb/month
toluene		0.0446	lb/month
ethylbenzene		0.0027	lb/month
xylenes		0.0117	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		38.9455	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00060
benzene	78.11	49	0.00065
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.59946
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000250	0.738	0.00034
benzene	0.000298	0.738	0.00040
2,2,4 TMP	0.000228	0.738	0.00031
toluene	0.000269	0.738	0.00036
ethylbenzene	0.000014	0.738	0.00002
xylenes	0.000061	0.738	0.00008
naphthalene	0.000000	0.738	0.00000
cumene	0.000002	0.738	0.00000
ethyl alcohol (ethanol)	0.469305	0.738	0.63576
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4562

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**126.55**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.034	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.018	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**20.63**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**38.51**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**32.82**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.501	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0626	lb/month
benzene		0.0763	lb/month
2,2,4 TMP		0.1068	lb/month
toluene		0.1362	lb/month
ethylbenzene		0.0185	lb/month
xylenes		0.0901	lb/month
naphthalene		0.0043	lb/month
cumene		0.0058	lb/month
ethyl alcohol (ethanol)		91.2357	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0522	lb/month
benzene		0.0576	lb/month
2,2,4 TMP		0.0653	lb/month
toluene		0.0636	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0174	lb/month
naphthalene		0.0000	lb/month
cumene		0.0007	lb/month
ethyl alcohol (ethanol)		57.6815	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00057
benzene	78.11	49	0.00063
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.62728
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000333	1.034	0.00032
benzene	0.000405	1.034	0.00039
2,2,4 TMP	0.000314	1.034	0.00030
toluene	0.000379	1.034	0.00037
ethylbenzene	0.000021	1.034	0.00002
xylenes	0.000090	1.034	0.00009
naphthalene	0.000000	1.034	0.00000
cumene	0.000003	1.034	0.00000
ethyl alcohol (ethanol)	0.687720	1.034	0.66527
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.6685

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**159.18**	lb/month
		0.08	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.383	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.025	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**27.95**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**52.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**44.46**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.588	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0781	lb/month
benzene		0.0946	lb/month
2,2,4 TMP		0.1284	lb/month
toluene		0.1590	lb/month
ethylbenzene		0.0202	lb/month
xylenes		0.0972	lb/month
naphthalene		0.0043	lb/month
cumene		0.0061	lb/month
ethyl alcohol (ethanol)		114.6576	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0677	lb/month
benzene		0.0759	lb/month
2,2,4 TMP		0.0869	lb/month
toluene		0.0864	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.0246	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol (ethanol)		81.1034	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00061
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65099
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000426	1.383	0.00031
benzene	0.000527	1.383	0.00038
2,2,4 TMP	0.000412	1.383	0.00030
toluene	0.000508	1.383	0.00037
ethylbenzene	0.000029	1.383	0.00002
xylenes	0.000126	1.383	0.00009
naphthalene	0.000000	1.383	0.00000
cumene	0.000004	1.383	0.00000
ethyl alcohol (ethanol)	0.954677	1.383	0.69041
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.9280

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**175.17**	lb/month
		0.09	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.551	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	L_R	**31.54**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**58.87**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**50.17**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.630	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{vI}L_W$		L_{TI}	
hexane		0.0854	lb/month
benzene		0.1033	lb/month
2,2,4 TMP		0.1388	lb/month
toluene		0.1702	lb/month
ethylbenzene		0.0210	lb/month
xylenes		0.1008	lb/month
naphthalene		0.0044	lb/month
cumene		0.0063	lb/month
ethyl alcohol (ethanol)		126.3663	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0750	lb/month
benzene		0.0847	lb/month
2,2,4 TMP		0.0973	lb/month
toluene		0.0975	lb/month
ethylbenzene		0.0064	lb/month
xylenes		0.0282	lb/month
naphthalene		0.0001	lb/month
cumene		0.0011	lb/month
ethyl alcohol (ethanol)		92.8121	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vI}L_W$		**Working losses**	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.66022
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000469	1.551	0.00030
benzene	0.000584	1.551	0.00038
2,2,4 TMP	0.000459	1.551	0.00030
toluene	0.000571	1.551	0.00037
ethylbenzene	0.000033	1.551	0.00002
xylenes	0.000143	1.551	0.00009
naphthalene	0.000000	1.551	0.00000
cumene	0.000005	1.551	0.00000
ethyl alcohol (ethanol)	1.085703	1.551	0.70020
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0554

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**168.63**	lb/month
		0.08	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is know	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.482	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.027	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ month	L_R	**30.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**56.13**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**47.84**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.613	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{vI}L_W$		L_{TI}	
hexane		0.0824	lb/month
benzene		0.0998	lb/month
2,2,4 TMP		0.1345	lb/month
toluene		0.1656	lb/month
ethylbenzene		0.0206	lb/month
xylenes		0.0994	lb/month
naphthalene		0.0044	lb/month
cumene		0.0062	lb/month
ethyl alcohol (ethanol)		121.5621	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0720	lb/month
benzene		0.0811	lb/month
2,2,4 TMP		0.0930	lb/month
toluene		0.0930	lb/month
ethylbenzene		0.0061	lb/month
xylenes		0.0267	lb/month
naphthalene		0.0000	lb/month
cumene		0.0010	lb/month
ethyl alcohol (ethanol)		88.0080	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vI}L_W$		**Working losses**	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00054
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65659
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000452	1.482	0.00030
benzene	0.000561	1.482	0.00038
2,2,4 TMP	0.000440	1.482	0.00030
toluene	0.000545	1.482	0.00037
ethylbenzene	0.000031	1.482	0.00002
xylenes	0.000136	1.482	0.00009
naphthalene	0.000000	1.482	0.00000
cumene	0.000005	1.482	0.00000
ethyl alcohol (ethanol)	1.032134	1.482	0.69635
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0033

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**137.19**	lb/month
		0.07	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^2)DP^* M_v K_c)/12$ months	L_R	**23.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**42.97**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**36.62**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.529	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{vI}L_W$		L_{TI}	
hexane		0.0677	lb/month
benzene		0.0823	lb/month
2,2,4 TMP		0.1139	lb/month
toluene		0.1437	lb/month
ethylbenzene		0.0191	lb/month
xylenes		0.0924	lb/month
naphthalene		0.0043	lb/month
cumene		0.0059	lb/month
ethyl alcohol (ethanol)		98.7988	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.0574	lb/month
benzene		0.0637	lb/month
2,2,4 TMP		0.0724	lb/month
toluene		0.0710	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.0197	lb/month
naphthalene		0.0000	lb/month
cumene		0.0008	lb/month
ethyl alcohol (ethanol)		65.2446	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vI}L_W$		**Working losses**	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.63591
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol (ethanol)	0.774645	1.149	0.67442
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.7530

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**102.51**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.771	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**15.24**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**28.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**24.24**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.435	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0506	lb/month
benzene		0.0624	lb/month
2,2,4 TMP		0.0905	lb/month
toluene		0.1193	lb/month
ethylbenzene		0.0174	lb/month
xylenes		0.0849	lb/month
naphthalene		0.0043	lb/month
cumene		0.0056	lb/month
ethyl alcohol (ethanol)		74.5112	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0403	lb/month
benzene		0.0437	lb/month
2,2,4 TMP		0.0490	lb/month
toluene		0.0467	lb/month
ethylbenzene		0.0028	lb/month
xylenes		0.0123	lb/month
naphthalene		0.0000	lb/month
cumene		0.0005	lb/month
ethyl alcohol (ethanol)		40.9570	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60305
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000259	0.771	0.00034
benzene	0.000310	0.771	0.00040
2,2,4 TMP	0.000238	0.771	0.00031
toluene	0.000281	0.771	0.00036
ethylbenzene	0.000015	0.771	0.00002
xylenes	0.000064	0.771	0.00008
naphthalene	0.000000	0.771	0.00000
cumene	0.000002	0.771	0.00000
ethyl alcohol (ethanol)	0.492970	0.771	0.63957
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.4792

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**82.64**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.550	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**10.78**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**20.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**17.15**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.380	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0402	lb/month
benzene		0.0505	lb/month
2,2,4 TMP		0.0767	lb/month
toluene		0.1054	lb/month
ethylbenzene		0.0164	lb/month
xylenes		0.0809	lb/month
naphthalene		0.0043	lb/month
cumene		0.0055	lb/month
ethyl alcohol (ethanol)		61.1731	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0299	lb/month
benzene		0.0318	lb/month
2,2,4 TMP		0.0352	lb/month
toluene		0.0327	lb/month
ethylbenzene		0.0019	lb/month
xylenes		0.0082	lb/month
naphthalene		0.0000	lb/month
cumene		0.0003	lb/month
ethyl alcohol (ethanol)		27.6189	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
2,2,4 TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57485
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000194	0.550	0.00035
benzene	0.000227	0.550	0.00041
2,2,4 TMP	0.000172	0.550	0.00031
toluene	0.000198	0.550	0.00036
ethylbenzene	0.000010	0.550	0.00002
xylenes	0.000043	0.550	0.00008
naphthalene	0.000000	0.550	0.00000
cumene	0.000001	0.550	0.00000
ethyl alcohol (ethanol)	0.335056	0.550	0.60966
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0021	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3257

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**67.42**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	440,384.88	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.378	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**7.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**34.59**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**13.75**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**11.72**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.337	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0318	lb/month
benzene		0.0410	lb/month
TMP		0.0659	lb/month
toluene		0.0947	lb/month
ethylbenzene		0.0157	lb/month
xylenes		0.0779	lb/month
naphthalene		0.0043	lb/month
cumene		0.0054	lb/month
ethyl alcohol (ethanol)		51.3952	lb/month
Individual HAP Monthly Emi Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0214	lb/month
benzene		0.0223	lb/month
TMP		0.0244	lb/month
toluene		0.0220	lb/month
ethylbenzene		0.0012	lb/month
xylenes		0.0053	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		17.8410	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0104	lb/month
benzene		0.0187	lb/month
TMP		0.0415	lb/month
toluene		0.0726	lb/month
ethylbenzene		0.0145	lb/month
xylenes		0.0726	lb/month
naphthalene		0.0043	lb/month
cumene		0.0052	lb/month
ethyl alcohol (ethanol)		33.5542	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54343
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000140	0.378	0.00037
benzene	0.000161	0.378	0.00043
2,2,4 TMP	0.000120	0.378	0.00032
toluene	0.000135	0.378	0.00036
ethylbenzene	0.000006	0.378	0.00002
xylenes	0.000028	0.378	0.00007
naphthalene	0.000000	0.378	0.00000
cumene	0.000001	0.378	0.00000
ethyl alcohol (ethanol)	0.217749	0.378	0.57634
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337\}10^{A-(B/(TLA+C))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2117

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 32			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**56,955,532**	gal/yr
Turnovers	N	**14.43**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.003**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		513.40 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**5,952.83**	lb/year
		2.98	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	8.688	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.223	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**1,229.00**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.2234548	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC,W$_L$/D)*[1+(N,F$_C$/D)]	**LW**	**474.16**	lb/yr
Annual throughput	Q	1,356,084	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2,294.43**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.22	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**1,955.23**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.22	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Crude Oil
Total HAP Annual Average Emissions		58.67
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$		
		L_{TI}
	hexane	17.334 lb/yr
	benzene	16.784 lb/yr
	2,2,4 TMP	1.644 lb/yr
	toluene	11.098 lb/yr
	ethylbenzene	2.663 lb/yr
	xylenes	8.970 lb/yr
	naphthalene	0.176 lb/yr
	cumene	0.000 lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}= y_I M_I / M_V$

	M_I	M_V	Z_{VI}
hexane	86.18	50	0.00282
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00043
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$

	$P_I = P_{VA}(x_I)$	P_{VA}	y_I
hexane	0.014204	8.688	0.00163
benzene	0.014150	8.688	0.00163
2,2,4 TMP	0.000812	8.688	0.00009
toluene	0.005470	8.688	0.00063
ethylbenzene	0.000573	8.688	0.00007
xylenes	0.001741	8.688	0.00020
naphthalene	0.000001	8.688	0.00000
cumene	0.000000	8.688	-

Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$

	Z_{LI}	M_L	M_I	X_I
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0	207	128.17	0.00059
cumene	0.0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^(A-(B/(TLA+C)))$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	32		
Nearest US Location		Albany, NY	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**4,746,294**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	42.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**286.20**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.594	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.121	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**55.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_f/D)]$	**L_W**	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**103.31**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**88.04**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		2.795	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		0.6666	lb/month
benzene		0.6736	lb/month
TMP		0.0750	lb/month
toluene		0.5760	lb/month
ethylbenzene		0.1775	lb/month
xylenes		0.6119	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.5085	lb/month
benzene		0.4365	lb/month
TMP		0.0355	lb/month
toluene		0.1809	lb/month
ethylbenzene		0.0194	lb/month
xylenes		0.0587	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00206
benzene	78.11	50	0.00177
2,2,4 TMP	114.23	50	0.00014
toluene	92.14	50	0.00073
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006691	5.594	0.00120
benzene	0.006337	5.594	0.00113
2,2,4 TMP	0.000353	5.594	0.00006
toluene	0.002226	5.594	0.00040
ethylbenzene	0.000208	5.594	0.00004
xylenes	0.000627	5.594	0.00011
naphthalene	0.000000	5.594	0.00000
cumene	0.000000	5.594	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**303.35**	lb/month
		0.15	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.129	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**59.19**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_f/D)]$	**L_W**	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**110.49**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**94.16**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.943	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		0.7230	lb/month
benzene		0.7250	lb/month
TMP		0.0794	lb/month
toluene		0.5997	lb/month
ethylbenzene		0.1804	lb/month
xylenes		0.6206	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.5649	lb/month
benzene		0.4880	lb/month
TMP		0.0399	lb/month
toluene		0.2045	lb/month
ethylbenzene		0.0223	lb/month
xylenes		0.0674	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00214
benzene	78.11	50	0.00185
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00078
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00026
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007323	5.895	0.00124
benzene	0.006979	5.895	0.00118
2,2,4 TMP	0.000390	5.895	0.00007
toluene	0.002480	5.895	0.00042
ethylbenzene	0.000235	5.895	0.00004
xylenes	0.000709	5.895	0.00012
naphthalene	0.000000	5.895	0.00000
cumene	0.000000	5.895	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**368.08**	lb/month
		0.18	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.946	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.161	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**73.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_FF_f/D)]$	**L_W**	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**137.60**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**117.26**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.543	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$		**L_{Ti}**	
hexane		0.9495	lb/month
benzene		0.9338	lb/month
2,2,4 TMP		0.0971	lb/month
toluene		0.6978	lb/month
ethylbenzene		0.1925	lb/month
xylenes		0.6576	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{Vi}(L_R + L_F + L_D)$		**Standing losses**	
hexane		0.7914	lb/month
benzene		0.6967	lb/month
2,2,4 TMP		0.0576	lb/month
toluene		0.3027	lb/month
ethylbenzene		0.0345	lb/month
xylenes		0.1044	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$		**Working losses**	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00241
benzene	78.11	50	0.00212
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00092
ethylbenzene	106.17	50	0.00010
xylenes	106.17	50	0.00032
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.009707	6.946	0.00140
benzene	0.009428	6.946	0.00136
2,2,4 TMP	0.000533	6.946	0.00008
toluene	0.003472	6.946	0.00050
ethylbenzene	0.000343	6.946	0.00005
xylenes	0.001040	6.946	0.00015
naphthalene	0.000000	6.946	0.00000
cumene	0.000000	6.946	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**492.98**	lb/month
		0.25	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	8.651	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.222	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**101.72**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**189.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**161.83**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		4.855	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.4320	lb/month
benzene		1.3868	lb/month
2,2,4 TMP		0.1360	lb/month
toluene		0.9189	lb/month
ethylbenzene		0.2212	lb/month
xylenes		0.7451	lb/month
naphthalene		0.0147	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2739	lb/month
benzene		1.1497	lb/month
2,2,4 TMP		0.0965	lb/month
toluene		0.5238	lb/month
ethylbenzene		0.0631	lb/month
xylenes		0.1919	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00281
benzene	78.11	50	0.00254
2,2,4 TMP	114.23	50	0.00021
toluene	92.14	50	0.00116
ethylbenzene	106.17	50	0.00014
xylenes	106.17	50	0.00042
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.014100	8.651	0.00163
benzene	0.014041	8.651	0.00162
2,2,4 TMP	0.000806	8.651	0.00009
toluene	0.005422	8.651	0.00063
ethylbenzene	0.000567	8.651	0.00007
xylenes	0.001724	8.651	0.00020
naphthalene	0.000001	8.651	0.00000
cumene	0.000000	8.651	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**644.95**	lb/month
		0.32	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.263	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.296	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**135.81**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**253.55**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**216.07**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		6.629	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.0699	lb/month
benzene		1.9954	lb/month
2,2,4 TMP		1.1889	lb/month
toluene		1.2261	lb/month
ethylbenzene		0.2626	lb/month
xylenes		0.8718	lb/month
naphthalene		0.0148	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.9118	lb/month
benzene		1.7583	lb/month
2,2,4 TMP		0.1494	lb/month
toluene		0.8310	lb/month
ethylbenzene		0.1045	lb/month
xylenes		0.3186	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00316
benzene	78.11	50	0.00290
2,2,4 TMP	114.23	50	0.00025
toluene	92.14	50	0.00137
ethylbenzene	106.17	50	0.00017
xylenes	106.17	50	0.00053
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.018802	10.263	0.00183
benzene	0.019079	10.263	0.00186
2,2,4 TMP	0.001108	10.263	0.00011
toluene	0.007644	10.263	0.00074
ethylbenzene	0.000834	10.263	0.00008
xylenes	0.002544	10.263	0.00025
naphthalene	0.000001	10.263	0.00000
cumene	0.000000	10.263	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**859.57**	lb/month
		0.43	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.895	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.401	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**183.96**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$	**LF**	**343.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**292.66**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.308	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.0170	lb/month
benzene		2.9089	lb/month
2,2,4 TMP		0.2688	lb/month
toluene		1.6983	lb/month
ethylbenzene		0.3279	lb/month
xylenes		1.0725	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.8589	lb/month
benzene		2.6718	lb/month
2,2,4 TMP		0.2293	lb/month
toluene		1.3032	lb/month
ethylbenzene		0.1698	lb/month
xylenes		0.5193	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00349
benzene	78.11	50	0.00326
2,2,4 TMP	114.23	50	0.00028
toluene	92.14	50	0.00159
ethylbenzene	106.17	50	0.00021
xylenes	106.17	50	0.00063
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024059	11.895	0.00202
benzene	0.024807	11.895	0.00209
2,2,4 TMP	0.001456	11.895	0.00012
toluene	0.010257	11.895	0.00086
ethylbenzene	0.001160	11.895	0.00010
xylenes	0.003547	11.895	0.00030
naphthalene	0.000002	11.895	0.00000
cumene	0.000000	11.895	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**988.96**	lb/month
		0.49	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	12.607	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.465	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**212.98**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_fF_r/D)]$	L_W	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**397.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**338.84**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		10.964	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		3.5979	lb/month
benzene		3.4718	lb/month
2,2,4 TMP		0.3182	lb/month
toluene		1.9925	lb/month
ethylbenzene		0.3691	lb/month
xylenes		1.1993	lb/month
naphthalene		0.0151	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.4399	lb/month
benzene		3.2347	lb/month
2,2,4 TMP		0.2787	lb/month
toluene		1.5974	lb/month
ethylbenzene		0.2111	lb/month
xylenes		0.6461	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	50	0.00362
benzene	78.11	50	0.00341
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.026499	12.607	0.00210
benzene	0.027493	12.607	0.00218
2,2,4 TMP	0.001620	12.607	0.00013
toluene	0.011510	12.607	0.00091
ethylbenzene	0.001320	12.607	0.00010
xylenes	0.004040	12.607	0.00032
naphthalene	0.000003	12.607	0.00000
cumene	0.000000	12.607	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**933.27**	lb/month
		0.47	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	12.321	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.437	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**200.49**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_fF_r/D)]$	L_W	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**374.30**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**318.96**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		10.250	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		3.3476	lb/month
benzene		3.2291	lb/month
2,2,4 TMP		0.2969	lb/month
toluene		1.8655	lb/month
ethylbenzene		0.3513	lb/month
xylenes		1.1445	lb/month
naphthalene		0.0150	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.1895	lb/month
benzene		2.9920	lb/month
2,2,4 TMP		0.2574	lb/month
toluene		1.4703	lb/month
ethylbenzene		0.1932	lb/month
xylenes		0.5913	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	50	0.00357
benzene	78.11	50	0.00335
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00165
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00066
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.025511	12.321	0.00207
benzene	0.026404	12.321	0.00214
2,2,4 TMP	0.001553	12.321	0.00013
toluene	0.011000	12.321	0.00089
ethylbenzene	0.001255	12.321	0.00010
xylenes	0.003839	12.321	0.00031
naphthalene	0.000003	12.321	0.00000
cumene	0.000000	12.321	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**709.91**	lb/month
		0.35	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	10.826	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**150.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_fF_r/D)]$	L_W	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**280.76**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^*M_vK_c)/12$ months	**LD**	**239.25**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		7.425	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		2.3527	lb/month
benzene		2.2673	lb/month
2,2,4 TMP		0.2126	lb/month
toluene		1.3657	lb/month
ethylbenzene		0.2817	lb/month
xylenes		0.9306	lb/month
naphthalene		0.0148	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.1947	lb/month
benzene		2.0302	lb/month
2,2,4 TMP		0.1731	lb/month
toluene		0.9705	lb/month
ethylbenzene		0.1237	lb/month
xylenes		0.3774	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.1581	lb/month
benzene		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month
toluene		0.3951	lb/month
ethylbenzene		0.1581	lb/month
xylenes		0.5532	lb/month
naphthalene		0.0146	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.020563	10.826	0.00190
benzene	0.020987	10.826	0.00194
2,2,4 TMP	0.001224	10.826	0.00011
toluene	0.008505	10.826	0.00079
ethylbenzene	0.000940	10.826	0.00009
xylenes	0.002870	10.826	0.00027
naphthalene	0.000002	10.826	0.00000
cumene	0.000000	10.826	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**509.00**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**402.00**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**318.88**	lb/month
		0.25	tons/month			0.20	tons/month			0.16	tons/month
Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5		Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	113,007.01	barrels/month
Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**		Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38		Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R	Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	I	882.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	534.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	510.41		TB = TAA + 0.003 as I	T_B	500.20		TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	8.843	psia	PvA = exp(A-(B/TLA))	P_{vA}	7.448	psia	PvA = exp(A-(B/TLA))	P_{vA}	6.158	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.230	NA	$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.177	NA	$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.137	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	L_R	**105.32**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	L_R	**81.31**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^b)DP^* M_v K_c)/12$ months	L_R	**62.67**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**39.51**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**39.51**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**39.51**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c)$	LF	**196.62**	lb/month	$L_F = F_F P^* M_v K_c)$	LF	**151.81**	lb/month	$L_F = F_F P^* M_v K_c)$	LF	**117.00**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**167.55**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**129.36**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**99.70**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Crude Oil		**Product - same as January**		Crude Oil		**Product - same as January**		Crude Oil	
Total HAP Monthly Emissions		5.034	lb/month	**Total HAP Monthly Emissions**		3.882	lb/month	**Total HAP Monthly Emissions**		3.080	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}				L_{Ti}				L_{Ti}	
hexane		1.4971	lb/month	**hexane**		1.0754	lb/month	**hexane**		0.7755	lb/month
benzene		1.4486	lb/month	**benzene**		1.0511	lb/month	**benzene**		0.7731	lb/month
2,2,4 TMP		0.1414	lb/month	**2,2,4 TMP**		0.1071	lb/month	**TMP**		0.0834	lb/month
toluene		0.9497	lb/month	**toluene**		0.7542	lb/month	**toluene**		0.6220	lb/month
ethylbenzene		0.2253	lb/month	**ethylbenzene**		0.1997	lb/month	**ethylbenzene**		0.1831	lb/month
xylenes		0.7575	lb/month	**xylenes**		0.6795	lb/month	**xylenes**		0.6288	lb/month
naphthalene		0.0147	lb/month	**naphthalene**		0.0146	lb/month	**naphthalene**		0.0146	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{Vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		1.3391	lb/month	**hexane**		0.9173	lb/month	**hexane**		0.6174	lb/month
benzene		1.2115	lb/month	**benzene**		0.8141	lb/month	**benzene**		0.5360	lb/month
2,2,4 TMP		0.1018	lb/month	**2,2,4 TMP**		0.0676	lb/month	**TMP**		0.0439	lb/month
toluene		0.5545	lb/month	**toluene**		0.3590	lb/month	**toluene**		0.2268	lb/month
ethylbenzene		0.0672	lb/month	**ethylbenzene**		0.0416	lb/month	**ethylbenzene**		0.0250	lb/month
xylenes		0.2044	lb/month	**xylenes**		0.1263	lb/month	**xylenes**		0.0757	lb/month
naphthalene		0.0001	lb/month	**naphthalene**		0.0001	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses = $Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses = $Z_{Li}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.1581	lb/month	**hexane**		0.1581	lb/month	**hexane**		0.1581	lb/month
benzene		0.2371	lb/month	**benzene**		0.2371	lb/month	**benzene**		0.2371	lb/month
2,2,4 TMP		0.0395	lb/month	**2,2,4 TMP**		0.0395	lb/month	**TMP**		0.0395	lb/month
toluene		0.3951	lb/month	**toluene**		0.3951	lb/month	**toluene**		0.3951	lb/month
ethylbenzene		0.1581	lb/month	**ethylbenzene**		0.1581	lb/month	**ethylbenzene**		0.1581	lb/month
xylenes		0.5532	lb/month	**xylenes**		0.5532	lb/month	**xylenes**		0.5532	lb/month
naphthalene		0.0146	lb/month	**naphthalene**		0.0146	lb/month	**naphthalene**		0.0146	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = yM_i / M_v$				**Vapor Weight Concentratior** $Z_{Vi} = yM_i / M_v$			
	M_i	M_v	Z_{Vi}		M_i	M_v	Z_{Vi}		M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00285	hexane	86.18	50	0.00253	hexane	86.18	50	0.00221
benzene	78.11	50	0.00258	benzene	78.11	50	0.00225	benzene	78.11	50	0.00192
2,2,4 TMP	114.23	50	0.00022	2,2,4 TMP	114.23	50	0.00019	2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00118	toluene	92.14	50	0.00099	toluene	92.14	50	0.00081
ethylbenzene	106.17	50	0.00014	ethylbenzene	106.17	50	0.00011	ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00044	xylenes	106.17	50	0.00035	xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000	naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000	cumene	120.19	50	0.00000	cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	P_{VA}	y_i		$P_i = P_{VA}(X_i)$	P_{VA}	y_i		$P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.014633	8.843	0.00165	hexane	0.010936	7.448	0.00147	hexane	0.007897	6.158	0.00128
benzene	0.014607	8.843	0.00165	benzene	0.010707	7.448	0.00144	benzene	0.007564	6.158	0.00123
2,2,4 TMP	0.000840	8.843	0.00009	2,2,4 TMP	0.000608	7.448	0.00008	2,2,4 TMP	0.000424	6.158	0.00007
toluene	0.005668	8.843	0.00064	toluene	0.004003	7.448	0.00054	toluene	0.002714	6.158	0.00044
ethylbenzene	0.000596	8.843	0.00007	ethylbenzene	0.000403	7.448	0.00005	ethylbenzene	0.000260	6.158	0.00004
xylenes	0.001813	8.843	0.00020	xylenes	0.001222	7.448	0.00016	xylenes	0.000785	6.158	0.00013
naphthalene	0.000001	8.843	0.00000	naphthalene	0.000001	7.448	0.00000	naphthalene	0.000000	6.158	0.00000
cumene	0.000000	8.843	-	cumene	0.000000	7.448	-	cumene	0.000000	6.158	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000	0	207	120.19	0.00000	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230	6.878	1171.5	224.37	1.1382	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.9186	6.906	1211	220.79	0.6734	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.4633	6.812	1257.8	220.74	0.3355	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.2523	7.017	1377.6	222.64	0.1782	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0764	6.95	1419.3	212.61	0.0517	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0664	7.009	1462.3	215.11	0.0448	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0016	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0344	6.929	1455.8	207.2	0.0226	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 32			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**175,929,309**	gal/yr
Turnovers	N	**44.56**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.003**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

			Loss Factor
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		513.40 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**378.99**	lb/year
		0.19	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**2.88**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**366.16**	lb/yr
Annual throughput	Q	4,188,793	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**5.37**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**4.58**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	509.09	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel	
Total HAP Annual Average Emissions		2.62	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}	
hexane		0.006	lb/yr
benzene		0.031	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.426	lb/yr
ethylbenzene		0.085	lb/yr
xylenes		1.794	lb/yr
naphthalene		0.282	lb/yr
cumene		0.000	lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02408
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05712
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000159	0.005	0.03394
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000328	0.005	0.06994
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	32		
Nearest US Location		Albany, NY	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**14,660,776**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type:		**Vapor-mounted seal | Rim-mounted secondary**	
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	10	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type) — IFR type, Adjustable	0	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	0	60.0	
Monthly deck fitting loss factor:	F_F	42.78	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.93**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.15**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.161	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0003		lb/month
benzene	0.0013		lb/month
TMP	0.0000		lb/month
toluene	0.0202		lb/month
ethylbenzene	0.0051		lb/month
xylenes	0.1105		lb/month
naphthalene	0.0232		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0002		lb/month
benzene	0.0011		lb/month
TMP	0.0000		lb/month
toluene	0.0105		lb/month
ethylbenzene	0.0011		lb/month
xylenes	0.0220		lb/month
naphthalene	0.0001		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0002		lb/month
TMP	0.0000		lb/month
toluene	0.0098		lb/month
ethylbenzene	0.0040		lb/month
xylenes	0.0885		lb/month
naphthalene	0.0231		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00055
benzene	78.11	130	0.00251
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02496
ethylbenzene	106.17	130	0.00273
xylenes	106.17	130	0.05244
naphthalene	128.17	130	0.00024
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00083
benzene	0.000008	0.002	0.00418
2,2,4 TMP	0.000000	0.002	-
toluene	0.000065	0.002	0.03522
ethylbenzene	0.000006	0.002	0.00334
xylenes	0.000118	0.002	0.06421
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**30.98**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.20**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.17**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.165	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0003		lb/month
benzene	0.0014		lb/month
TMP	0.0000		lb/month
toluene	0.0214		lb/month
ethylbenzene	0.0053		lb/month
xylenes	0.1133		lb/month
naphthalene	0.0232		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0003		lb/month
benzene	0.0012		lb/month
TMP	0.0000		lb/month
toluene	0.0117		lb/month
ethylbenzene	0.0013		lb/month
xylenes	0.0249		lb/month
naphthalene	0.0001		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0002		lb/month
TMP	0.0000		lb/month
toluene	0.0098		lb/month
ethylbenzene	0.0040		lb/month
xylenes	0.0885		lb/month
naphthalene	0.0231		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00247
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02488
ethylbenzene	106.17	130	0.00276
xylenes	106.17	130	0.05306
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00081
benzene	0.000008	0.002	0.00412
2,2,4 TMP	0.000000	0.002	-
toluene	0.000072	0.002	0.03510
ethylbenzene	0.000007	0.002	0.00337
xylenes	0.000133	0.002	0.06497
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.18**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**0.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]*[1+(N_FF_F/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.28**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**0.24**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.182	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane	0.0004		lb/month
benzene	0.0018		lb/month
2,2,4 TMP	0.0000		lb/month
toluene	0.0261		lb/month
ethylbenzene	0.0059		lb/month
xylenes	0.1249		lb/month
naphthalene	0.0233		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane	0.0003		lb/month
benzene	0.0016		lb/month
2,2,4 TMP	0.0000		lb/month
toluene	0.0163		lb/month
ethylbenzene	0.0019		lb/month
xylenes	0.0364		lb/month
naphthalene	0.0002		lb/month
cumene	0.0000		lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane	0.0000		lb/month
benzene	0.0002		lb/month
2,2,4 TMP	0.0000		lb/month
toluene	0.0098		lb/month
ethylbenzene	0.0040		lb/month
xylenes	0.0885		lb/month
naphthalene	0.0231		lb/month
cumene	0.0000		lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00050
benzene	78.11	130	0.00236
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02458
ethylbenzene	106.17	130	0.00284
xylenes	106.17	130	0.05489
naphthalene	128.17	130	0.00029
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00076
benzene	0.000011	0.003	0.00392
2,2,4 TMP	0.000000	0.003	-
toluene	0.000101	0.003	0.03468
ethylbenzene	0.000010	0.003	0.00348
xylenes	0.000196	0.003	0.06720
naphthalene	0.000001	0.003	0.00030
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**31.57**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.24**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.38**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.218	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0026	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0353	lb/month
ethylbenzene		0.0071	lb/month
xylenes		0.1489	lb/month
naphthalene		0.0235	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0023	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0255	lb/month
ethylbenzene		0.0031	lb/month
xylenes		0.0605	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00046
benzene	78.11	130	0.00220
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02407
ethylbenzene	106.17	130	0.00295
xylenes	106.17	130	0.05708
naphthalene	128.17	130	0.00035
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00069
benzene	0.000017	0.005	0.00366
2,2,4 TMP	0.000000	0.005	-
toluene	0.000158	0.005	0.03396
ethylbenzene	0.000017	0.005	0.00361
xylenes	0.000324	0.005	0.06989
naphthalene	0.000002	0.005	0.00036
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**32.04**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.64**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.54**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.260	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0007	lb/month
benzene		0.0034	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0457	lb/month
ethylbenzene		0.0086	lb/month
xylenes		0.1777	lb/month
naphthalene		0.0237	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0032	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0359	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0892	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00042
benzene	78.11	130	0.00208
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02360
ethylbenzene	106.17	130	0.00301
xylenes	106.17	130	0.05856
naphthalene	128.17	130	0.00041
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000004	0.007	0.00064
benzene	0.000023	0.007	0.00346
2,2,4 TMP	0.000000	0.007	-
toluene	0.000222	0.007	0.03329
ethylbenzene	0.000025	0.007	0.00369
xylenes	0.000479	0.007	0.07171
naphthalene	0.000003	0.007	0.00041
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**32.60**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.47**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.87**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.74**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.310	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0009	lb/month
benzene		0.0044	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0580	lb/month
ethylbenzene		0.0104	lb/month
xylenes		0.2129	lb/month
naphthalene		0.0240	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0008	lb/month
benzene		0.0041	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0482	lb/month
ethylbenzene		0.0064	lb/month
xylenes		0.1244	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00040
benzene	78.11	130	0.00198
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02314
ethylbenzene	106.17	130	0.00306
xylenes	106.17	130	0.05968
naphthalene	128.17	130	0.00046
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.009	0.00060
benzene	0.000030	0.009	0.00329
2,2,4 TMP	0.000000	0.009	-
toluene	0.000298	0.009	0.03264
ethylbenzene	0.000034	0.009	0.00375
xylenes	0.000667	0.009	0.07308
naphthalene	0.000004	0.009	0.00046
cumene	0.000000	0.009	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.87**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	532.75	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.20**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.99**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.84**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.335	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0009	lb/month
benzene		0.0048	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0639	lb/month
ethylbenzene		0.0112	lb/month
xylenes		0.2302	lb/month
naphthalene		0.0242	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0009	lb/month
benzene		0.0046	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0541	lb/month
ethylbenzene		0.0073	lb/month
xylenes		0.1417	lb/month
naphthalene		0.0011	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02294
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06008
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00322
2,2,4 TMP	0.000000	0.010	-
toluene	0.000335	0.010	0.03237
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000760	0.010	0.07356
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7581
benzene	6.906	1211	220.79	1.7291
2,2,4 TMP	6.812	1257.8	220.74	0.8939
toluene	7.017	1377.6	222.64	0.5123
ethylbenzene	6.95	1419.3	212.61	0.1692
xylenes	7.009	1462.3	215.11	0.1480
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0810

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.76**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	531.38	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**532.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.50**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.94**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.80**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.325	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0009	lb/month
benzene		0.0046	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0615	lb/month
ethylbenzene		0.0109	lb/month
xylenes		0.2231	lb/month
naphthalene		0.0241	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0009	lb/month
benzene		0.0044	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0517	lb/month
ethylbenzene		0.0069	lb/month
xylenes		0.1346	lb/month
naphthalene		0.0011	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00195
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02302
ethylbenzene	106.17	130	0.00307
xylenes	106.17	130	0.05992
naphthalene	128.17	130	0.00047
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00059
benzene	0.000032	0.010	0.00325
2,2,4 TMP	0.000000	0.010	-
toluene	0.000320	0.010	0.03248
ethylbenzene	0.000037	0.010	0.00376
xylenes	0.000722	0.010	0.07337
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.6553
benzene	6.906	1211	220.79	1.6605
2,2,4 TMP	6.812	1257.8	220.74	0.8571
toluene	7.017	1377.6	222.64	0.4896
ethylbenzene	6.95	1419.3	212.61	0.1609
xylenes	7.009	1462.3	215.11	0.1406
naphthalene	7.146	1831.6	211.82	0.0042
cumene	6.929	1455.8	207.2	0.0767

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**32.22**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.03**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	**L_R**	**0.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.71**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.61**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.276	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0498	lb/month
ethylbenzene		0.0091	lb/month
xylenes		0.1891	lb/month
naphthalene		0.0238	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0035	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0400	lb/month
ethylbenzene		0.0052	lb/month
xylenes		0.1007	lb/month
naphthalene		0.0007	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.62**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.25**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.40**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.222	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0005	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0364	lb/month
ethylbenzene		0.0072	lb/month
xylenes		0.1521	lb/month
naphthalene		0.0235	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0024	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0266	lb/month
ethylbenzene		0.0033	lb/month
xylenes		0.0636	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00219
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02401
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05728
naphthalene	128.17	130	0.00036
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00364
2,2,4 TMP	0.000000	0.005	-
toluene	0.000165	0.005	0.03388
ethylbenzene	0.000018	0.005	0.00362
xylenes	0.000341	0.005	0.07014
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0016
cumene	6.929	1455.8	207.2	0.0344

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.28**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.32**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.27**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.192	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0286	lb/month
ethylbenzene		0.0062	lb/month
xylenes		0.1313	lb/month
naphthalene		0.0233	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0018	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0188	lb/month
ethylbenzene		0.0022	lb/month
xylenes		0.0428	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00049
benzene	78.11	130	0.00231
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02443
ethylbenzene	106.17	130	0.00288
xylenes	106.17	130	0.05562
naphthalene	128.17	130	0.00031
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.003	0.00074
benzene	0.000013	0.003	0.00384
2,2,4 TMP	0.000000	0.003	-
toluene	0.000116	0.003	0.03447
ethylbenzene	0.000012	0.003	0.00352
xylenes	0.000230	0.003	0.06810
naphthalene	0.000001	0.003	0.00032
cumene	0.000000	0.003	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.03**	lb/month
		0.02	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**30.51**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.18**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.169	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
TMP		0.0000	lb/month
toluene		0.0225	lb/month
ethylbenzene		0.0054	lb/month
xylenes		0.1160	lb/month
naphthalene		0.0232	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
TMP		0.0000	lb/month
toluene		0.0128	lb/month
ethylbenzene		0.0014	lb/month
xylenes		0.0275	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0098	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0885	lb/month
naphthalene		0.0231	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{Vi} = yM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	130	0.00053
benzene	78.11	130	0.00244
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02481
ethylbenzene	106.17	130	0.00278
xylenes	106.17	130	0.05356
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00406
2,2,4 TMP	0.000000	0.002	-
toluene	0.000079	0.002	0.03500
ethylbenzene	0.000008	0.002	0.00340
xylenes	0.000148	0.002	0.06558
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.		32	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Biodiesel	
Vapor Molecular weight	M_v	**32**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**175,929,309**	gal/yr
Turnovers	N	**44.56**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type, Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0)	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ea}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Eb}	**0.003**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

	Type	Qty	Loss Factor Kf (Table 7.1-12)
Deck Fitting Data [1]			
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	10	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		513.40 (per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**379.63**	lb/year
		0.19	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.71**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0000805	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_{N}$W$_L$ID)/[1+(N,F$_F$/D)]	**LW**	**376.47**	lb/yr
Annual throughput	Q	4,188,793	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	10.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1.32**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	513.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**1.13**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**510.00**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	509.09	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	509.09	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.25	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:		biodiesel	
Total HAP Annual Average Emissions		2.95	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_C) + Z_{Li}L_{WF}$			
		L_{Ti}	
hexane		0.000	lb/yr
benzene		0.000	lb/yr
2,2,4 TMP		0.000	lb/yr
toluene		0.000	lb/yr
ethylbenzene		0.000	lb/yr
xylenes		0.000	lb/yr
naphthalene		1.447	lb/yr
cumene		0.753	lb/yr
methanol		0.753	lb/yr

Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$

	M_i	M_V	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.48801
cumene	120.19	32	0.45763
methanol	32.04	32	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000571	0.005	0.12199
methanol	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure P_{VA}=(0.019337)10^(A-(B/(TLA+C)))

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.4784
benzene	6.906	1211	220.79	0.8899
2,2,4 TMP	6.812	1257.8	220.74	0.4483
toluene	7.017	1377.6	222.64	0.2435
ethylbenzene	6.95	1419.3	212.61	0.0734
xylenes	7.009	1462.3	215.11	0.0638
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0330
methanol	8.079	1581.3	239.65	1.0863

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**32**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**14,660,776**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**10.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**10**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**125**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	F_F	42.78 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.48**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	483.65	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**484.06**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L)/D]^*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2D^2P^*M_vK_c)/12$ months	LD	**0.04**	lb/month

HAPS Speciation	Product - select from list			
			biodiesel	
Total HAP Monthly Emissions			0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			L_{TI}	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.4963	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			**Standing losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.4336	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			**Working losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.0627	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.19615

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.007709	0.002	4.19615

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.6964
benzene	6.906	1211	220.79	0.3985
2,2,4 TMP	6.812	1257.8	220.74	0.1946
toluene	7.017	1377.6	222.64	0.0991
ethylbenzene	6.95	1419.3	212.61	0.0266
xylenes	7.009	1462.3	215.11	0.0230
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0110
methanol	8.079	1581.3	239.65	0.4452

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.49**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	486.39	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**487.00**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L)/D]^*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2D^2P^*M_vK_c)/12$ months	LD	**0.04**	lb/month

HAPS Speciation	Product - same as January			
			biodiesel	
Total HAP Monthly Emissions			0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			L_{TI}	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.5451	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			**Standing losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.4824	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			**Working losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.0627	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.17721

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008576	0.002	4.17721

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7622
benzene	6.906	1211	220.79	0.4389
2,2,4 TMP	6.812	1257.8	220.74	0.2151
toluene	7.017	1377.6	222.64	0.1104
ethylbenzene	6.95	1419.3	212.61	0.0301
xylenes	7.009	1462.3	215.11	0.0260
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0126
methanol	8.079	1581.3	239.65	0.4953

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.54**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	495.62	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**496.47**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	P*	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L)/D]^*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D^2D^2P^*M_vK_c)/12$ months	LD	**0.06**	lb/month

HAPS Speciation	Product - same as January			
			biodiesel	
Total HAP Monthly Emissions			0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			L_{TI}	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
2,2,4 TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.7360	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			**Standing losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
2,2,4 TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.6733	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			**Working losses**	
hexane			0.0000	lb/month
benzene			0.0000	lb/month
2,2,4 TMP			0.0000	lb/month
toluene			0.0000	lb/month
ethylbenzene			0.0000	lb/month
xylenes			0.0000	lb/month
naphthalene			0.0000	lb/month
cumene			0.0000	lb/month
methanol			0.6733	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.11345

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.011970	0.003	4.11345

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0103
benzene	6.906	1211	220.79	0.5929
2,2,4 TMP	6.812	1257.8	220.74	0.2940
toluene	7.017	1377.6	222.64	0.1546
ethylbenzene	6.95	1419.3	212.61	0.0440
xylenes	7.009	1462.3	215.11	0.0381
naphthalene	7.146	1831.6	211.82	0.0008
cumene	6.929	1455.8	207.2	0.0190
methanol	8.079	1581.3	239.65	0.6913

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.63**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	508.57	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**509.73**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.09**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1117	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.0489	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0627	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.01842

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.018648	0.005	4.01842

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.4676
benzene	6.906	1211	220.79	0.8830
2,2,4 TMP	6.812	1257.8	220.74	0.4447
toluene	7.017	1377.6	222.64	0.2414
ethylbenzene	6.95	1419.3	212.61	0.0727
xylenes	7.009	1462.3	215.11	0.0632
naphthalene	7.146	1831.6	211.82	0.0015
cumene	6.929	1455.8	207.2	0.0326
methanol	8.079	1581.3	239.65	1.0769

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.75**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	519.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**520.55**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**0.08**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.13**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.5407	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.4780	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0627	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.93734

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.026274	0.007	3.93734

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.9569
benzene	6.906	1211	220.79	1.1999
2,2,4 TMP	6.812	1257.8	220.74	0.6115
toluene	7.017	1377.6	222.64	0.3402
ethylbenzene	6.95	1419.3	212.61	0.1070
xylenes	7.009	1462.3	215.11	0.0932
naphthalene	7.146	1831.6	211.82	0.0025
cumene	6.929	1455.8	207.2	0.0495
methanol	8.079	1581.3	239.65	1.5173

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.89**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	528.84	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**530.28**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.009	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_B/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.22**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.18**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		2.0473	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.9845	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0627	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.86270

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.009	-
benzene	0.000000	0.009	-
2,2,4 TMP	0.000000	0.009	-
toluene	0.000000	0.009	-
ethylbenzene	0.000000	0.009	-
xylenes	0.000000	0.009	-
naphthalene	0.000000	0.009	-
cumene	0.000000	0.009	-
methanol	0.035276	0.009	3.86270

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$

	Z_{vi}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.5042
benzene	6.906	1211	220.79	1.5602
2,2,4 TMP	6.812	1257.8	220.74	0.8033
toluene	7.017	1377.6	222.64	0.4566
ethylbenzene	6.95	1419.3	212.61	0.1488
xylenes	7.009	1462.3	215.11	0.1300
naphthalene	7.146	1831.6	211.82	0.0038
cumene	6.929	1455.8	207.2	0.0705
methanol	8.079	1581.3	239.65	2.0372

MONTH July				MONTH August				MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.95**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**31.93**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**31.79**	lb/month
		0.02	tons/month			0.02	tons/month			0.02	tons/month
Product Type		Biodiesel		Product Type		Biodiesel		Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month	Monthly Throughput (only change if actual is know	Q_{month}	349,066.09	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**		Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10		Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R	Vapor Pressure Equation Constant B	B	8907.00	°R	Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R	TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R	Average daily maximum ambient temper	T_{AX}	539.70	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R	Average daily minimum ambient temper	T_{AN}	520.60	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 as I	T_B	532.75		TB = TAA + 0.003 as I	T_B	531.38		TB = TAA + 0.003 as I	T_B	523.03	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.20**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**532.65**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.03**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.010	psia	PvA = exp(A-(B/TLA))	P_{vA}	0.007	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA	$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.13**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.12**	lb/month	$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.09**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^*M_v K_c)$	LF	**0.24**	lb/month	$L_F = F_F P^*M_v K_c)$	LF	**0.23**	lb/month	$L_F = F_F P^*M_v K_c)$	LF	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.21**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.20**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.15**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		biodiesel		**Product - same as January**		biodiesel		**Product - same as January**		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month	**Total HAP Monthly Emissions**		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{vi}L_W$			
		L_{Ti}				L_{Ti}				L_{Ti}	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		2.2906	lb/month	**methanol**		2.1915	lb/month	**methanol**		1.7075	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}((L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}((L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $=Z_{vi}((L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		2.2279	lb/month	**methanol**		2.1287	lb/month	**methanol**		1.6447	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{vi}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.0000	lb/month	**hexane**		0.0000	lb/month	**hexane**		0.0000	lb/month
benzene		0.0000	lb/month	**benzene**		0.0000	lb/month	**benzene**		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month	**2,2,4 TMP**		0.0000	lb/month
toluene		0.0000	lb/month	**toluene**		0.0000	lb/month	**toluene**		0.0000	lb/month
ethylbenzene		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month	**ethylbenzene**		0.0000	lb/month
xylenes		0.0000	lb/month	**xylenes**		0.0000	lb/month	**xylenes**		0.0000	lb/month
naphthalene		0.0000	lb/month	**naphthalene**		0.0000	lb/month	**naphthalene**		0.0000	lb/month
cumene		0.0000	lb/month	**cumene**		0.0000	lb/month	**cumene**		0.0000	lb/month
methanol		0.0627	lb/month	**methanol**		0.0627	lb/month	**methanol**		0.0627	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-** $Z_{vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}		M_i	M_v	Z_{vi}		M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000	hexane	86.18	32	0.00000	hexane	86.18	32	0.00000
benzene	78.11	32	0.00000	benzene	78.11	32	0.00000	benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000	2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000	toluene	92.14	32	0.00000	toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000	ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000	xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000	naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000	cumene	120.19	32	0.00000	cumene	120.19	32	0.00000
methanol	32.04	32	3.83221	methanol	32.04	32	3.84429	methanol	32.04	32	3.91078
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	P_{vA}	y_i		$P_i = P_{vA}(x_i)$	P_{vA}	y_i		$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-	hexane	0.000000	0.010	-	hexane	0.000000	0.007	-
benzene	0.000000	0.010	-	benzene	0.000000	0.010	-	benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.010	-	2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.010	-	toluene	0.000000	0.010	-	toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.010	-	ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.010	-	xylenes	0.000000	0.010	-	xylenes	0.000000	0.007	-
naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.010	-	naphthalene	0.000000	0.007	-
cumene	0.000000	0.010	-	cumene	0.000000	0.010	-	cumene	0.000000	0.007	-
methanol	0.039600	0.010	3.83221	methanol	0.037838	0.010	3.84429	methanol	0.029238	0.007	3.91078
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{vA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}	**A**	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.7581	6.878	1171.5	224.37	2.6553	6.878	1171.5	224.37	2.1402
benzene	6.906	1211	220.79	1.7291	6.906	1211	220.79	1.6605	6.906	1211	220.79	1.3199
2,2,4 TMP	6.812	1257.8	220.74	0.8939	6.812	1257.8	220.74	0.8571	6.812	1257.8	220.74	0.6752
toluene	7.017	1377.6	222.64	0.5123	7.017	1377.6	222.64	0.4896	7.017	1377.6	222.64	0.3786
ethylbenzene	6.95	1419.3	212.61	0.1692	6.95	1419.3	212.61	0.1609	6.95	1419.3	212.61	0.1206
xylenes	7.009	1462.3	215.11	0.1480	7.009	1462.3	215.11	0.1406	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0045	7.146	1831.6	211.82	0.0042	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0810	6.929	1455.8	207.2	0.0767	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	2.2869	8.079	1581.3	239.65	2.1852	8.079	1581.3	239.65	1.6885

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.65**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.41	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**511.10**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.1590	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.0962	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0627	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.00835

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.019489	0.005	4.00835

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5230
benzene	6.906	1211	220.79	0.9186
2,2,4 TMP	6.812	1257.8	220.74	0.4633
toluene	7.017	1377.6	222.64	0.2523
ethylbenzene	6.95	1419.3	212.61	0.0764
xylenes	7.009	1462.3	215.11	0.0664
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0344
methanol	8.079	1581.3	239.65	1.1255

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.56**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.20	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**500.61**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8383	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.7755	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0627	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.08439

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.013788	0.003	4.08439

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.1382
benzene	6.906	1211	220.79	0.6734
2,2,4 TMP	6.812	1257.8	220.74	0.3355
toluene	7.017	1377.6	222.64	0.1782
ethylbenzene	6.95	1419.3	212.61	0.0517
xylenes	7.009	1462.3	215.11	0.0448
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0226
methanol	8.079	1581.3	239.65	0.7963

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**31.50**	lb/month
		0.02	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	349,066.09	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**489.49**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**31.37**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.05**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.05**	lb/month

HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5901	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5273	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0627	lb/month

Vapor Weight Concentrations $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16083

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009376	0.002	4.16083

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.8219
benzene	6.906	1211	220.79	0.4757
2,2,4 TMP	6.812	1257.8	220.74	0.2338
toluene	7.017	1377.6	222.64	0.1208
ethylbenzene	6.95	1419.3	212.61	0.0333
xylenes	7.009	1462.3	215.11	0.0288
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0141
methanol	8.079	1581.3	239.65	0.5414

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 39			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 13	
Vapor Molecular weight	M_v	**62**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.64**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5043.58**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**179,426,294**	gal/yr
Turnovers	N	**45.45**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^ft^yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft²
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft²

			Loss Factor	
Deck Fitting Data [1/]	**Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch	Bolted cover, gasketed	2	1.6	
Column Well	Built-up column, gasketed sliding cover	0	33.0	
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0	
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2	
Deck drain	Stub drain (1-inch diameter)	125	1.2	
Legs (IFR type)	IFR type, Adjustable	0	7.9	
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7	
Ladder	Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0	
Total deck fitting loss factor Eq. 2-14:			183.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**7,691.29**	lb/year
		3.85	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	6.051	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.134	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft²-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**2,277.77**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**270.72**	lb/yr
Annual throughput	Q	4,272,055	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**1,519.07**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	183.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.13	
Average vapor molecular weight	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD22P*MvKc)	**LD**	**3,623.73**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.13	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	62.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:			Gasoline
Total HAP Annual Average Emissions			200.59
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$			L_{TI}
hexane			31.400 lb/yr
benzene			36.094 lb/yr
2,2,4 TMP			45.872 lb/yr
toluene			52.442 lb/yr
ethylbenzene			5.830 lb/yr
xylenes			27.815 lb/yr
naphthalene			1.136 lb/yr
cumene			1.683 lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	62	0.00387
benzene	78.11	62	0.00421
2,2,4 TMP	114.23	62	0.00472
toluene	92.14	62	0.00451
ethylbenzene	106.17	62	0.00027
xylenes	106.17	62	0.00119
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.016831	6.051	0.00278
benzene	0.020207	6.051	0.00334
2,2,4 TMP	0.015509	6.051	0.00256
toluene	0.018375	6.051	0.00304
ethylbenzene	0.000971	6.051	0.00016
xylenes	0.004221	6.051	0.00070
naphthalene	0.000005	6.051	0.00000
cumene	0.000139	6.051	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**39**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**13.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**14,952,191**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**125**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	15.28	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**397.87**	lb/month
		0.20	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.143	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.084	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**115.20**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**76.83**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**183.28**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		9.849	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		1.2663	lb/month
benzene		1.4806	lb/month
TMP		2.0696	lb/month
toluene		2.6226	lb/month
ethylbenzene		0.3722	lb/month
xylenes		1.8224	lb/month
naphthalene		0.0939	lb/month
cumene		0.1212	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.0407	lb/month
benzene		1.0745	lb/month
TMP		1.1672	lb/month
toluene		1.0434	lb/month
ethylbenzene		0.0564	lb/month
xylenes		0.2432	lb/month
naphthalene		0.0003	lb/month
cumene		0.0084	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2256	lb/month
benzene		0.4061	lb/month
TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00277
benzene	78.11	60	0.00286
2,2,4 TMP	114.23	60	0.00311
toluene	92.14	60	0.00278
ethylbenzene	106.17	60	0.00015
xylenes	106.17	60	0.00065
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008018	4.143	0.00194
benzene	0.009134	4.143	0.00220
2,2,4 TMP	0.006784	4.143	0.00164
toluene	0.007518	4.143	0.00181
ethylbenzene	0.000353	4.143	0.00009
xylenes	0.001521	4.143	0.00037
naphthalene	0.000001	4.143	0.00000
cumene	0.000046	4.143	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**431.52**	lb/month
		0.22	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.452	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.091	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**125.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**83.72**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**199.71**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.498	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		1.3981	lb/month
benzene		1.6254	lb/month
TMP		2.2328	lb/month
toluene		2.7791	lb/month
ethylbenzene		0.3817	lb/month
xylenes		1.8638	lb/month
naphthalene		0.0939	lb/month
cumene		0.1227	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.1725	lb/month
benzene		1.2193	lb/month
TMP		1.3304	lb/month
toluene		1.1999	lb/month
ethylbenzene		0.0659	lb/month
xylenes		0.2846	lb/month
naphthalene		0.0003	lb/month
cumene		0.0099	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2256	lb/month
benzene		0.4061	lb/month
TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	60	0.00287
benzene	78.11	60	0.00298
2,2,4 TMP	114.23	60	0.00325
toluene	92.14	60	0.00293
ethylbenzene	106.17	60	0.00016
xylenes	106.17	60	0.00070
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00002

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.008910	4.452	0.00200
benzene	0.010223	4.452	0.00230
2,2,4 TMP	0.007627	4.452	0.00171
toluene	0.008528	4.452	0.00192
ethylbenzene	0.000406	4.452	0.00009
xylenes	0.001755	4.452	0.00039
naphthalene	0.000002	4.452	0.00000
cumene	0.000054	4.452	0.00001

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**487.38**	lb/month
		0.24	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.826	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.100	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**142.68**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_L)/D)]^*[1+(N_FF_F/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**95.15**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**226.99**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		12.385	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
	L_{Ti}		
hexane		1.7645	lb/month
benzene		2.0388	lb/month
2,2,4 TMP		2.7061	lb/month
toluene		3.2477	lb/month
ethylbenzene		0.4118	lb/month
xylenes		1.9946	lb/month
naphthalene		0.0941	lb/month
cumene		0.1277	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
	Standing losses		
hexane		1.5389	lb/month
benzene		1.6327	lb/month
2,2,4 TMP		1.8037	lb/month
toluene		1.6685	lb/month
ethylbenzene		0.0959	lb/month
xylenes		0.4154	lb/month
naphthalene		0.0005	lb/month
cumene		0.0149	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
	Working losses		
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	62	0.00331
benzene	78.11	62	0.00351
2,2,4 TMP	114.23	62	0.00388
toluene	92.14	62	0.00359
ethylbenzene	106.17	62	0.00021
xylenes	106.17	62	0.00089
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00003

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.011496	4.826	0.00238
benzene	0.013456	4.826	0.00279
2,2,4 TMP	0.010165	4.826	0.00211
toluene	0.011657	4.826	0.00242
ethylbenzene	0.000582	4.826	0.00012
xylenes	0.002519	4.826	0.00052
naphthalene	0.000003	4.826	0.00000
cumene	0.000080	4.826	0.00002

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**646.69**	lb/month
		0.32	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.093	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.135	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**191.58**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**127.77**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**304.79**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.011	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.6457	lb/month
benzene		3.0412	lb/month
2,2,4 TMP		3.8613	lb/month
toluene		4.4095	lb/month
ethylbenzene		0.4885	lb/month
xylenes		2.3295	lb/month
naphthalene		0.0947	lb/month
cumene		0.1407	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4201	lb/month
benzene		2.6351	lb/month
2,2,4 TMP		2.9589	lb/month
toluene		2.8303	lb/month
ethylbenzene		0.1726	lb/month
xylenes		0.7503	lb/month
naphthalene		0.0011	lb/month
cumene		0.0279	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_I M_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	62	0.00388
benzene	78.11	62	0.00422
2,2,4 TMP	114.23	62	0.00474
toluene	92.14	62	0.00453
ethylbenzene	106.17	62	0.00028
xylenes	106.17	62	0.00120
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(x_I)$	**P_{VA}**	**y_I**
hexane	0.016998	6.093	0.00279
benzene	0.020421	6.093	0.00335
2,2,4 TMP	0.015680	6.093	0.00257
toluene	0.018594	6.093	0.00305
ethylbenzene	0.000984	6.093	0.00016
xylenes	0.004278	6.093	0.00070
naphthalene	0.000005	6.093	0.00000
cumene	0.000141	6.093	0.00002
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**558.00**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.023	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.105	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**164.36**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**109.61**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**261.48**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		20.801	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		3.3139	lb/month
benzene		3.8345	lb/month
2,2,4 TMP		3.7998	lb/month
toluene		5.4036	lb/month
ethylbenzene		0.5595	lb/month
xylenes		2.6415	lb/month
naphthalene		0.0954	lb/month
cumene		0.1534	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.0883	lb/month
benzene		3.4284	lb/month
2,2,4 TMP		3.8974	lb/month
toluene		3.8244	lb/month
ethylbenzene		0.2436	lb/month
xylenes		1.0623	lb/month
naphthalene		0.0017	lb/month
cumene		0.0406	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_I M_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	68	0.00577
benzene	78.11	68	0.00640
2,2,4 TMP	114.23	68	0.00728
toluene	92.14	68	0.00714
ethylbenzene	106.17	68	0.00046
xylenes	106.17	68	0.00198
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(x_I)$	**P_{VA}**	**y_I**
hexane	0.022859	5.023	0.00455
benzene	0.027999	5.023	0.00557
2,2,4 TMP	0.021765	5.023	0.00433
toluene	0.026477	5.023	0.00527
ethylbenzene	0.001464	5.023	0.00029
xylenes	0.006383	5.023	0.00127
naphthalene	0.000009	5.023	0.00000
cumene	0.000216	5.023	0.00004
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**703.37**	lb/month
		0.35	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.068	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**208.98**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**139.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**332.46**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		26.875	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		4.3919	lb/month
benzene		5.1060	lb/month
2,2,4 TMP		6.3008	lb/month
toluene		6.9914	lb/month
ethylbenzene		0.6732	lb/month
xylenes		3.1418	lb/month
naphthalene		0.0964	lb/month
cumene		0.1739	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.1663	lb/month
benzene		4.6999	lb/month
2,2,4 TMP		5.3984	lb/month
toluene		5.4122	lb/month
ethylbenzene		0.3573	lb/month
xylenes		1.5626	lb/month
naphthalene		0.0028	lb/month
cumene		0.0611	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_I M_I / M_V$			
	M_I	**M_V**	**Z_{VI}**
hexane	86.18	68	0.00612
benzene	78.11	68	0.00690
2,2,4 TMP	114.23	68	0.00793
toluene	92.14	68	0.00795
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_I = P_I / P_{VA}$			
	$P_I = P_{VA}(x_I)$	**P_{VA}**	**y_I**
hexane	0.029301	6.068	0.00483
benzene	0.036469	6.068	0.00601
2,2,4 TMP	0.028643	6.068	0.00472
toluene	0.035601	6.068	0.00587
ethylbenzene	0.002040	6.068	0.00034
xylenes	0.008920	6.068	0.00147
naphthalene	0.000013	6.068	0.00000
cumene	0.000308	6.068	0.00005
Liquid Mole Fraction Eq. 40-4 $x_I = (Z_{LI}M_L)/M_I$			
	Z_{LI}	**M_L**	**M_I**	**X_I**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**773.06**	lb/month
		0.39	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.530	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.148	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**230.37**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**153.64**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**366.50**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		29.920	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		4.9229	lb/month
benzene		5.7377	lb/month
2,2,4 TMP		7.0508	lb/month
toluene		7.7949	lb/month
ethylbenzene		0.7319	lb/month
xylenes		3.4004	lb/month
naphthalene		0.0970	lb/month
cumene		0.1846	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.6973	lb/month
benzene		5.3316	lb/month
2,2,4 TMP		6.1484	lb/month
toluene		6.2157	lb/month
ethylbenzene		0.4160	lb/month
xylenes		1.8212	lb/month
naphthalene		0.0034	lb/month
cumene		0.0718	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00626
benzene	78.11	68	0.00710
2,2,4 TMP	114.23	68	0.00819
toluene	92.14	68	0.00828
ethylbenzene	106.17	68	0.00055
xylenes	106.17	68	0.00243
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00010
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.032250	6.530	0.00494
benzene	0.040387	6.530	0.00618
2,2,4 TMP	0.031847	6.530	0.00488
toluene	0.039914	6.530	0.00611
ethylbenzene	0.002319	6.530	0.00036
xylenes	0.010150	6.530	0.00155
naphthalene	0.000016	6.530	0.00000
cumene	0.000353	6.530	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Vi}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$	**LT**	**736.60**	lb/month
		0.37	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.292	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.141	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**219.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**146.17**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**348.69**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		28.318	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		4.6441	lb/month
benzene		5.4057	lb/month
2,2,4 TMP		6.6563	lb/month
toluene		7.3715	lb/month
ethylbenzene		0.7009	lb/month
xylenes		3.2637	lb/month
naphthalene		0.0967	lb/month
cumene		0.1789	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.4185	lb/month
benzene		4.9996	lb/month
2,2,4 TMP		5.7539	lb/month
toluene		5.7923	lb/month
ethylbenzene		0.3850	lb/month
xylenes		1.6845	lb/month
naphthalene		0.0031	lb/month
cumene		0.0661	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00619
benzene	78.11	68	0.00700
2,2,4 TMP	114.23	68	0.00806
toluene	92.14	68	0.00811
ethylbenzene	106.17	68	0.00054
xylenes	106.17	68	0.00236
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.030719	6.292	0.00488
benzene	0.038350	6.292	0.00610
2,2,4 TMP	0.030180	6.292	0.00480
toluene	0.037665	6.292	0.00599
ethylbenzene	0.002173	6.292	0.00035
xylenes	0.009506	6.292	0.00151
naphthalene	0.000014	6.292	0.00000
cumene	0.000330	6.292	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Vi}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**917.34**	lb/month
		0.46	tons/month
Product Type		Gasoline - RVP 13	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.64	
Vapor Pressure Equation Constant B	B	5043.58	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	7.901	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.193	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	L_R	**274.66**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**183.17**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**436.95**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		24.766	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		4.0691	lb/month
benzene		4.6912	lb/month
2,2,4 TMP		5.7871	lb/month
toluene		6.3997	lb/month
ethylbenzene		0.6259	lb/month
xylenes		2.9321	lb/month
naphthalene		0.0959	lb/month
cumene		0.1648	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.8435	lb/month
benzene		4.2851	lb/month
2,2,4 TMP		4.8847	lb/month
toluene		4.8205	lb/month
ethylbenzene		0.3100	lb/month
xylenes		1.3529	lb/month
naphthalene		0.0023	lb/month
cumene		0.0520	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	62	0.00430
benzene	78.11	62	0.00479
2,2,4 TMP	114.23	62	0.00546
toluene	92.14	62	0.00539
ethylbenzene	106.17	62	0.00035
xylenes	106.17	62	0.00151
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024415	7.901	0.00309
benzene	0.030033	7.901	0.00380
2,2,4 TMP	0.023410	7.901	0.00296
toluene	0.028641	7.901	0.00363
ethylbenzene	0.001599	7.901	0.00020
xylenes	0.006976	7.901	0.00088
naphthalene	0.000010	7.901	0.00000
cumene	0.000237	7.901	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Vi}	**M_v**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**685.16**	lb/month
		0.34	tons/month
Product Type		Gasoline - RVP 13.5	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**62.00**	
Vapor Pressure Equation Constant A	A	11.63	
Vapor Pressure Equation Constant B	B	5015.72	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.375	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.143	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**203.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**135.64**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**323.57**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.231	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.6897	lb/month
benzene		3.0898	lb/month
2,2,4 TMP		3.9163	lb/month
toluene		4.4629	lb/month
ethylbenzene		0.4918	lb/month
xylenes		2.3441	lb/month
naphthalene		0.0947	lb/month
cumene		0.1413	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4641	lb/month
benzene		2.6837	lb/month
2,2,4 TMP		3.0139	lb/month
toluene		2.8837	lb/month
ethylbenzene		0.1760	lb/month
xylenes		0.7649	lb/month
naphthalene		0.0011	lb/month
cumene		0.0285	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	62	0.00372
benzene	78.11	62	0.00405
2,2,4 TMP	114.23	62	0.00455
toluene	92.14	62	0.00435
ethylbenzene	106.17	62	0.00027
xylenes	106.17	62	0.00115
naphthalene	128.17	62	0.00000
cumene	120.19	62	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAI}(X_i)$	**P_{VA}**	**y_i**
hexane	0.017057	6.375	0.00268
benzene	0.020496	6.375	0.00321
2,2,4 TMP	0.015739	6.375	0.00247
toluene	0.018670	6.375	0.00293
ethylbenzene	0.000989	6.375	0.00016
xylenes	0.004298	6.375	0.00067
naphthalene	0.000005	6.375	0.00000
cumene	0.000141	6.375	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**590.00**	lb/month
		0.29	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.797	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.126	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**174.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**116.16**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**277.10**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		13.842	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		2.0591	lb/month
benzene		2.3625	lb/month
2,2,4 TMP		3.0715	lb/month
toluene		3.6005	lb/month
ethylbenzene		0.4336	lb/month
xylenes		2.0895	lb/month
naphthalene		0.0943	lb/month
cumene		0.1312	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.8335	lb/month
benzene		1.9564	lb/month
2,2,4 TMP		2.1691	lb/month
toluene		2.0213	lb/month
ethylbenzene		0.1178	lb/month
xylenes		0.5103	lb/month
naphthalene		0.0007	lb/month
cumene		0.0184	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
2,2,4 TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	60	0.00323
benzene	78.11	60	0.00345
2,2,4 TMP	114.23	60	0.00382
toluene	92.14	60	0.00356
ethylbenzene	106.17	60	0.00021
xylenes	106.17	60	0.00090
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAI}(X_i)$	**P_{VA}**	**y_i**
hexane	0.013073	5.797	0.00226
benzene	0.015391	5.797	0.00266
2,2,4 TMP	0.011668	5.797	0.00201
toluene	0.013479	5.797	0.00233
ethylbenzene	0.000682	5.797	0.00012
xylenes	0.002953	5.797	0.00051
naphthalene	0.000003	5.797	0.00000
cumene	0.000094	5.797	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**449.70**	lb/month
		0.22	tons/month
Product Type		Gasoline - RVP 15	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**60.15**	
Vapor Pressure Equation Constant A	A	11.60	
Vapor Pressure Equation Constant B	B	4937.93	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.616	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.095	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**131.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.56**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**87.44**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**208.59**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.858	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		1.4708	lb/month
benzene		1.7056	lb/month
TMP		2.3234	lb/month
toluene		2.8666	lb/month
ethylbenzene		0.3871	lb/month
xylenes		1.8872	lb/month
naphthalene		0.0940	lb/month
cumene		0.1236	lb/month
Individual HAP Monthly Em Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.2452	lb/month
benzene		1.2995	lb/month
TMP		1.4210	lb/month
toluene		1.2874	lb/month
ethylbenzene		0.0713	lb/month
xylenes		0.3080	lb/month
naphthalene		0.0003	lb/month
cumene		0.0108	lb/month
Individual HAP Monthly Em Working losses = $Z_{LI}L_W$			
		Working losses	
hexane		0.2256	lb/month
benzene		0.4061	lb/month
TMP		0.9024	lb/month
toluene		1.5792	lb/month
ethylbenzene		0.3158	lb/month
xylenes		1.5792	lb/month
naphthalene		0.0936	lb/month
cumene		0.1128	lb/month
Vapor Weight Concentratior $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	60	0.00292
benzene	78.11	60	0.00304
2,2,4 TMP	114.23	60	0.00333
toluene	92.14	60	0.00301
ethylbenzene	106.17	60	0.00017
xylenes	106.17	60	0.00072
naphthalene	128.17	60	0.00000
cumene	120.19	60	0.00003
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAI}(X_i)$	**P_{VA}**	**y_i**
hexane	0.009392	4.616	0.00203
benzene	0.010814	4.616	0.00234
2,2,4 TMP	0.008086	4.616	0.00175
toluene	0.009082	4.616	0.00197
ethylbenzene	0.000436	4.616	0.00009
xylenes	0.001886	4.616	0.00041
naphthalene	0.000002	4.616	0.00000
cumene	0.000058	4.616	0.00001
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.01	96	86.18	0.01114
benzene	0.018	96	78.11	0.02212
2,2,4 TMP	0.04	96	114.23	0.03362
toluene	0.07	96	92.14	0.07293
ethylbenzene	0.014	96	106.17	0.01266
xylenes	0.07	96	106.17	0.06329
naphthalene	0.00415	96	128.17	0.00311
cumene	0.005	96	120.19	0.00399
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No.		39	
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Denatured Ethanol (3% Gas)	
Vapor Molecular weight	M_v	**49**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**15.90**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8257.84**	°R
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**179,426,294**	gal/yr
Turnovers	N	**45.45**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type, Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0)	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1]	Type	Qty	Loss Factor Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		183.40 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**929.27**	lb/year
		0.46	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.803	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.014	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**190.57**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	(lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0141831	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC$_N$W$_L$/D)*[1+(N,F$_P$/D)]	**LW**	**308.43**	lb/yr
Annual throughput	Q	4,272,055	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	6.38	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/ft
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**127.09**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	183.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.01	
Average vapor molecular weight	Mv	48.86	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list: Ethanol

Total HAP Annual Average Emissions		679.57
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R+L_F+L_D)+Z_{vL}L_W$		L_{Ti}
hexane		0.458 lb/yr
benzene		0.565 lb/yr
2,2,4 TMP		0.817 lb/yr
toluene		1.075 lb/yr
ethylbenzene		0.156 lb/yr
xylenes		0.761 lb/yr
naphthalene		0.039 lb/yr
cumene		0.050 lb/yr
ethyl alcohol (ethanol)		675.650 lb/yr

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
Ethyl alcohol (ethanol)	46.07	49	0.60639

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_{VA}=P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000268	0.803	0.00033
benzene	0.000322	0.803	0.00040
2,2,4 TMP	0.000247	0.803	0.00031
toluene	0.000293	0.803	0.00036
ethylbenzene	0.000015	0.803	0.00002
xylenes	0.000067	0.803	0.00008
naphthalene	0.000000	0.803	0.00000
cumene	0.000002	0.803	0.00000
Ethyl alcohol (ethanol)	0.516121	0.803	0.64312

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{vi}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0	48.86	128.17	0.00005
cumene	0.0	48.86	120.19	0.00006
Ethyl alcohol (ethanol)	0.970	48.86	46.07	1.02874

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362
Ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.5017

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**39**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**6.38**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**14,952,191**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
		P*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))$^{0.5}$)^2	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data		**Bolted**	
Deck Seam (choose Welded or Bolted)		**Continuous sheet**	
Select Deck Construction Type		**5**	
If bolted continuous sheet or panel, enter width		**0**	
If bolted panel, also enter length		**0.20**	ft/ft^2
Deck seam length factor; Length of Seam / Area of Deck	SD	**Loss Factor**	

Deck Fitting Data		Qty	Kf (Table 7.1-12)
Access Hatch	Bolted cover, gasketed	**2**	1.6
Column Well	Built-up column, gasketed sliding cover	**0**	33.0
Unslotted Guidepole and Well	Gasketed sliding cover w/pole sleeve	**0**	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	**0**	11.0
Gauge-float well (automatic ga	Bolted cover, gasketed	**0**	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	**2**	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	**1**	6.2
Deck drain	Stub drain (1-inch diameter)	**125**	1.2
Legs (IFR type)	IFR type, Adjustable	**0**	7.9
Rim Vent	Weighted mechanical actuation, gasketed	**0**	0.7
Ladder	Sliding cover, gasketed	**0**	56.0
Ladder / Guide-Pole Combinati	Ladder sleeve, gasketed sliding cover	**0**	60.0
	Monthly deck fitting loss factor:	**F_F**	15.28 per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**46.28**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.325	psia
Vapor pressure function Eq. 2-4:			
P*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))$^{0.5}$)^2	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + $K_{Rb}\sqrt{}$)DP* M_v K_c)/12 months	L_R	**6.32**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$/D)*[1+(N$_c$F$_c$/D)]	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**4.21**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**10.05**	lb/month
HAPS Speciation			
Product - select from list		Ethanol	
Total HAP Monthly Emissions		0.239	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{Ti}		
hexane		0.0214	lb/month
benzene		0.0280	lb/month
TMP		0.0462	lb/month
toluene		0.0677	lb/month
ethylbenzene		0.0115	lb/month
xylenes		0.0572	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol {ethanol}		35.8521	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0137	lb/month
benzene		0.0141	lb/month
TMP		0.0154	lb/month
toluene		0.0137	lb/month
ethylbenzene		0.0007	lb/month
xylenes		0.0032	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		10.9210	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**		
hexane		0.0077	lb/month
benzene		0.0139	lb/month
TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol {ethanol}		24.9311	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00067
benzene	78.11	49	0.00069
2,2,4 TMP	114.23	49	0.00075
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.53071

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000122	0.325	0.00038
benzene	0.000139	0.325	0.00043
2,2,4 TMP	0.000104	0.325	0.00032
toluene	0.000115	0.325	0.00035
ethylbenzene	0.000005	0.325	0.00002
xylenes	0.000023	0.325	0.00007
naphthalene	0.000000	0.325	0.00000
cumene	0.000001	0.325	0.00000
ethyl alcohol {ethanol}	0.182727	0.325	0.56285

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.1776

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**48.95**	lb/month
		0.02	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.366	psia
Vapor pressure function Eq. 2-4:			
P*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))$^{0.5}$)^2	**P***	0.006	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + $K_{Rb}\sqrt{}$)DP* M_v K_c)/12 months	L_R	**7.14**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$/D)*[1+(N$_c$F$_c$/D)]	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**4.76**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**11.35**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.247	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{Ti}		
hexane		0.0229	lb/month
benzene		0.0297	lb/month
TMP		0.0481	lb/month
toluene		0.0696	lb/month
ethylbenzene		0.0117	lb/month
xylenes		0.0577	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol {ethanol}		37.5037	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0152	lb/month
benzene		0.0158	lb/month
TMP		0.0173	lb/month
toluene		0.0156	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0037	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol {ethanol}		12.5727	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**		
hexane		0.0077	lb/month
benzene		0.0139	lb/month
TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol {ethanol}		24.9311	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00066
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.54082

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000136	0.366	0.00037
benzene	0.000156	0.366	0.00043
2,2,4 TMP	0.000116	0.366	0.00032
toluene	0.000130	0.366	0.00036
ethylbenzene	0.000006	0.366	0.00002
xylenes	0.000027	0.366	0.00007
naphthalene	0.000000	0.366	0.00000
cumene	0.000001	0.366	0.00000
ethyl alcohol {ethanol}	0.210056	0.366	0.57357

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.2042

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**58.60**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.515	psia
Vapor pressure function Eq. 2-4:			
P*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))$^{0.5}$)^2	**P***	0.009	NA
Rim Seal Losses Eq. 2-3:			
L_R = (((K_{Ra} + $K_{Rb}\sqrt{}$)DP* M_v K_c)/12 months	L_R	**10.10**	lb/month
Withdrawal losses Eq. 2-19:			
L_W=[((0.943)QCsW$_v$/D)*[1+(N$_c$F$_c$/D)]	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
L_F = F_F P*$M_v$$K_c$)	**LF**	**6.73**	lb/month
Deck Seam Losses Eq. 2-18:			
L_D = $K_D$$S_D$$D^2$P*$M_v$$K_c$)/12 months	**LD**	**16.06**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.274	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$	L_{Ti}		
hexane		0.0283	lb/month
benzene		0.0358	lb/month
2,2,4 TMP		0.0550	lb/month
toluene		0.0763	lb/month
ethylbenzene		0.0121	lb/month
xylenes		0.0595	lb/month
naphthalene		0.0032	lb/month
cumene		0.0041	lb/month
ethyl alcohol {ethanol}		43.6636	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0206	lb/month
benzene		0.0219	lb/month
2,2,4 TMP		0.0242	lb/month
toluene		0.0224	lb/month
ethylbenzene		0.0013	lb/month
xylenes		0.0056	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol {ethanol}		18.7325	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$	**Working losses**		
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol {ethanol}		24.9311	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00063
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.56948

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000183	0.515	0.00036
benzene	0.000214	0.515	0.00042
2,2,4 TMP	0.000162	0.515	0.00031
toluene	0.000186	0.515	0.00036
ethylbenzene	0.000009	0.515	0.00002
xylenes	0.000040	0.515	0.00008
naphthalene	0.000000	0.515	0.00000
cumene	0.000001	0.515	0.00000
ethyl alcohol {ethanol}	0.311333	0.515	0.60397

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.3026

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**78.06**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.812	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**16.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**10.72**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**25.57**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.328	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0385	lb/month
benzene		0.0474	lb/month
2,2,4 TMP		0.0685	lb/month
toluene		0.0900	lb/month
ethylbenzene		0.0130	lb/month
xylenes		0.0635	lb/month
naphthalene		0.0032	lb/month
cumene		0.0042	lb/month
ethyl alcohol (ethanol)		56.7300	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0308	lb/month
benzene		0.0335	lb/month
2,2,4 TMP		0.0377	lb/month
toluene		0.0360	lb/month
ethylbenzene		0.0022	lb/month
xylenes		0.0096	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		31.7990	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		24.9311	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60735

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000271	0.812	0.00033
benzene	0.000325	0.812	0.00040
2,2,4 TMP	0.000250	0.812	0.00031
toluene	0.000296	0.812	0.00036
ethylbenzene	0.000016	0.812	0.00002
xylenes	0.000068	0.812	0.00008
naphthalene	0.000000	0.812	0.00000
cumene	0.000002	0.812	0.00000
ethyl alcohol (ethanol)	0.522951	0.812	0.64413

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.5083

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**100.73**	lb/month
		0.05	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.149	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.021	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**23.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**15.36**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**36.64**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.390	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0496	lb/month
benzene		0.0604	lb/month
2,2,4 TMP		0.0838	lb/month
toluene		0.1059	lb/month
ethylbenzene		0.0141	lb/month
xylenes		0.0684	lb/month
naphthalene		0.0032	lb/month
cumene		0.0044	lb/month
ethyl alcohol (ethanol)		72.6462	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0419	lb/month
benzene		0.0466	lb/month
2,2,4 TMP		0.0529	lb/month
toluene		0.0519	lb/month
ethylbenzene		0.0033	lb/month
xylenes		0.0144	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol (ethanol)		47.7151	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		24.9311	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00056
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00071
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.63596

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000364	1.149	0.00032
benzene	0.000446	1.149	0.00039
2,2,4 TMP	0.000347	1.149	0.00030
toluene	0.000422	1.149	0.00037
ethylbenzene	0.000023	1.149	0.00002
xylenes	0.000102	1.149	0.00009
naphthalene	0.000000	1.149	0.00000
cumene	0.000003	1.149	0.00000
ethyl alcohol (ethanol)	0.775173	1.149	0.67447

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.7535

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**127.81**	lb/month
		0.06	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.542	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.028	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**31.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**20.90**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**49.87**	lb/month

HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.462	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} =Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0623	lb/month
benzene		0.0754	lb/month
2,2,4 TMP		0.1015	lb/month
toluene		0.1248	lb/month
ethylbenzene		0.0155	lb/month
xylenes		0.0744	lb/month
naphthalene		0.0032	lb/month
cumene		0.0047	lb/month
ethyl alcohol (ethanol)		92.3001	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0545	lb/month
benzene		0.0615	lb/month
2,2,4 TMP		0.0707	lb/month
toluene		0.0708	lb/month
ethylbenzene		0.0047	lb/month
xylenes		0.0205	lb/month
naphthalene		0.0000	lb/month
cumene		0.0008	lb/month
ethyl alcohol (ethanol)		67.3690	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		24.9311	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.65975

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000467	1.542	0.00030
benzene	0.000581	1.542	0.00038
2,2,4 TMP	0.000456	1.542	0.00030
toluene	0.000567	1.542	0.00037
ethylbenzene	0.000033	1.542	0.00002
xylenes	0.000142	1.542	0.00009
naphthalene	0.000000	1.542	0.00000
cumene	0.000005	1.542	0.00000
ethyl alcohol (ethanol)	1.078714	1.542	0.69971

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805
ethyl alcohol (ethanol)	8.247	1670.4	232.96	1.0486

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**140.95**	lb/month
		0.07	tons/month
Product Type		Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.728	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.032	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**35.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**23.59**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**56.28**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.496	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0682	lb/month
benzene		0.0825	lb/month
2,2,4 TMP		0.1100	lb/month
toluene		0.1340	lb/month
ethylbenzene		0.0161	lb/month
xylenes		0.0774	lb/month
naphthalene		0.0032	lb/month
cumene		0.0048	lb/month
ethyl alcohol {ethanol}		102.0192	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0605	lb/month
benzene		0.0686	lb/month
2,2,4 TMP		0.0791	lb/month
toluene		0.0800	lb/month
ethylbenzene		0.0054	lb/month
xylenes		0.0234	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol {ethanol}		77.0881	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol {ethanol}		24.9311	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00052
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66888
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000514	1.728	0.00030
benzene	0.000643	1.728	0.00037
2,2,4 TMP	0.000507	1.728	0.00029
toluene	0.000636	1.728	0.00037
ethylbenzene	0.000037	1.728	0.00002
xylenes	0.000162	1.728	0.00009
naphthalene	0.000000	1.728	0.00000
cumene	0.000006	1.728	0.00000
ethyl alcohol {ethanol}	1.225733	1.728	0.70938
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.1915

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**134.07**	lb/month
		0.07	tons/month
Product Type		Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is know	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	°R
Average daily maximum ambient temper	T_{AX}	539.70	°R
Average daily minimum ambient temper	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.631	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.030	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**33.27**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**22.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**52.92**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.478	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0651	lb/month
benzene		0.0788	lb/month
2,2,4 TMP		0.1056	lb/month
toluene		0.1292	lb/month
ethylbenzene		0.0158	lb/month
xylenes		0.0758	lb/month
naphthalene		0.0032	lb/month
cumene		0.0047	lb/month
ethyl alcohol {ethanol}		96.9177	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0574	lb/month
benzene		0.0649	lb/month
2,2,4 TMP		0.0747	lb/month
toluene		0.0752	lb/month
ethylbenzene		0.0050	lb/month
xylenes		0.0219	lb/month
naphthalene		0.0000	lb/month
cumene		0.0009	lb/month
ethyl alcohol {ethanol}		71.9866	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol {ethanol}		24.9311	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00053
benzene	78.11	49	0.00060
2,2,4 TMP	114.23	49	0.00069
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00005
xylenes	106.17	49	0.00020
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.66426
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000489	1.631	0.00030
benzene	0.000611	1.631	0.00037
2,2,4 TMP	0.000481	1.631	0.00029
toluene	0.000600	1.631	0.00037
ethylbenzene	0.000035	1.631	0.00002
xylenes	0.000151	1.631	0.00009
naphthalene	0.000000	1.631	0.00000
cumene	0.000005	1.631	0.00000
ethyl alcohol {ethanol}	1.148813	1.631	0.70448
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5369
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861
ethyl alcohol {ethanol}	8.247	1670.4	232.96	1.1167

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**107.07**	lb/month
		0.05	tons/month
Product Type		Denatured Ethanol (3% Gas)	
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	1.242	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.022	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**24.98**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c$)	LF	**16.66**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c$)/12 months	LD	**39.73**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.407	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0527	lb/month
benzene		0.0640	lb/month
2,2,4 TMP		0.0880	lb/month
toluene		0.1103	lb/month
ethylbenzene		0.0144	lb/month
xylenes		0.0698	lb/month
naphthalene		0.0032	lb/month
cumene		0.0045	lb/month
ethyl alcohol {ethanol}		77.1925	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0449	lb/month
benzene		0.0501	lb/month
2,2,4 TMP		0.0571	lb/month
toluene		0.0564	lb/month
ethylbenzene		0.0036	lb/month
xylenes		0.0158	lb/month
naphthalene		0.0000	lb/month
cumene		0.0006	lb/month
ethyl alcohol {ethanol}		52.2614	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol {ethanol}		24.9311	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00055
benzene	78.11	49	0.00062
2,2,4 TMP	114.23	49	0.00070
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00019
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol {ethanol}	46.07	49	0.64229
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(x_i)$	**P_{vA}**	**y_i**
hexane	0.000389	1.242	0.00031
benzene	0.000478	1.242	0.00039
2,2,4 TMP	0.000373	1.242	0.00030
toluene	0.000456	1.242	0.00037
ethylbenzene	0.000025	1.242	0.00002
xylenes	0.000111	1.242	0.00009
naphthalene	0.000000	1.242	0.00000
cumene	0.000004	1.242	0.00000
ethyl alcohol {ethanol}	0.846147	1.242	0.68119
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{vi}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol {ethanol}	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619
ethyl alcohol {ethanol}	8.247	1670.4	232.96	0.8225

MONTH October

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**78.28**	lb/month
		0.04	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.815	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+[1-(P_{vA}/P_A)]^{0.5})^2$	**P***	0.014	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**16.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**10.76**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	LD	**25.67**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.329	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0386	lb/month
benzene		0.0475	lb/month
2,2,4 TMP		0.0687	lb/month
toluene		0.0902	lb/month
ethylbenzene		0.0130	lb/month
xylenes		0.0636	lb/month
naphthalene		0.0032	lb/month
cumene		0.0042	lb/month
ethyl alcohol (ethanol)		56.8790	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0309	lb/month
benzene		0.0337	lb/month
2,2,4 TMP		0.0378	lb/month
toluene		0.0362	lb/month
ethylbenzene		0.0022	lb/month
xylenes		0.0096	lb/month
naphthalene		0.0000	lb/month
cumene		0.0004	lb/month
ethyl alcohol (ethanol)		31.9479	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		24.9311	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00059
benzene	78.11	49	0.00064
2,2,4 TMP	114.23	49	0.00072
toluene	92.14	49	0.00069
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00018
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.60768
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000272	0.815	0.00033
benzene	0.000327	0.815	0.00040
2,2,4 TMP	0.000251	0.815	0.00031
toluene	0.000297	0.815	0.00036
ethylbenzene	0.000016	0.815	0.00002
xylenes	0.000068	0.815	0.00008
naphthalene	0.000000	0.815	0.00000
cumene	0.000002	0.815	0.00000
ethyl alcohol (ethanol)	0.525339	0.815	0.64449
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.5107

MONTH November

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**62.10**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.569	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+[1-(P_{vA}/P_A)]^{0.5})^2$	**P***	0.010	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**11.17**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**7.45**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	LD	**17.78**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.284	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0302	lb/month
benzene		0.0379	lb/month
2,2,4 TMP		0.0575	lb/month
toluene		0.0788	lb/month
ethylbenzene		0.0122	lb/month
xylenes		0.0602	lb/month
naphthalene		0.0032	lb/month
cumene		0.0041	lb/month
ethyl alcohol (ethanol)		45.9636	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0225	lb/month
benzene		0.0240	lb/month
2,2,4 TMP		0.0266	lb/month
toluene		0.0248	lb/month
ethylbenzene		0.0014	lb/month
xylenes		0.0063	lb/month
naphthalene		0.0000	lb/month
cumene		0.0002	lb/month
ethyl alcohol (ethanol)		21.0326	lb/month
Individual HAP Monthly Emissions Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
2,2,4 TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		24.9311	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00062
benzene	78.11	49	0.00066
2,2,4 TMP	114.23	49	0.00073
toluene	92.14	49	0.00068
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00017
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.57780
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000200	0.569	0.00035
benzene	0.000235	0.569	0.00041
2,2,4 TMP	0.000178	0.569	0.00031
toluene	0.000206	0.569	0.00036
ethylbenzene	0.000010	0.569	0.00002
xylenes	0.000045	0.569	0.00008
naphthalene	0.000000	0.569	0.00000
cumene	0.000001	0.569	0.00000
ethyl alcohol (ethanol)	0.348894	0.569	0.61279
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.3391

MONTH December

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**50.42**	lb/month
		0.03	tons/month
Product Type	Denatured Ethanol (3% Gas)		
Monthly Throughput (only change if actual is known)	Q_{month}	356,004.55	barrels/month
Vapor Molecular weight	M_v	**48.86**	
Vapor Pressure Equation Constant A	A	15.90	
Vapor Pressure Equation Constant B	B	8257.84	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.389	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+[1-(P_{vA}/P_A)]^{0.5})^2$	**P***	0.007	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_c)/12$ months	L_R	**7.59**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_V)/D]*[1+(N_CF_C/D)]$	L_W	**25.70**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	LF	**5.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	LD	**12.07**	lb/month
HAPS Speciation			
Product - same as January		Ethanol	
Total HAP Monthly Emissions		0.251	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0238	lb/month
benzene		0.0306	lb/month
TMP		0.0492	lb/month
toluene		0.0706	lb/month
ethylbenzene		0.0117	lb/month
xylenes		0.0579	lb/month
naphthalene		0.0032	lb/month
cumene		0.0040	lb/month
ethyl alcohol (ethanol)		38.4220	lb/month
Individual HAP Monthly Emi Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0161	lb/month
benzene		0.0168	lb/month
TMP		0.0183	lb/month
toluene		0.0166	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0040	lb/month
naphthalene		0.0000	lb/month
cumene		0.0001	lb/month
ethyl alcohol (ethanol)		13.4909	lb/month
Individual HAP Monthly Emi Working losses $= Z_iL_W$			
		Working losses	
hexane		0.0077	lb/month
benzene		0.0139	lb/month
TMP		0.0308	lb/month
toluene		0.0540	lb/month
ethylbenzene		0.0108	lb/month
xylenes		0.0540	lb/month
naphthalene		0.0032	lb/month
cumene		0.0039	lb/month
ethyl alcohol (ethanol)		24.9311	lb/month
Vapor Weight Concentration $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	49	0.00065
benzene	78.11	49	0.00068
2,2,4 TMP	114.23	49	0.00074
toluene	92.14	49	0.00067
ethylbenzene	106.17	49	0.00004
xylenes	106.17	49	0.00016
naphthalene	128.17	49	0.00000
cumene	120.19	49	0.00001
ethyl alcohol (ethanol)	46.07	49	0.54588
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000143	0.389	0.00037
benzene	0.000165	0.389	0.00042
2,2,4 TMP	0.000123	0.389	0.00032
toluene	0.000139	0.389	0.00036
ethylbenzene	0.000007	0.389	0.00002
xylenes	0.000029	0.389	0.00007
naphthalene	0.000000	0.389	0.00000
cumene	0.000001	0.389	0.00000
ethyl alcohol (ethanol)	0.225218	0.389	0.57894
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0.0003	48.86	86.18	0.00017
benzene	0.00054	48.86	78.11	0.00034
2,2,4 TMP	0.0012	48.86	114.23	0.00051
toluene	0.0021	48.86	92.14	0.00111
ethylbenzene	0.00042	48.86	106.17	0.00019
xylenes	0.0021	48.86	106.17	0.00097
naphthalene	0.0001245	48.86	128.17	0.00005
cumene	0.00015	48.86	120.19	0.00006
ethyl alcohol (ethanol)	0.97	48.86	46.07	1.02874
Component Vapor pressure $P_{VA}=\{0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146
ethyl alcohol (ethanol)	8.247	1670.4	232.96	0.2189

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 39			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Crude RVP 12.5	
Vapor Molecular weight	M_v	**50**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**10.38**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**4189.71**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**46,042,517**	gal/yr
Turnovers	N	**11.66**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			183.40 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**4,607.52**	lb/year
		2.30	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	9.026	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.237	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**1,306.16**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_vW_v/D)*[1+(N_cF_c/D)]$	**LW**	**352.31**	lb/yr
Annual throughput	Q	1,096,250	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0060	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**871.09**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	183.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.24	
Average vapor molecular weight	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Deck Seam Losses (Eq.2-18: LD = KDSDD2P*MvKc)	**LD**	**2,077.97**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.24	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	50.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	0.40	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Crude Oil
Total HAP Annual Average Emissions		45.94
Individual HAP Annual Average Emist Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		L_{TI}
	hexane	13.718 lb/yr
	benzene	13.276 lb/yr
	2,2,4 TMP	1.292 lb/yr
	toluene	8.655 lb/yr
	ethylbenzene	2.034 lb/yr
	xylenes	6.834 lb/yr
	naphthalene	0.131 lb/yr
	cumene	0.000 lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	50	0.00289
benzene	78.11	50	0.00262
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00121
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.015148	9.026	0.00168
benzene	0.015155	9.026	0.00168
2,2,4 TMP	0.000872	9.026	0.00010
toluene	0.005906	9.026	0.00065
ethylbenzene	0.000624	9.026	0.00007
xylenes	0.001899	9.026	0.00021
naphthalene	0.000001	9.026	0.00000
cumene	0.000000	9.026	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0	207	128.17	0.00059
cumene	0.0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**39**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**12.50**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**0.40**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**3,836,876**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft^{n}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0060**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**125**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	15.28	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**214.10**	lb/month
		0.11	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3°TAA + 0.7°TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	5.702	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.124	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**56.71**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	L_W	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**37.82**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**90.22**	lb/month
HAPS Speciation			
Product - select from list		Crude Oil	
Total HAP Monthly Emissions		2.100	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.5036	lb/month
benzene		0.5084	lb/month
TMP		0.0564	lb/month
toluene		0.4319	lb/month
ethylbenzene		0.1324	lb/month
xylenes		0.4561	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.3861	lb/month
benzene		0.3322	lb/month
TMP		0.0271	lb/month
toluene		0.1383	lb/month
ethylbenzene		0.0149	lb/month
xylenes		0.0451	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00209
benzene	78.11	50	0.00180
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00075
ethylbenzene	106.17	50	0.00008
xylenes	106.17	50	0.00024
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.006915	5.702	0.00121
benzene	0.006565	5.702	0.00115
2,2,4 TMP	0.000366	5.702	0.00006
toluene	0.002316	5.702	0.00041
ethylbenzene	0.000217	5.702	0.00004
xylenes	0.000656	5.702	0.00012
naphthalene	0.000000	5.702	0.00000
cumene	0.000000	5.702	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**229.33**	lb/month
		0.11	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3°TAA + 0.7°TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	6.062	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**61.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	L_W	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**40.94**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**97.65**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.233	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.5544	lb/month
benzene		0.5548	lb/month
TMP		0.0603	lb/month
toluene		0.4533	lb/month
ethylbenzene		0.1350	lb/month
xylenes		0.4640	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4369	lb/month
benzene		0.3786	lb/month
TMP		0.0310	lb/month
toluene		0.1597	lb/month
ethylbenzene		0.0175	lb/month
xylenes		0.0530	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00218
benzene	78.11	50	0.00189
2,2,4 TMP	114.23	50	0.00015
toluene	92.14	50	0.00080
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00027
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.007685	6.062	0.00127
benzene	0.007347	6.062	0.00121
2,2,4 TMP	0.000411	6.062	0.00007
toluene	0.002627	6.062	0.00043
ethylbenzene	0.000250	6.062	0.00004
xylenes	0.000757	6.062	0.00012
naphthalene	0.000000	6.062	0.00000
cumene	0.000000	6.062	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**282.32**	lb/month
		0.14	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3°TAA + 0.7°TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	7.210	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.169	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**77.65**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]^*[1+(N_FF_c/D)]$	L_W	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**51.78**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**123.53**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.735	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.7431	lb/month
benzene		0.7293	lb/month
TMP		0.0752	lb/month
toluene		0.5358	lb/month
ethylbenzene		0.1453	lb/month
xylenes		0.4955	lb/month
naphthalene		0.0109	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.6257	lb/month
benzene		0.5532	lb/month
TMP		0.0458	lb/month
toluene		0.2423	lb/month
ethylbenzene		0.0279	lb/month
xylenes		0.0844	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	50	0.00247
benzene	78.11	50	0.00219
2,2,4 TMP	114.23	50	0.00018
toluene	92.14	50	0.00096
ethylbenzene	106.17	50	0.00011
xylenes	106.17	50	0.00033
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.010346	7.210	0.00143
benzene	0.010092	7.210	0.00140
2,2,4 TMP	0.000572	7.210	0.00008
toluene	0.003747	7.210	0.00052
ethylbenzene	0.000374	7.210	0.00005
xylenes	0.001133	7.210	0.00016
naphthalene	0.000001	7.210	0.00000
cumene	0.000000	7.210	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**387.36**	lb/month
		0.19	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.079	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.240	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**109.89**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**73.29**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**174.83**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.867	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1572	lb/month
benzene		1.1196	lb/month
2,2,4 TMP		0.1088	lb/month
toluene		0.7279	lb/month
ethylbenzene		0.1704	lb/month
xylenes		0.5722	lb/month
naphthalene		0.0109	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0398	lb/month
benzene		0.9435	lb/month
2,2,4 TMP		0.0795	lb/month
toluene		0.4343	lb/month
ethylbenzene		0.0530	lb/month
xylenes		0.1612	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00290
benzene	78.11	50	0.00264
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00121
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.015299	9.079	0.00169
benzene	0.015316	9.079	0.00169
2,2,4 TMP	0.000882	9.079	0.00010
toluene	0.005977	9.079	0.00066
ethylbenzene	0.000633	9.079	0.00007
xylenes	0.001925	9.079	0.00021
naphthalene	0.000001	9.079	0.00000
cumene	0.000000	9.079	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**519.59**	lb/month
		0.26	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	10.830	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.328	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**150.48**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**100.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**239.40**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.449	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.7226	lb/month
benzene		1.6611	lb/month
2,2,4 TMP		1.1560	lb/month
toluene		1.0035	lb/month
ethylbenzene		0.2079	lb/month
xylenes		0.6871	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.6052	lb/month
benzene		1.4850	lb/month
2,2,4 TMP		0.1266	lb/month
toluene		0.7099	lb/month
ethylbenzene		0.0905	lb/month
xylenes		0.2761	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00327
benzene	78.11	50	0.00303
2,2,4 TMP	114.23	50	0.00026
toluene	92.14	50	0.00145
ethylbenzene	106.17	50	0.00018
xylenes	106.17	50	0.00056
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.020573	10.830	0.00190
benzene	0.020999	10.830	0.00194
2,2,4 TMP	0.001224	10.830	0.00011
toluene	0.008510	10.830	0.00079
ethylbenzene	0.000941	10.830	0.00009
xylenes	0.002872	10.830	0.00027
naphthalene	0.000002	10.830	0.00000
cumene	0.000000	10.830	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**717.73**	lb/month
		0.36	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.570	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.461	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**211.30**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**140.92**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**336.15**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		7.961	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.6066	lb/month
benzene		2.5162	lb/month
2,2,4 TMP		0.2309	lb/month
toluene		1.4484	lb/month
ethylbenzene		0.2699	lb/month
xylenes		0.8778	lb/month
naphthalene		0.0112	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.4892	lb/month
benzene		2.3400	lb/month
2,2,4 TMP		0.2016	lb/month
toluene		1.1548	lb/month
ethylbenzene		0.1525	lb/month
xylenes		0.4668	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	50	0.00362
benzene	78.11	50	0.00340
2,2,4 TMP	114.23	50	0.00029
toluene	92.14	50	0.00168
ethylbenzene	106.17	50	0.00022
xylenes	106.17	50	0.00068
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.026371	12.570	0.00210
benzene	0.027352	12.570	0.00218
2,2,4 TMP	0.001611	12.570	0.00013
toluene	0.011443	12.570	0.00091
ethylbenzene	0.001311	12.570	0.00010
xylenes	0.004014	12.570	0.00032
naphthalene	0.000003	12.570	0.00000
cumene	0.000000	12.570	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**849.51**	lb/month
		0.42	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	13.318	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.549	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**251.75**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_t)/D]^*[1+(N_c F_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**167.89**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**400.51**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		9.651	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		3.1981	lb/month
benzene		3.0901	lb/month
2,2,4 TMP		0.2814	lb/month
toluene		1.7495	lb/month
ethylbenzene		0.3123	lb/month
xylenes		1.0083	lb/month
naphthalene		0.0113	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.0807	lb/month
benzene		2.9139	lb/month
2,2,4 TMP		0.2520	lb/month
toluene		1.4559	lb/month
ethylbenzene		0.1949	lb/month
xylenes		0.5972	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_i L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00376
benzene	78.11	50	0.00355
2,2,4 TMP	114.23	50	0.00031
toluene	92.14	50	0.00178
ethylbenzene	106.17	50	0.00024
xylenes	106.17	50	0.00073
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029025	13.318	0.00218
benzene	0.030290	13.318	0.00227
2,2,4 TMP	0.001791	13.318	0.00013
toluene	0.012830	13.318	0.00096
ethylbenzene	0.001490	13.318	0.00011
xylenes	0.004567	13.318	0.00034
naphthalene	0.000003	13.318	0.00000
cumene	0.000000	13.318	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li} M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**775.90**	lb/month
		0.39	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is know	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	12.933	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.500	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**229.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_t)/D]^*[1+(N_c F_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**152.82**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**364.56**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		8.708	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		2.8681	lb/month
benzene		2.7698	lb/month
2,2,4 TMP		0.2532	lb/month
toluene		1.5814	lb/month
ethylbenzene		0.2886	lb/month
xylenes		0.9354	lb/month
naphthalene		0.0112	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.7507	lb/month
benzene		2.5937	lb/month
2,2,4 TMP		0.2239	lb/month
toluene		1.2878	lb/month
ethylbenzene		0.1712	lb/month
xylenes		0.5243	lb/month
naphthalene		0.0004	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_i L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00368
benzene	78.11	50	0.00347
2,2,4 TMP	114.23	50	0.00030
toluene	92.14	50	0.00173
ethylbenzene	106.17	50	0.00023
xylenes	106.17	50	0.00070
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.027647	12.933	0.00214
benzene	0.028763	12.933	0.00222
2,2,4 TMP	0.001698	12.933	0.00013
toluene	0.012107	12.933	0.00094
ethylbenzene	0.001397	12.933	0.00011
xylenes	0.004278	12.933	0.00033
naphthalene	0.000003	12.933	0.00000
cumene	0.000000	12.933	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li} M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**560.61**	lb/month
		0.28	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	11.265	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A)/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.356	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V)^n D P^* M_v K_c)/12$ months	**L_R**	**163.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W = [((0.943) Q C s W_t)/D]^*[1+(N_c F_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**108.75**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**259.43**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		5.961	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_i L_W$			
		L_{Ti}	
hexane		1.9036	lb/month
benzene		1.8356	lb/month
2,2,4 TMP		0.1712	lb/month
toluene		1.0936	lb/month
ethylbenzene		0.2204	lb/month
xylenes		0.7254	lb/month
naphthalene		0.0110	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.7861	lb/month
benzene		1.6594	lb/month
2,2,4 TMP		0.1419	lb/month
toluene		0.8000	lb/month
ethylbenzene		0.1029	lb/month
xylenes		0.3143	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = $Z_i L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	50	0.00336
benzene	78.11	50	0.00312
2,2,4 TMP	114.23	50	0.00027
toluene	92.14	50	0.00151
ethylbenzene	106.17	50	0.00019
xylenes	106.17	50	0.00059
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.021974	11.265	0.00195
benzene	0.022524	11.265	0.00200
2,2,4 TMP	0.001317	11.265	0.00012
toluene	0.009206	11.265	0.00082
ethylbenzene	0.001028	11.265	0.00009
xylenes	0.003139	11.265	0.00028
naphthalene	0.000002	11.265	0.00000
cumene	0.000000	11.265	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li} M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**388.55**	lb/month
		0.19	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	9.097	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.241	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**110.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**73.53**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**175.41**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		3.881	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		1.1622	lb/month
benzene		1.1243	lb/month
2,2,4 TMP		0.1092	lb/month
toluene		0.7302	lb/month
ethylbenzene		0.1707	lb/month
xylenes		0.5732	lb/month
naphthalene		0.0109	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0447	lb/month
benzene		0.9482	lb/month
2,2,4 TMP		0.0799	lb/month
toluene		0.4366	lb/month
ethylbenzene		0.0533	lb/month
xylenes		0.1621	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00291
benzene	78.11	50	0.00264
2,2,4 TMP	114.23	50	0.00022
toluene	92.14	50	0.00122
ethylbenzene	106.17	50	0.00015
xylenes	106.17	50	0.00045
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.015351	9.097	0.00169
benzene	0.015372	9.097	0.00169
2,2,4 TMP	0.000885	9.097	0.00010
toluene	0.006001	9.097	0.00066
ethylbenzene	0.000636	9.097	0.00007
xylenes	0.001934	9.097	0.00021
naphthalene	0.000001	9.097	0.00000
cumene	0.000000	9.097	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**301.19**	lb/month
		0.15	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	7.583	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.182	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**83.44**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**55.65**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**132.74**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.927	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.8141	lb/month
benzene		0.7956	lb/month
2,2,4 TMP		0.0809	lb/month
toluene		0.5679	lb/month
ethylbenzene		0.1494	lb/month
xylenes		0.5080	lb/month
naphthalene		0.0109	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.6967	lb/month
benzene		0.6195	lb/month
2,2,4 TMP		0.0515	lb/month
toluene		0.2743	lb/month
ethylbenzene		0.0320	lb/month
xylenes		0.0969	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
2,2,4 TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00256
benzene	78.11	50	0.00228
2,2,4 TMP	114.23	50	0.00019
toluene	92.14	50	0.00101
ethylbenzene	106.17	50	0.00012
xylenes	106.17	50	0.00036
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.011275	7.583	0.00149
benzene	0.011062	7.583	0.00146
2,2,4 TMP	0.000629	7.583	0.00008
toluene	0.004152	7.583	0.00055
ethylbenzene	0.000420	7.583	0.00006
xylenes	0.001274	7.583	0.00017
naphthalene	0.000001	7.583	0.00000
cumene	0.000000	7.583	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**237.56**	lb/month
		0.12	tons/month
Product Type		Crude RVP 12.5	
Monthly Throughput (only change if actual is known)	Q_{month}	91,354.20	barrels/month
Vapor Molecular weight	M_v	**50.00**	
Vapor Pressure Equation Constant A	A	10.38	
Vapor Pressure Equation Constant B	B	4189.71	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.250	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.139	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**63.91**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)^*[1+(N_cF_c/D)]$	**L_W**	**29.36**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**42.62**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**101.67**	lb/month
HAPS Speciation			
Product - same as January		Crude Oil	
Total HAP Monthly Emissions		2.307	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.5825	lb/month
benzene		0.5806	lb/month
TMP		0.0625	lb/month
toluene		0.4653	lb/month
ethylbenzene		0.1365	lb/month
xylenes		0.4685	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.4651	lb/month
benzene		0.4045	lb/month
TMP		0.0332	lb/month
toluene		0.1717	lb/month
ethylbenzene		0.0190	lb/month
xylenes		0.0575	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.1174	lb/month
benzene		0.1762	lb/month
TMP		0.0294	lb/month
toluene		0.2936	lb/month
ethylbenzene		0.1174	lb/month
xylenes		0.4110	lb/month
naphthalene		0.0108	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentratior $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	50	0.00223
benzene	78.11	50	0.00194
2,2,4 TMP	114.23	50	0.00016
toluene	92.14	50	0.00082
ethylbenzene	106.17	50	0.00009
xylenes	106.17	50	0.00028
naphthalene	128.17	50	0.00000
cumene	120.19	50	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(X_i)$	**P_{VA}**	**y_i**
hexane	0.008101	6.250	0.00130
benzene	0.007773	6.250	0.00124
2,2,4 TMP	0.000436	6.250	0.00007
toluene	0.002798	6.250	0.00045
ethylbenzene	0.000269	6.250	0.00004
xylenes	0.000813	6.250	0.00013
naphthalene	0.000000	6.250	0.00000
cumene	0.000000	6.250	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.004	207	86.18	0.00961
benzene	0.006	207	78.11	0.01590
2,2,4 TMP	0.001	207	114.23	0.00181
toluene	0.01	207	92.14	0.02247
ethylbenzene	0.004	207	106.17	0.00780
xylenes	0.014	207	106.17	0.02730
naphthalene	0.0003684	207	128.17	0.00059
cumene	0	207	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in *Green.* ***Select Cells in*** *Red* ***to open the drop down selection list.***

	Symbol		Units
Tank No. 39			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Distillate Fuel Oil No.2	
Vapor Molecular weight	M_v	**130**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	°R
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**142,220,220**	gal/yr
Turnovers	N	**36.03**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		Riveted	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.00	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_C	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{RZ}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{RD}	**0.003**	lb-mole/(mph)^{2}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2

Deck Fitting Data [1/]	**Type**	**Qty**	**Loss Factor Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
Total deck fitting loss factor Eq. 2-14:			183.40 per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**282.22**	lb/year
		0.14	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**3.12**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0000873	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: L_{WD}=(0.943*QC,W$_L$/D)*[1+(N,F$_C$/D)]	**LW**	**272.06**	lb/yr
Annual throughput	Q	3,386,196	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.10	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**2.08**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	183.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**4.96**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	125.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.00	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	130.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

	Product - select from list:	Diesel
Total HAP Annual Average Emissions		2.01
Individual HAP Annual Average Emist Eq. 40-2 $L_{TI}=Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$		
		L_{TI}
hexane		0.005 lb/yr
benzene		0.024 lb/yr
2,2,4 TMP		0.000 lb/yr
toluene		0.331 lb/yr
ethylbenzene		0.065 lb/yr
xylenes		1.373 lb/yr
naphthalene		0.210 lb/yr
cumene		0.000 lb/yr

Vapor Weight Concentrations Eq. 40-1 $Z_{VI}= y_iM_i / M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02396
ethylbenzene	106.17	130	0.00296
xylenes	106.17	130	0.05747
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000003	0.005	0.00068
benzene	0.000018	0.005	0.00361
2,2,4 TMP	0.000000	0.005	-
toluene	0.000172	0.005	0.03380
ethylbenzene	0.000018	0.005	0.00363
xylenes	0.000357	0.005	0.07036
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0	188	128.17	0.00111
cumene	0.0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**39**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**11,851,685**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**125**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	F_F	15.28	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**22.99**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.16**	lb/month
HAPS Speciation			
Product - select from list		Diesel	
Total HAP Monthly Emissions		0.120	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0002	lb/month
benzene		0.0010	lb/month
TMP		0.0000	lb/month
toluene		0.0152	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0826	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0008	lb/month
TMP		0.0000	lb/month
toluene		0.0080	lb/month
ethylbenzene		0.0009	lb/month
xylenes		0.0168	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00054
benzene	78.11	130	0.00250
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02493
ethylbenzene	106.17	130	0.00274
xylenes	106.17	130	0.05267
naphthalene	128.17	130	0.00025
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00082
benzene	0.000008	0.002	0.00415
2,2,4 TMP	0.000000	0.002	-
toluene	0.000067	0.002	0.03518
ethylbenzene	0.000006	0.002	0.00335
xylenes	0.000123	0.002	0.06449
naphthalene	0.000000	0.002	0.00025
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.03**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.11**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.18**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.124	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0163	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0851	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0090	lb/month
ethylbenzene		0.0010	lb/month
xylenes		0.0194	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00053
benzene	78.11	130	0.00245
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02483
ethylbenzene	106.17	130	0.00277
xylenes	106.17	130	0.05338
naphthalene	128.17	130	0.00026
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.002	0.00080
benzene	0.000009	0.002	0.00408
2,2,4 TMP	0.000000	0.002	-
toluene	0.000076	0.002	0.03504
ethylbenzene	0.000007	0.002	0.00339
xylenes	0.000142	0.002	0.06536
naphthalene	0.000001	0.002	0.00026
cumene	0.000000	0.002	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.20**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.16**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c)$	**LF**	**0.11**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.26**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.138	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.0003	lb/month
benzene		0.0014	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0201	lb/month
ethylbenzene		0.0045	lb/month
xylenes		0.0948	lb/month
naphthalene		0.0173	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0012	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0129	lb/month
ethylbenzene		0.0015	lb/month
xylenes		0.0290	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$

	M_i	M_v	Z_{Vi}
hexane	86.18	130	0.00049
benzene	78.11	130	0.00233
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02450
ethylbenzene	106.17	130	0.00286
xylenes	106.17	130	0.05528
naphthalene	128.17	130	0.00030
cumene	120.19	130	0.00000

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000002	0.003	0.00075
benzene	0.000012	0.003	0.00388
2,2,4 TMP	0.000000	0.003	-
toluene	0.000109	0.003	0.03457
ethylbenzene	0.000011	0.003	0.00350
xylenes	0.000213	0.003	0.06769
naphthalene	0.000001	0.003	0.00031
cumene	0.000000	0.003	-

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$

	Z_{Li}	M_L	M_i	X_i
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000

Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.53**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.42**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.168	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0278	lb/month
ethylbenzene		0.0055	lb/month
xylenes		0.1151	lb/month
naphthalene		0.0175	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0205	lb/month
ethylbenzene		0.0025	lb/month
xylenes		0.0493	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02394
ethylbenzene	106.17	130	0.00297
xylenes	106.17	130	0.05752
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00068
benzene	0.000019	0.005	0.00361
2,2,4 TMP	0.000000	0.005	-
toluene	0.000174	0.005	0.03378
ethylbenzene	0.000019	0.005	0.00363
xylenes	0.000362	0.005	0.07043
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.92**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.38**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.26**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.61**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.204	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0005	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0365	lb/month
ethylbenzene		0.0067	lb/month
xylenes		0.1394	lb/month
naphthalene		0.0177	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0005	lb/month
benzene		0.0025	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0292	lb/month
ethylbenzene		0.0038	lb/month
xylenes		0.0736	lb/month
naphthalene		0.0005	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00041
benzene	78.11	130	0.00204
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02343
ethylbenzene	106.17	130	0.00303
xylenes	106.17	130	0.05899
naphthalene	128.17	130	0.00042
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.007	0.00062
benzene	0.000025	0.007	0.00340
2,2,4 TMP	0.000000	0.007	-
toluene	0.000247	0.007	0.03306
ethylbenzene	0.000028	0.007	0.00371
xylenes	0.000540	0.007	0.07223
naphthalene	0.000003	0.007	0.00043
cumene	0.000000	0.007	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**24.38**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**0.53**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.35**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.84**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.246	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{VI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0007	lb/month
benzene		0.0035	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0466	lb/month
ethylbenzene		0.0082	lb/month
xylenes		0.1686	lb/month
naphthalene		0.0180	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{VI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0033	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0393	lb/month
ethylbenzene		0.0053	lb/month
xylenes		0.1029	lb/month
naphthalene		0.0008	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00039
benzene	78.11	130	0.00194
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02295
ethylbenzene	106.17	130	0.00308
xylenes	106.17	130	0.06006
naphthalene	128.17	130	0.00048
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.010	0.00058
benzene	0.000033	0.010	0.00323
2,2,4 TMP	0.000000	0.010	-
toluene	0.000333	0.010	0.03239
ethylbenzene	0.000039	0.010	0.00377
xylenes	0.000755	0.010	0.07354
naphthalene	0.000005	0.010	0.00048
cumene	0.000000	0.010	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**24.61**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.012	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.59**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_FF_r/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.40**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.95**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.266	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0008	lb/month
benzene		0.0039	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0513	lb/month
ethylbenzene		0.0089	lb/month
xylenes		0.1828	lb/month
naphthalene		0.0181	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0441	lb/month
ethylbenzene		0.0060	lb/month
xylenes		0.1171	lb/month
naphthalene		0.0010	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00038
benzene	78.11	130	0.00190
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02276
ethylbenzene	106.17	130	0.00309
xylenes	106.17	130	0.06043
naphthalene	128.17	130	0.00050
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000007	0.012	0.00057
benzene	0.000037	0.012	0.00316
2,2,4 TMP	0.000000	0.012	-
toluene	0.000373	0.012	0.03211
ethylbenzene	0.000044	0.012	0.00379
xylenes	0.000859	0.012	0.07399
naphthalene	0.000006	0.012	0.00050
cumene	0.000000	0.012	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**24.49**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is know	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.011	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.56**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_FF_r/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.37**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.89**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.255	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0007	lb/month
benzene		0.0037	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0489	lb/month
ethylbenzene		0.0086	lb/month
xylenes		0.1754	lb/month
naphthalene		0.0180	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0007	lb/month
benzene		0.0035	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0416	lb/month
ethylbenzene		0.0056	lb/month
xylenes		0.1096	lb/month
naphthalene		0.0009	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00038
benzene	78.11	130	0.00192
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02286
ethylbenzene	106.17	130	0.00309
xylenes	106.17	130	0.06024
naphthalene	128.17	130	0.00049
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000006	0.011	0.00058
benzene	0.000035	0.011	0.00319
2,2,4 TMP	0.000000	0.011	-
toluene	0.000352	0.011	0.03225
ethylbenzene	0.000041	0.011	0.00378
xylenes	0.000805	0.011	0.07376
naphthalene	0.000005	0.011	0.00049
cumene	0.000000	0.011	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**24.03**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.008	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**0.42**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_FF_r/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.28**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.66**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.213	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		0.0006	lb/month
benzene		0.0029	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0389	lb/month
ethylbenzene		0.0071	lb/month
xylenes		0.1462	lb/month
naphthalene		0.0177	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0006	lb/month
benzene		0.0027	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0316	lb/month
ethylbenzene		0.0041	lb/month
xylenes		0.0805	lb/month
naphthalene		0.0006	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	130	0.00041
benzene	78.11	130	0.00201
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02331
ethylbenzene	106.17	130	0.00305
xylenes	106.17	130	0.05929
naphthalene	128.17	130	0.00044
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000005	0.008	0.00061
benzene	0.000027	0.008	0.00335
2,2,4 TMP	0.000000	0.008	-
toluene	0.000268	0.008	0.03289
ethylbenzene	0.000030	0.008	0.00373
xylenes	0.000591	0.008	0.07260
naphthalene	0.000004	0.008	0.00044
cumene	0.000000	0.008	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.53**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.26**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.18**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.42**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.169	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0004	lb/month
benzene		0.0020	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0279	lb/month
ethylbenzene		0.0055	lb/month
xylenes		0.1153	lb/month
naphthalene		0.0175	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0004	lb/month
benzene		0.0019	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0206	lb/month
ethylbenzene		0.0026	lb/month
xylenes		0.0496	lb/month
naphthalene		0.0003	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00045
benzene	78.11	130	0.00217
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02394
ethylbenzene	106.17	130	0.00297
xylenes	106.17	130	0.05754
naphthalene	128.17	130	0.00037
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.005	0.00067
benzene	0.000019	0.005	0.00360
2,2,4 TMP	0.000000	0.005	-
toluene	0.000174	0.005	0.03377
ethylbenzene	0.000019	0.005	0.00363
xylenes	0.000364	0.005	0.07045
naphthalene	0.000002	0.005	0.00037
cumene	0.000000	0.005	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.26**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.004	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.18**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.29**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.144	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0003	lb/month
benzene		0.0015	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0215	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0984	lb/month
naphthalene		0.0173	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0003	lb/month
benzene		0.0013	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0143	lb/month
ethylbenzene		0.0017	lb/month
xylenes		0.0326	lb/month
naphthalene		0.0002	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00048
benzene	78.11	130	0.00230
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02439
ethylbenzene	106.17	130	0.00289
xylenes	106.17	130	0.05580
naphthalene	128.17	130	0.00032
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000003	0.004	0.00073
benzene	0.000013	0.004	0.00382
2,2,4 TMP	0.000000	0.004	-
toluene	0.000121	0.004	0.03441
ethylbenzene	0.000012	0.004	0.00353
xylenes	0.000240	0.004	0.06832
naphthalene	0.000001	0.004	0.00032
cumene	0.000000	0.004	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.06**	lb/month
		0.01	tons/month
Product Type		Distillate Fuel Oil No.2	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**130.00**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**0.12**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**22.67**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**0.08**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.19**	lb/month
HAPS Speciation			
Product - same as January		Diesel	
Total HAP Monthly Emissions		0.126	lb/month
Individual HAP Monthly Em Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$			
		L_{TI}	
hexane		0.0002	lb/month
benzene		0.0011	lb/month
TMP		0.0000	lb/month
toluene		0.0169	lb/month
ethylbenzene		0.0040	lb/month
xylenes		0.0866	lb/month
naphthalene		0.0173	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Standing losses $= Z_{vI}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0002	lb/month
benzene		0.0009	lb/month
TMP		0.0000	lb/month
toluene		0.0096	lb/month
ethylbenzene		0.0011	lb/month
xylenes		0.0208	lb/month
naphthalene		0.0001	lb/month
cumene		0.0000	lb/month
Individual HAP Monthly Em Working losses $= Z_{LI}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0002	lb/month
TMP		0.0000	lb/month
toluene		0.0073	lb/month
ethylbenzene		0.0029	lb/month
xylenes		0.0657	lb/month
naphthalene		0.0172	lb/month
cumene		0.0000	lb/month
Vapor Weight Concentration $Z_{VI} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{VI}**
hexane	86.18	130	0.00052
benzene	78.11	130	0.00243
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02478
ethylbenzene	106.17	130	0.00279
xylenes	106.17	130	0.05373
naphthalene	128.17	130	0.00027
cumene	120.19	130	0.00000
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VAE}(X_i)$	**P_{VA}**	**y_i**
hexane	0.000002	0.002	0.00079
benzene	0.000009	0.002	0.00405
2,2,4 TMP	0.000000	0.002	-
toluene	0.000081	0.002	0.03496
ethylbenzene	0.000008	0.002	0.00341
xylenes	0.000153	0.002	0.06579
naphthalene	0.000001	0.002	0.00027
cumene	0.000000	0.002	-
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{LI}M_L)/M_i$			
	Z_{LI}	**M_L**	**M_i**	**X_i**
hexane	0.000001	188	86.18	0.00000
benzene	0.000008	188	78.11	0.00002
2,2,4 TMP	0	188	114.23	0.00000
toluene	0.00032	188	92.14	0.00065
ethylbenzene	0.00013	188	106.17	0.00023
xylenes	0.0029	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0	188	120.19	0.00000
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAI}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146

IFRT TANK EMISSION CALCULATION

INPUT DATA				
Input data in Green. Select Cells in Red to open the drop down selection list.				
	Symbol			Units
Tank No.	39			
Nearest US Location		Albany, NY		
Time Period		**Annual**		
Absolute Pressure	P_A	14.55	psi	
Product Information				
Product Type (annual average, see below for monthly calcs)		Biodiesel		
Vapor Molecular weight	M_v	**32**	Lb/lb-mole	
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**12.10**		
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**8907.00**	^oR	
Average organic liquid density	W_L	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00		
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**142,220,220**	gal/yr	
Turnovers	N	**36.03**	per year	
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft	
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft	
Tank Construction (pick from drop down list)		Riveted		
Tank Color (pick from drop down list)		Gray, light		
Tank Shell Condition (pick from drop down list)		Average		
Tank Interior Condition (pick from drop down list)		Light Rust		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		
Internal floating roof design data				
Rim Seal Type, Vapor-mounted seal | Rim-mounted secondary				
Rim Seal Fit (Average or Tight fitting)		Average		
Number of fixed roof support columns	Nc	**0.00**	NA	
Effective column diameter (1.1 for fix7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	1.00	ft	
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr	
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr	
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft*yr	
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph	
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA	
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2	
Deck Design Data				
Deck Seam (choose Welded or Bolted)		Bolted		
Select Deck Construction Type		Continuous sheet		
If bolted continuous sheet or panel, enter width		5		
If bolted panel, also enter length				
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2	

			Loss Factor
Deck Fitting Data [1]	**Type**	**Qty**	**Kf (Table 7.1-12)**
Access Hatch	Bolted cover, gasketed	2	1.6
Column Well	Built-up column, gasketed sliding cover	0	33.0
Unslotted Guidepole/Well	Gasketed sliding cover w/pole sleeve	0	8.6
Slotted guidepole/sample well	Gasketed sliding cover, with pole sleeve	0	11.0
Gauge-float well (auto gauge)	Bolted cover, gasketed	0	2.8
Gauge-hatch/sample port	Slit fabric seal, 10% open area	2	12.0
Vacuum Breaker	Weighted mechanical actuation, gasketed	1	6.2
Deck drain	Stub drain (1-inch diameter)	125	1.2
Legs (IFR type)	IFR type, Adjustable	0	7.9
Rim Vent	Weighted mechanical actuation, gasketed	0	0.7
Ladder	Sliding cover, gasketed	0	56.0
Ladder/guidepole combination	Ladder sleeve, gasketed sliding cover	0	60.0
	Total deck fitting loss factor Eq. 2-14:		183.40 per year

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS			
	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**282.23**	lb/year
		0.14	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	0.005	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.000	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**0.77**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)nft*yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Seal-related wind speed exponent; see Table 7.1-8	n	4.30	NA
Vapor pressure function	P*	0.0000873	NA
Tank diameter	D	125.00	ft
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_WW_L/D)[1+(N_FF_C/D)]$	**LW**	**279.72**	lb/yr
Annual throughput	Q	3,386,196	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	7.30	lb/gal
Tank diameter	D	125.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	0.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.00	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**0.51**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	183.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.00	
Average vapor molecular weight	Mv	32.04	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	^oR
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	^oR
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	^oR
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	^oR
Liquid bulk temperature (Equation 1-31)	TB	510.25	^oR
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	^oR
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation				
		Product - select from list:	biodiesel	
Total HAP Annual Average Emissions			21.15	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{Ti}=Z_{vi}(L_R + L_F + L_C) + Z_{Li}L_{WF}$				
			L_{Ti}	
hexane			0.000	lb/yr
benzene			0.000	lb/yr
2,2,4 TMP			0.000	lb/yr
toluene			0.000	lb/yr
ethylbenzene			0.000	lb/yr
xylenes			0.000	lb/yr
naphthalene			0.000	lb/yr
cumene			10.577	lb/yr
methanol			10.577	lb/yr
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_iM_i / M_v$				
		M_i	**M_v**	**Z_{vi}**
hexane		86.18	32	0.00000
benzene		78.11	32	0.00000
2,2,4 TMP		114.23	32	0.00000
toluene		92.14	32	0.00000
ethylbenzene		106.17	32	0.00000
xylenes		106.17	32	0.00000
cumene		120.19	32	0.00000
methanol		32.04	32	3.99885
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				
		$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane		0.000000	0.005	-
benzene		0.000000	0.005	-
2,2,4 TMP		0.000000	0.005	-
toluene		0.000000	0.005	-
ethylbenzene		0.000000	0.005	-
xylenes		0.000000	0.005	-
naphthalene		0.000000	0.005	-
cumene		0.000000	0.005	-
methanol		0.020308	0.005	3.99885
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$				
		Z_{Li}	**M_L**	**M_i**	**X_i**
hexane		0	277.4	86.18	0.00000
benzene		0	277.4	78.11	0.00000
2,2,4 TMP		0	277.4	114.23	0.00000
toluene		0	277.4	92.14	0.00000
ethylbenzene		0	277.4	106.17	0.00000
xylenes		0	277.4	106.17	0.00000
naphthalene		0	277.4	128.17	0.00000
cumene		0	277.4	120.19	0.00000
methanol		0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VA}=(0.019337)10^{A-(B/(TLA+C))}$				
		A	**B**	**C**	**P_{VA}**
hexane		6.878	1171.5	224.37	1.5766
benzene		6.906	1211	220.79	0.9531
2,2,4 TMP		6.812	1257.8	220.74	0.4814
toluene		7.017	1377.6	222.64	0.2629
ethylbenzene		6.95	1419.3	212.61	0.0801
xylenes		7.009	1462.3	215.11	0.0696
naphthalene		7.146	1831.6	211.82	0.0017
cumene		6.929	1455.8	207.2	0.0362
methanol		8.079	1581.3	239.65	1.1728

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**39**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_C	**1.00**	
Tank design data		**0**	
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**11,851,685**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**22.50**	ft
Tank Construction (pick from drop down list)		**Riveted**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal** | **Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**0.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0	Fc	**1.00**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft-yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	**2**	1.6	
Column Well — Built-up column, gasketed sliding cover	**0**	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	**0**	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	**0**	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	**0**	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	**2**	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	**1**	6.2	
Deck drain — Stub drain (1-inch diameter)	**125**	1.2	
Legs (IFR type) — IFR type, Adjustable	**0**	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	**0**	0.7	
Ladder — Sliding cover, gasketed	**0**	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	**0**	60.0	
Monthly deck fitting loss factor:	**F_F**	15.28	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.39**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.02**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L/D]^*[1+(N_CF_C/D)]$	L_W	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	**LD**	**0.04**	lb/month
HAPS Speciation	Product - select from list		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$	**L_{TI}**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3761	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3295	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$	**Working losses**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.18930

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.008015	0.002	4.18930

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116
methanol	8.079	1581.3	239.65	0.4629

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.40**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L/D]^*[1+(N_CF_C/D)]$	L_W	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	**LD**	**0.04**	lb/month
HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$	**L_{TI}**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4198	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3732	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$	**Working losses**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month

Vapor Weight Concentrations Eq. 40-6-t $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.16680

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009079	0.002	4.16680

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135
methanol	8.079	1581.3	239.65	0.5243

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.44**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	I	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.003	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*M_vK_C)/12$ months	L_R	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[(0.943)QCsW_L/D]^*[1+(N_CF_C/D)]$	L_W	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_C)$	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_v)/12$ months	**LD**	**0.06**	lb/month
HAPS Speciation	Product - same as January		
		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{vI}(L_R + L_F + L_D) + Z_{LI}L_W$	**L_{TI}**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5773	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vI}(L_R + L_F + L_D)$	**Standing losses**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5307	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{LI}L_W$	**Working losses**		
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.09805

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.003	-
benzene	0.000000	0.003	-
2,2,4 TMP	0.000000	0.003	-
toluene	0.000000	0.003	-
ethylbenzene	0.000000	0.003	-
xylenes	0.000000	0.003	-
naphthalene	0.000000	0.003	-
cumene	0.000000	0.003	-
methanol	0.012910	0.003	4.09805

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$

	Z_{Li}	M_v	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208
methanol	8.079	1581.3	239.65	0.7456

MONTH April

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.52**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**0.06**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.10**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8913	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8447	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.99612

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.020549	0.005	3.99612

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$

	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367
methanol	8.079	1581.3	239.65	1.1867

MONTH May

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.62**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.007	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**0.09**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.06**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.15**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2493	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.2027	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month

Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.91062

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.007	-
benzene	0.000000	0.007	-
2,2,4 TMP	0.000000	0.007	-
toluene	0.000000	0.007	-
ethylbenzene	0.000000	0.007	-
xylenes	0.000000	0.007	-
naphthalene	0.000000	0.007	-
cumene	0.000000	0.007	-
methanol	0.029255	0.007	3.91062

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$

	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563
methanol	8.079	1581.3	239.65	1.6895

MONTH June

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.73**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.010	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	**L_R**	**0.13**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_cF_c/D)]$	**L_W**	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**0.21**	lb/month

HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_vL_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.6653	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.6187	lb/month
Individual HAP Monthly Emissions Working losses $= Z_vL_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month

Vapor Weight Concentrations Eq. $Z_{vi} = y_iM_i / M_v$

	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.83376

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$

	$P_i = P_{vA}(x_i)$	P_{vA}	y_i
hexane	0.000000	0.010	-
benzene	0.000000	0.010	-
2,2,4 TMP	0.000000	0.010	-
toluene	0.000000	0.010	-
ethylbenzene	0.000000	0.010	-
xylenes	0.000000	0.010	-
naphthalene	0.000000	0.010	-
cumene	0.000000	0.010	-
methanol	0.039376	0.010	3.83376

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_vM_v)/M_l$

	Z_{Li}	M_v	M_l	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732

Component Vapor pressure $P_{vAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{vAi}
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805
methanol	8.079	1581.3	239.65	2.2737

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.79**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1872.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**531.35**	^oR
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	^oR
Average daily minimum ambient temperature, Ta	T_{AN}	521.70	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**537.97**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.012	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.15**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**0.10**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.23**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.8625	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.8159	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month
Vapor Weight Concentrations Eq. 40-4 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.80286
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.012	-
benzene	0.000000	0.012	-
2,2,4 TMP	0.000000	0.012	-
toluene	0.000000	0.012	-
ethylbenzene	0.000000	0.012	-
xylenes	0.000000	0.012	-
naphthalene	0.000000	0.012	-
cumene	0.000000	0.012	-
methanol	0.044164	0.012	3.80286
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923
methanol	8.079	1581.3	239.65	2.5505

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.76**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is know	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1640.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**530.15**	^oR
Average daily maximum ambient temper	T_{AX}	539.70	^oR
Average daily minimum ambient temper	T_{AN}	520.60	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**535.95**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.011	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ month	L_R	**0.14**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**0.09**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.22**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7597	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.7130	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.81861
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.011	-
benzene	0.000000	0.011	-
2,2,4 TMP	0.000000	0.011	-
toluene	0.000000	0.011	-
ethylbenzene	0.000000	0.011	-
xylenes	0.000000	0.011	-
naphthalene	0.000000	0.011	-
cumene	0.000000	0.011	-
methanol	0.041664	0.011	3.81861
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5369
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861
methanol	8.079	1581.3	239.65	2.4061

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**23.64**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	^oR
Daily total solar insolation on a horizontal surface	I	1300.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**522.05**	^oR
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	^oR
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	^oR
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**526.65**	^oR
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	0.008	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	L_R	**0.10**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	L_W	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	LF	**0.07**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	LD	**0.16**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3478	lb/month
Individual HAP Monthly Emissions Standing losses $=Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		1.3012	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	M_v	Z_{vi}
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.89069
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{vA}$			
	$P_i = P_{vA}(X_i)$	P_{vA}	y_i
hexane	0.000000	0.008	-
benzene	0.000000	0.008	-
2,2,4 TMP	0.000000	0.008	-
toluene	0.000000	0.008	-
ethylbenzene	0.000000	0.008	-
xylenes	0.000000	0.008	-
naphthalene	0.000000	0.008	-
cumene	0.000000	0.008	-
methanol	0.031651	0.008	3.89069
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	M_L	M_i	X_i
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{vai}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	P_{VAi}
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619
methanol	8.079	1581.3	239.65	1.8278

MONTH October			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.52**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	511.28	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.005	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	**L_R**	**0.07**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.04**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.10**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8948	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.8482	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	3.99517
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000000	0.005	-
benzene	0.000000	0.005	-
2,2,4 TMP	0.000000	0.005	-
toluene	0.000000	0.005	-
ethylbenzene	0.000000	0.005	-
xylenes	0.000000	0.005	-
naphthalene	0.000000	0.005	-
cumene	0.000000	0.005	-
methanol	0.020633	0.005	3.99517
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978
benzene	6.906	1211	220.79	0.9667
2,2,4 TMP	6.812	1257.8	220.74	0.4886
toluene	7.017	1377.6	222.64	0.2671
ethylbenzene	6.95	1419.3	212.61	0.0815
xylenes	7.009	1462.3	215.11	0.0709
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0369
methanol	8.079	1581.3	239.65	1.1916

MONTH November			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.45**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	500.73	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.004	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	**L_R**	**0.04**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.03**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.07**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.6343	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.5877	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
2,2,4 TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.07675
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000000	0.004	-
benzene	0.000000	0.004	-
2,2,4 TMP	0.000000	0.004	-
toluene	0.000000	0.004	-
ethylbenzene	0.000000	0.004	-
xylenes	0.000000	0.004	-
naphthalene	0.000000	0.004	-
cumene	0.000000	0.004	-
methanol	0.014297	0.004	4.07675
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.1735
benzene	6.906	1211	220.79	0.6957
2,2,4 TMP	6.812	1257.8	220.74	0.3471
toluene	7.017	1377.6	222.64	0.1848
ethylbenzene	6.95	1419.3	212.61	0.0538
xylenes	7.009	1462.3	215.11	0.0467
naphthalene	7.146	1831.6	211.82	0.0010
cumene	6.929	1455.8	207.2	0.0236
methanol	8.079	1581.3	239.65	0.8256

MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_B+L_W+L_F+L_D$)	**LT**	**23.41**	lb/month
		0.01	tons/month
Product Type		Biodiesel	
Monthly Throughput (only change if actual is known)	Q_{month}	282,182.98	barrels/month
Vapor Molecular weight	M_v	**32.04**	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.00	°R
Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 as I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	0.002	psia
Vapor pressure function Eq. 2-4:			
$P^*=P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.000	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^n)DP^*\ M_v K_c)/12$ months	**L_R**	**0.03**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**23.31**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_v K_c)$	**LF**	**0.02**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**0.05**	lb/month
HAPS Speciation			
Product - same as January		biodiesel	
Total HAP Monthly Emissions		0.000	lb/month
Individual HAP Monthly Emi Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.4438	lb/month
Individual HAP Monthly Emi Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.3972	lb/month
Individual HAP Monthly Emi Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0000	lb/month
benzene		0.0000	lb/month
TMP		0.0000	lb/month
toluene		0.0000	lb/month
ethylbenzene		0.0000	lb/month
xylenes		0.0000	lb/month
naphthalene		0.0000	lb/month
cumene		0.0000	lb/month
methanol		0.0466	lb/month
Vapor Weight Concentration $Z_{vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{vi}**
hexane	86.18	32	0.00000
benzene	78.11	32	0.00000
2,2,4 TMP	114.23	32	0.00000
toluene	92.14	32	0.00000
ethylbenzene	106.17	32	0.00000
xylenes	106.17	32	0.00000
naphthalene	128.17	32	0.00000
cumene	120.19	32	0.00000
methanol	32.04	32	4.15518
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{vai}(x_i)$	**P_{VA}**	**y_i**
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	-
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.000000	0.002	-
cumene	0.000000	0.002	-
methanol	0.009663	0.002	4.15518
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{vi}M_v)/M_i$			
	Z_{Li}	**M_v**	**M_i**	**X_i**
hexane	0	277.4	86.18	0.00000
benzene	0	277.4	78.11	0.00000
2,2,4 TMP	0	277.4	114.23	0.00000
toluene	0	277.4	92.14	0.00000
ethylbenzene	0	277.4	106.17	0.00000
xylenes	0	277.4	106.17	0.00000
naphthalene	0	277.4	128.17	0.00000
cumene	0	277.4	120.19	0.00000
methanol	0.002	277.4	32.04	0.01732
Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0146
methanol	8.079	1581.3	239.65	0.5580

IFRT TANK EMISSION CALCULATION

INPUT DATA

Input data in Green. Select Cells in Red to open the drop down selection list.

	Symbol		Units
Tank No. 130			
Nearest US Location		Albany, NY	
Time Period		**Annual**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Product Type (annual average, see below for monthly calcs)		Gasoline - RVP 9	
Vapor Molecular weight	M_v	**68**	Lb/lb-mole
Vapor Pressure Equation Constant A (Figure 7.1-15)	A	**11.76**	
Vapor Pressure Equation Constant B (Figure 7.1-15)	B	**5315.06**	°R
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**9.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Tank design data			
Shell height	Hs	**48.00**	ft
Diameter	D	**75.00**	ft
Throughput	Q	**1,449,252**	gal/yr
Turnovers	N	**0.95**	per year
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		Welded	
Tank Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: Vapor-mounted seal | Rim-mounted secondary			
Rim Seal Fit (Average or Tight fitting)		Average	
Number of fixed roof support columns	Nc	**6.00**	NA
Effective column diameter (1.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if c	Fc	1.10	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	K_D	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	**0.003**	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		Bolted	
Select Deck Construction Type		Continuous sheet	
If bolted continuous sheet or panel, enter width		5	
If bolted panel, also enter length			
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data [1/] **Type**	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	6	33.0	
Unslotted Guidepole/Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (auto gauge) — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	45	1.2	
Legs (IFR type) — IFR type, Adjustable	30	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder/guidepole combination — Ladder sleeve, gasketed sliding cover	1	60.0	
Total deck fitting loss factor Eq. 2-14:		570.40	per year

[1/] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

ROUTINE EMISSIONS CALCULATIONS

	Symbol		Units
Total Losses (Eq.2-1 & 2-2: LT = LR+LW+LF+LD)	**LT**	**4,853.49**	lb/year
		2.43	ton/year
Data based on specific time averaging period			
True Vapor Pressure Eq. 1-25 PvA = exp(A-(B/TLA))	PvA	3.986	psia
Vapor pressure function; P*=PVA/PA/(1+(1-(PVA/PA))^0.5)^2	P*	0.080	
Daily total solar insolation on a horizontal surface	I	**1180.0**	Btu/ft^2-day
Rim Seal Losses (Eq.2-3: LR = (KRa + KRb v^n)DP* Mv Kc)	**LR**	**896.15**	lb/year
Zero wind speed LR factor; see Table 7.1-8	K_{Ra}	2.20	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	K_{Rb}	0.00	lb-mole/(mph)^{n}ft^{2}yr
Average ambient wind speed at tank site; if IFR use Zero	v	0.00	mph
Withdrawal losses Eq.2-19: $L_{WD}=(0.943*QC_kW_L/D)*[1+(N_kF_c/D)]$	**LW**	**3.97**	lb/yr
Annual throughput	Q	34,506	bbl/yr
Shell clingage factor; see Table 7.1-10	Cs	0.0015	bbl/1,000 ft2
Average organic liquid density	W_L	5.60	lb/gal
Tank diameter	D	75.00	ft
Constant		0.943	1,000 ft3*gal/bbl2
Number of fixed roof support columns	Nc	6.00	NA
Effective column diameter; 1.1, 0.7, or 1.0	Fc	1.10	ft
Deck Fitting Losses (Eq.2-13: LF = FF P*MvKc)	**LF**	**3,097.96**	lb/yr
Total deck fitting loss factor; see Eq. 2-14	FF	570.40	lb-mole/year
Vapor pressure function; see Figure 7.1-19	P*	0.08	
Average vapor molecular weight	Mv	68.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Deck Seam Losses (Eq.2-18: LD = KDSD2P*MvKc)	**LD**	**855.42**	lb/yr
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	0.14	lb-mole/ft-yr
Deck seam length factor; Length of Seam / Area of Deck	SD	0.20	ft/ft2
Tank diameter	D	75.00	ft
Vapor pressure function; see Figure 7.1-19	P*	0.08	NA
Average vapor molecular weight; see Note 1 to Equation 1-21	Mv	68.00	lb/lb-mole
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	NA
Average Daily Ambient Temperature; see Equation 1-30			
TAA = ((TAX+TAN)/2)	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R
Average Daily Liquid Surface Temperature (TLA) Eq 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**TLA**	**512.37**	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	°R
Liquid bulk temperature (Equation 1-31)	TB	510.25	°R
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	**TB**	510.25	°R
Average daily ambient temperature (Equation 1-30)	TAA	508.20	
Tank paint solar absorptance, dimensionless, Table 7.1-6	αs	0.58	
Daily total solar insolation on a horizontal surface, Btu/(ft2 day)	I	1180	Btu/(ft2 day)

HAPS Speciation

Product - select from list:	Gasoline	
Total HAP Annual Average Emissions	126.94	
Individual HAP Annual Average Emiss Eq. 40-2 $L_{TI}=Z_{VI}(L_R+L_F+L_D)+Z_{LI}L_W$		
	L_{TI}	
hexane	25.990	lb/yr
benzene	28.309	lb/yr
2,2,4 TMP	31.852	lb/yr
toluene	30.568	lb/yr
ethylbenzene	1.900	lb/yr
xylenes	8.295	lb/yr
naphthalene	0.028	lb/yr
cumene	0.318	lb/yr

Vapor Weight Concentrations Eq. 40-t $Z_{VI}=y_iM_i/M_V$

	M_i	M_V	Z_{VI}
hexane	86.18	68	0.00535
benzene	78.11	68	0.00582
2,2,4 TMP	114.23	68	0.00654
toluene	92.14	68	0.00625
ethylbenzene	106.17	68	0.00038
xylenes	106.17	68	0.00165
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00006

Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$

	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.016831	3.986	0.00422
benzene	0.020207	3.986	0.00507
2,2,4 TMP	0.015509	3.986	0.00389
toluene	0.018375	3.986	0.00461
ethylbenzene	0.000971	3.986	0.00024
xylenes	0.004221	3.986	0.00106
naphthalene	0.000005	3.986	0.00000
cumene	0.000139	3.986	0.00003

Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_i)/M_L$

	Z_{Li}	M_L	M_i	X_i
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.0	92	128.17	0.00298
cumene	0.0	92	120.19	0.00383

Component Vapor pressure $P_{VAi}=(0.019337)10^{(A-(B/(TLA+C)))}$

	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.5766
benzene	6.906	1211	220.79	0.9531
2,2,4 TMP	6.812	1257.8	220.74	0.4814
toluene	7.017	1377.6	222.64	0.2629
ethylbenzene	6.95	1419.3	212.61	0.0801
xylenes	7.009	1462.3	215.11	0.0696
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0362

5,342.00 lb/yr

MONTHLY IFRT TANK VOC AND HAP ESTIMATIONS

INPUT DATA	Symbol		Units
Tank No.	**130**		
Nearest US Location		**Albany, NY**	
Absolute Pressure	P_A	14.55	psi
Product Information			
Average organic liquid density	W_L	**5.60**	lb/gal
Average Reid Vapor Pressure	RVP	**9.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	K_c	**1.00**	
Tank design data		**0**	
Shell height	Hs	**48.00**	ft
Diameter	D	**75.00**	ft
Throughput	Q	**120,771**	gal/month
Maximum Filling Height (use Hs-1 if unknown)	H_{LX}	**47.00**	ft
Minimum Filling Height (use 1 if unknown)	H_{LN}	**1.00**	ft
Liquid height (assume 1/2 Hs)	H_L	**24.00**	ft
Tank Construction (pick from drop down list)		**Welded**	
Tank Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Internal floating roof design data			
Rim Seal Type: **Vapor-mounted seal | Rim-mounted secondary**			
Rim Seal Fit (Average or Tight fitting)		**Average**	
Number of fixed roof support columns	Nc	**6.00**	NA
Effective column diameter (3.1 for 9x7 in. built up columns; 0.7 for 8 in. pipe columns; 1.0 if u	Fc	**1.10**	ft
Deck seam loss per unit seam length factor; 0.0 or 0.14	KD	**0.14**	lb-mole/ft-yr
Zero wind speed LR factor; see Table 7.1-8	KRa	**2.2**	lb-mole/ft-yr
Wind speed dependent LR factor; see Table 7.1-8	KRb	**0.0**	lb-mole/(mph)^{n}ft*yr
Average ambient wind speed at tank site; for IFR use Zero	v	**0.0**	mph
Seal-related wind speed exponent; see Table 7.1-8	n	**4.3**	NA
Shell clingage factor; see Table 7.1-10	Cs	**0.0015**	bbl/1,000 ft^2
Deck Design Data			
Deck Seam (choose Welded or Bolted)		**Bolted**	
Select Deck Construction Type		**Continuous sheet**	
If bolted continuous sheet or panel, enter width		**5**	
If bolted panel, also enter length		**0**	
Deck seam length factor; Length of Seam / Area of Deck	SD	**0.20**	ft/ft^2
		Loss Factor	
Deck Fitting Data	**Qty**	**Kf (Table 7.1-12)**	
Access Hatch — Bolted cover, gasketed	2	1.6	
Column Well — Built-up column, gasketed sliding cover	6	33.0	
Unslotted Guidepole and Well — Gasketed sliding cover w/pole sleeve	0	8.6	
Slotted guidepole/sample well — Gasketed sliding cover, with pole sleeve	0	11.0	
Gauge-float well (automatic ga — Bolted cover, gasketed	0	2.8	
Gauge-hatch/sample port — Slit fabric seal, 10% open area	1	12.0	
Vacuum Breaker — Weighted mechanical actuation, gasketed	1	6.2	
Deck drain — Stub drain (1-inch diameter)	45	1.2	
Legs (IFR type) — IFR type, Adjustable	30	7.9	
Rim Vent — Weighted mechanical actuation, gasketed	0	0.7	
Ladder — Sliding cover, gasketed	0	56.0	
Ladder / Guide-Pole Combinati — Ladder sleeve, gasketed sliding cover	1	60.0	
Monthly deck fitting loss factor:	F_F	47.53	per month

[1] Deck legs determined from AP-42 Table 7.1-15. Stub drains determined from AP-42 7.1-15. All other fitting data taken from assumptions provided in Global IFR roof summary table

MONTH January

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**210.27**	lb/month
		0.11	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	532.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	475.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	484.18	
Average Daily Liquid Surface Temperature Eq. 2-6			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**485.13**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	2.226	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.041	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**38.80**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**134.12**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**37.03**	lb/month
HAPS Speciation			
Product - select from list		Gasoline	
Total HAP Monthly Emissions		4.165	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		0.9216	lb/month
benzene		0.9541	lb/month
TMP		1.0432	lb/month
toluene		0.9438	lb/month
ethylbenzene		0.0544	lb/month
xylenes		0.2377	lb/month
naphthalene		0.0016	lb/month
cumene		0.0090	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		0.9183	lb/month
benzene		0.9481	lb/month
TMP		1.0299	lb/month
toluene		0.9207	lb/month
ethylbenzene		0.0497	lb/month
xylenes		0.2146	lb/month
naphthalene		0.0002	lb/month
cumene		0.0074	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00437
benzene	78.11	68	0.00452
2,2,4 TMP	114.23	68	0.00491
toluene	92.14	68	0.00439
ethylbenzene	106.17	68	0.00024
xylenes	106.17	68	0.00102
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.007684	2.226	0.00345
benzene	0.008753	2.226	0.00393
2,2,4 TMP	0.006502	2.226	0.00292
toluene	0.007205	2.226	0.00324
ethylbenzene	0.000338	2.226	0.00015
xylenes	0.001457	2.226	0.00065
naphthalene	0.000001	2.226	0.00000
cumene	0.000044	2.226	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.7198
benzene	6.906	1211	220.79	0.4129
2,2,4 TMP	6.812	1257.8	220.74	0.2018
toluene	7.017	1377.6	222.64	0.1031
ethylbenzene	6.95	1419.3	212.61	0.0278
xylenes	7.009	1462.3	215.11	0.0240
naphthalene	7.146	1831.6	211.82	0.0004
cumene	6.929	1455.8	207.2	0.0116

MONTH February

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**228.81**	lb/month
		0.11	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	789.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	477.80	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	487.17	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**488.59**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	2.406	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.045	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**42.22**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**145.95**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**40.30**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		4.706	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.0310	lb/month
benzene		1.0746	lb/month
TMP		1.1792	lb/month
toluene		1.0748	lb/month
ethylbenzene		0.0564	lb/month
xylenes		0.2726	lb/month
naphthalene		0.0016	lb/month
cumene		0.0103	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.0277	lb/month
benzene		1.0687	lb/month
TMP		1.1660	lb/month
toluene		1.0516	lb/month
ethylbenzene		0.0578	lb/month
xylenes		0.2494	lb/month
naphthalene		0.0003	lb/month
cumene		0.0087	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00450
benzene	78.11	68	0.00468
2,2,4 TMP	114.23	68	0.00510
toluene	92.14	68	0.00460
ethylbenzene	106.17	68	0.00025
xylenes	106.17	68	0.00109
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.008538	2.406	0.00355
benzene	0.009797	2.406	0.00407
2,2,4 TMP	0.007309	2.406	0.00304
toluene	0.008173	2.406	0.00340
ethylbenzene	0.000390	2.406	0.00016
xylenes	0.001682	2.406	0.00070
naphthalene	0.000002	2.406	0.00000
cumene	0.000052	2.406	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	0.7998
benzene	6.906	1211	220.79	0.4621
2,2,4 TMP	6.812	1257.8	220.74	0.2269
toluene	7.017	1377.6	222.64	0.1169
ethylbenzene	6.95	1419.3	212.61	0.0321
xylenes	7.009	1462.3	215.11	0.0277
naphthalene	7.146	1831.6	211.82	0.0005
cumene	6.929	1455.8	207.2	0.0135

MONTH March

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**291.87**	lb/month
		0.15	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1096.0	Btu/ft^2-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	T_{AA}	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	486.10	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 αs I	T_B	496.71	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	T_{LA}	**498.68**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	P_{vA}	2.998	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{VA}/P_A/(1+(1-(P_{VA}/P_A))^{0.5})^2$	**P***	0.058	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}v^n)DP^*M_vK_c)/12$ months	L_R	**53.87**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	L_W	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**186.24**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_D D^2P^*M_vK_c)/12$ months	**LD**	**51.42**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		6.678	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{TI} = Z_{Vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{TI}	
hexane		1.4201	lb/month
benzene		1.5091	lb/month
2,2,4 TMP		1.6737	lb/month
toluene		1.5592	lb/month
ethylbenzene		0.0930	lb/month
xylenes		0.4056	lb/month
naphthalene		0.0018	lb/month
cumene		0.0154	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{Vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		1.4168	lb/month
benzene		1.5031	lb/month
2,2,4 TMP		1.6605	lb/month
toluene		1.5360	lb/month
ethylbenzene		0.0883	lb/month
xylenes		0.3824	lb/month
naphthalene		0.0005	lb/month
cumene		0.0137	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00486
benzene	78.11	68	0.00516
2,2,4 TMP	114.23	68	0.00570
toluene	92.14	68	0.00527
ethylbenzene	106.17	68	0.00030
xylenes	106.17	68	0.00131
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00005
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.011496	2.998	0.00383
benzene	0.013456	2.998	0.00449
2,2,4 TMP	0.010165	2.998	0.00339
toluene	0.011657	2.998	0.00389
ethylbenzene	0.000582	2.998	0.00019
xylenes	0.002519	2.998	0.00084
naphthalene	0.000003	2.998	0.00000
cumene	0.000080	2.998	0.00003
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_v)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.0768
benzene	6.906	1211	220.79	0.6347
2,2,4 TMP	6.812	1257.8	220.74	0.3155
toluene	7.017	1377.6	222.64	0.1668
ethylbenzene	6.95	1419.3	212.61	0.0480
xylenes	7.009	1462.3	215.11	0.0415
naphthalene	7.146	1831.6	211.82	0.0009
cumene	6.929	1455.8	207.2	0.0208

MONTH April			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**408.01**	lb/month
		0.20	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1496.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	497.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	510.05	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.74**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.016	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.081	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**75.34**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**260.43**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**71.91**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		10.736	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		2.1902	lb/month
benzene		2.3871	lb/month
2,2,4 TMP		2.6870	lb/month
toluene		2.5807	lb/month
ethylbenzene		0.1606	lb/month
xylenes		0.7011	lb/month
naphthalene		0.0024	lb/month
cumene		0.0269	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		2.1869	lb/month
benzene		2.3812	lb/month
2,2,4 TMP		2.6737	lb/month
toluene		2.5575	lb/month
ethylbenzene		0.1560	lb/month
xylenes		0.6780	lb/month
naphthalene		0.0010	lb/month
cumene		0.0252	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00536
benzene	78.11	68	0.00584
2,2,4 TMP	114.23	68	0.00656
toluene	92.14	68	0.00627
ethylbenzene	106.17	68	0.00038
xylenes	106.17	68	0.00166
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00006
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.016998	4.016	0.00423
benzene	0.020421	4.016	0.00508
2,2,4 TMP	0.015680	4.016	0.00390
toluene	0.018594	4.016	0.00463
ethylbenzene	0.000984	4.016	0.00025
xylenes	0.004278	4.016	0.00107
naphthalene	0.000005	4.016	0.00000
cumene	0.000141	4.016	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5923
benzene	6.906	1211	220.79	0.9632
2,2,4 TMP	6.812	1257.8	220.74	0.4867
toluene	7.017	1377.6	222.64	0.2660
ethylbenzene	6.95	1419.3	212.61	0.0811
xylenes	7.009	1462.3	215.11	0.0705
naphthalene	7.146	1831.6	211.82	0.0017
cumene	6.929	1455.8	207.2	0.0367

MONTH May			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**533.98**	lb/month
		0.27	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1739.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**517.90**	°R
Average daily maximum ambient temperature, Table	T_{AX}	528.40	°R
Average daily minimum ambient temperature, Table	T_{AN}	507.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	520.93	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**524.05**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.023	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.105	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**98.61**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**340.91**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**94.13**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		15.611	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		3.0812	lb/month
benzene		3.4229	lb/month
2,2,4 TMP		3.8976	lb/month
toluene		3.8347	lb/month
ethylbenzene		0.2475	lb/month
xylenes		1.0819	lb/month
naphthalene		0.0031	lb/month
cumene		0.0421	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.0779	lb/month
benzene		3.4169	lb/month
2,2,4 TMP		3.8844	lb/month
toluene		3.8116	lb/month
ethylbenzene		0.2428	lb/month
xylenes		1.0588	lb/month
naphthalene		0.0017	lb/month
cumene		0.0405	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00577
benzene	78.11	68	0.00640
2,2,4 TMP	114.23	68	0.00728
toluene	92.14	68	0.00714
ethylbenzene	106.17	68	0.00046
xylenes	106.17	68	0.00198
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.022859	5.023	0.00455
benzene	0.027999	5.023	0.00557
2,2,4 TMP	0.021765	5.023	0.00433
toluene	0.026477	5.023	0.00527
ethylbenzene	0.001464	5.023	0.00029
xylenes	0.006383	5.023	0.00127
naphthalene	0.000009	5.023	0.00000
cumene	0.000216	5.023	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.1413
benzene	6.906	1211	220.79	1.3206
2,2,4 TMP	6.812	1257.8	220.74	0.6756
toluene	7.017	1377.6	222.64	0.3788
ethylbenzene	6.95	1419.3	212.61	0.1207
xylenes	7.009	1462.3	215.11	0.1052
naphthalene	7.146	1831.6	211.82	0.0029
cumene	6.929	1455.8	207.2	0.0563

MONTH June			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**678.86**	lb/month
		0.34	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1853.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	517.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	530.67	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**534.01**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.068	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/(P_a/(1+(1-(P_{vA}/P_a))^{0.5})^2$	**P***	0.134	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb} V^n)DP^* M_v K_c)/12$ months	**L_R**	**125.39**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D)]*[1+(N_cF_c/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^* M_v K_c$)	**LF**	**433.46**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_S S_D D^2 P^* M_v K_c)/12$ months	**LD**	**119.69**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		21.664	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}	
hexane		4.1556	lb/month
benzene		4.6901	lb/month
2,2,4 TMP		5.3935	lb/month
toluene		5.4172	lb/month
ethylbenzene		0.3608	lb/month
xylenes		1.5805	lb/month
naphthalene		0.0042	lb/month
cumene		0.0625	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.1523	lb/month
benzene		4.6842	lb/month
2,2,4 TMP		5.3803	lb/month
toluene		5.3941	lb/month
ethylbenzene		0.3562	lb/month
xylenes		1.5573	lb/month
naphthalene		0.0028	lb/month
cumene		0.0609	lb/month
Individual HAP Monthly Emissions Working losses = $Z_{Li}L_W$			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. $Z_{Vi} = y_i M_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00612
benzene	78.11	68	0.00690
2,2,4 TMP	114.23	68	0.00793
toluene	92.14	68	0.00795
ethylbenzene	106.17	68	0.00052
xylenes	106.17	68	0.00230
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.029301	6.068	0.00483
benzene	0.036469	6.068	0.00601
2,2,4 TMP	0.028643	6.068	0.00472
toluene	0.035601	6.068	0.00587
ethylbenzene	0.002040	6.068	0.00034
xylenes	0.008920	6.068	0.00147
naphthalene	0.000013	6.068	0.00000
cumene	0.000308	6.068	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.7447
benzene	6.906	1211	220.79	1.7202
2,2,4 TMP	6.812	1257.8	220.74	0.8891
toluene	7.017	1377.6	222.64	0.5094
ethylbenzene	6.95	1419.3	212.61	0.1682
xylenes	7.009	1462.3	215.11	0.1471
naphthalene	7.146	1831.6	211.82	0.0045
cumene	6.929	1455.8	207.2	0.0805

MONTH July			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**748.32**	lb/month
		0.37	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1872.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**531.35**	°R
Average daily maximum ambient temperature, Ta	T_{AX}	541.00	°R
Average daily minimum ambient temperature, Tal	T_{AN}	521.70	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	534.61	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**537.97**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.530	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.148	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**138.22**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_fF_r/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**477.83**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**131.94**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		24.699	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		4.6849	lb/month
benzene		5.3197	lb/month
2,2,4 TMP		6.1411	lb/month
toluene		6.2180	lb/month
ethylbenzene		0.4193	lb/month
xylenes		1.8383	lb/month
naphthalene		0.0048	lb/month
cumene		0.0732	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.6816	lb/month
benzene		5.3138	lb/month
2,2,4 TMP		6.1279	lb/month
toluene		6.1949	lb/month
ethylbenzene		0.4146	lb/month
xylenes		1.8151	lb/month
naphthalene		0.0034	lb/month
cumene		0.0715	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40- $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00626
benzene	78.11	68	0.00710
2,2,4 TMP	114.23	68	0.00819
toluene	92.14	68	0.00828
ethylbenzene	106.17	68	0.00055
xylenes	106.17	68	0.00243
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00010
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.032250	6.530	0.00494
benzene	0.040387	6.530	0.00618
2,2,4 TMP	0.031847	6.530	0.00488
toluene	0.039914	6.530	0.00611
ethylbenzene	0.002319	6.530	0.00036
xylenes	0.010150	6.530	0.00155
naphthalene	0.000016	6.530	0.00000
cumene	0.000353	6.530	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	3.0210
benzene	6.906	1211	220.79	1.9050
2,2,4 TMP	6.812	1257.8	220.74	0.9886
toluene	7.017	1377.6	222.64	0.5711
ethylbenzene	6.95	1419.3	212.61	0.1911
xylenes	7.009	1462.3	215.11	0.1673
naphthalene	7.146	1831.6	211.82	0.0053
cumene	6.929	1455.8	207.2	0.0923

MONTH August			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**711.98**	lb/month
		0.36	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is know	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1640.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**530.15**	°R
Average daily maximum ambient temperat	T_{AX}	539.70	°R
Average daily minimum ambient temperat	T_{AN}	520.60	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	533.00	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**535.95**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	6.292	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.141	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**131.51**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_fF_r/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**454.61**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**125.53**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		23.102	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		4.4070	lb/month
benzene		4.9888	lb/month
2,2,4 TMP		5.7478	lb/month
toluene		5.7960	lb/month
ethylbenzene		0.3884	lb/month
xylenes		1.7020	lb/month
naphthalene		0.0044	lb/month
cumene		0.0675	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		4.4037	lb/month
benzene		4.9828	lb/month
2,2,4 TMP		5.7346	lb/month
toluene		5.7729	lb/month
ethylbenzene		0.3837	lb/month
xylenes		1.6789	lb/month
naphthalene		0.0031	lb/month
cumene		0.0659	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-2 $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00619
benzene	78.11	68	0.00700
2,2,4 TMP	114.23	68	0.00806
toluene	92.14	68	0.00811
ethylbenzene	106.17	68	0.00054
xylenes	106.17	68	0.00236
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00009
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.030719	6.292	0.00488
benzene	0.038350	6.292	0.00610
2,2,4 TMP	0.030180	6.292	0.00480
toluene	0.037665	6.292	0.00599
ethylbenzene	0.002173	6.292	0.00035
xylenes	0.009506	6.292	0.00151
naphthalene	0.000014	6.292	0.00000
cumene	0.000330	6.292	0.00005
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.8776
benzene	6.906	1211	220.79	1.8089
2,2,4 TMP	6.812	1257.8	220.74	0.9368
toluene	7.017	1377.6	222.64	0.5389
ethylbenzene	6.95	1419.3	212.61	0.1791
xylenes	7.009	1462.3	215.11	0.1567
naphthalene	7.146	1831.6	211.82	0.0048
cumene	6.929	1455.8	207.2	0.0861

MONTH eptember			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_T+L_D$)	**LT**	**568.24**	lb/month
		0.28	tons/month
Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	1300.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	512.40	°R
Liquid Bulk Temperature Eq 1-31:			
TB = TAA + 0.003 os I	T_B	524.31	
Average Daily Liquid Surface Temperature Eq. 1-28			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**526.65**	°R
True Vapor Pressure Eq. 1-25:			
PvA = exp(A-(B/TLA))	**P_{vA}**	5.281	psia
Vapor pressure function Eq. 2-4:			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.112	NA
Rim Seal Losses Eq. 2-3:			
$L_R = ((K_{Ra} + K_{Rb}V^b)DP^*M_vK_c)/12$ months	**L_R**	**104.95**	lb/month
Withdrawal losses Eq. 2-19:			
$L_W=[((0.943)QCsW_v)/D]^*[1+(N_fF_r/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:			
$L_F = F_F P^*M_vK_c)$	**LF**	**362.79**	lb/month
Deck Seam Losses Eq. 2-18:			
$L_D = K_DS_DD^2P^*M_vK_c)/12$ months	**LD**	**100.17**	lb/month
HAPS Speciation			
Product - same as January		Gasoline	
Total HAP Monthly Emissions		17.004	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_iL_W$			
		L_{Ti}	
hexane		3.3312	lb/month
benzene		3.7161	lb/month
2,2,4 TMP		4.2426	lb/month
toluene		4.1969	lb/month
ethylbenzene		0.2731	lb/month
xylenes		1.1945	lb/month
naphthalene		0.0033	lb/month
cumene		0.0467	lb/month
Individual HAP Monthly Emissions Standing losses = $Z_{vi}(L_R + L_F + L_D)$			
		Standing losses	
hexane		3.3279	lb/month
benzene		3.7102	lb/month
2,2,4 TMP		4.2294	lb/month
toluene		4.1737	lb/month
ethylbenzene		0.2684	lb/month
xylenes		1.1714	lb/month
naphthalene		0.0020	lb/month
cumene		0.0450	lb/month
Individual HAP Monthly Emissions Working losses = Z_iL_W			
		Working losses	
hexane		0.0033	lb/month
benzene		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month
toluene		0.0231	lb/month
ethylbenzene		0.0046	lb/month
xylenes		0.0231	lb/month
naphthalene		0.0014	lb/month
cumene		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_iM_i / M_V$			
	M_i	**M_V**	**Z_{Vi}**
hexane	86.18	68	0.00586
benzene	78.11	68	0.00653
2,2,4 TMP	114.23	68	0.00745
toluene	92.14	68	0.00735
ethylbenzene	106.17	68	0.00047
xylenes	106.17	68	0.00206
naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00008
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$			
	$P_i = P_{VA}(x_i)$	**P_{VA}**	**y_i**
hexane	0.024415	5.281	0.00462
benzene	0.030033	5.281	0.00569
2,2,4 TMP	0.023410	5.281	0.00443
toluene	0.028641	5.281	0.00542
ethylbenzene	0.001599	5.281	0.00030
xylenes	0.006976	5.281	0.00132
naphthalene	0.000010	5.281	0.00000
cumene	0.000237	5.281	0.00004
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_iM_i)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				
	A	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	2.2871
benzene	6.906	1211	220.79	1.4166
2,2,4 TMP	6.812	1257.8	220.74	0.7267
toluene	7.017	1377.6	222.64	0.4098
ethylbenzene	6.95	1419.3	212.61	0.1318
xylenes	7.009	1462.3	215.11	0.1150
naphthalene	7.146	1831.6	211.82	0.0033
cumene	6.929	1455.8	207.2	0.0619

MONTH October				MONTH November				MONTH December			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)	**LT**	**409.25**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**313.67**	lb/month	**Total VOC Losses (Eq.2-1 & 2-2: $L_T = L_R+L_W+L_F+L_D$)**	**LT**	**238.75**	lb/month
		0.20	tons/month			0.16	tons/month			0.12	tons/month
Product Type		Gasoline - RVP 9		Product Type		Gasoline - RVP 9		Product Type		Gasoline - RVP 9	
Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month	Monthly Throughput (only change if actual is known)	Q_{month}	2,875.50	barrels/month
Vapor Molecular weight	M_v	**68.00**		Vapor Molecular weight	M_v	**68.00**		Vapor Molecular weight	M_v	**68.00**	
Vapor Pressure Equation Constant A	A	11.76		Vapor Pressure Equation Constant A	A	11.76		Vapor Pressure Equation Constant A	A	11.76	
Vapor Pressure Equation Constant B	B	5315.06	°R	Vapor Pressure Equation Constant B	B	5315.06	°R	Vapor Pressure Equation Constant B	B	5315.06	°R
Daily total solar insolation on a horizontal surface	**I**	882.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	**I**	534.0	Btu/ft²-day	Daily total solar insolation on a horizontal surface	**I**	422.0	Btu/ft²-day
Average Daily Ambient Temperature Eq. 1-30				**Average Daily Ambient Temperature Eq. 1-30**				**Average Daily Ambient Temperature Eq. 1-30**			
TAA = ((TAX+TAN)/2)	**T_{AA}**	**509.75**	°R	TAA = ((TAX+TAN)/2)	**T_{AA}**	**499.80**	°R	TAA = ((TAX+TAN)/2)	**T_{AA}**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	519.00	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	507.40	°R	Average daily maximum ambient temperature, Table 7.1-7	T_{AX}	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	500.50	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	492.20	°R	Average daily minimum ambient temperature, Table 7.1-7	T_{AN}	482.10	°R
Liquid Bulk Temperature Eq 1-31:				**Liquid Bulk Temperature Eq 1-31:**				**Liquid Bulk Temperature Eq 1-31:**			
TB = TAA + 0.003 αs I	T_B	511.28		TB = TAA + 0.003 αs I	T_B	500.73		TB = TAA + 0.003 αs I	T_B	489.58	
Average Daily Liquid Surface Temperature Eq. 1-28				**Average Daily Liquid Surface Temperature Eq. 1-28**				**Average Daily Liquid Surface Temperature Eq. 1-28**			
TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**512.87**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**501.69**	°R	TLA = 0.3*TAA + 0.7*TB + 0.004*α*I	**T_{LA}**	**490.34**	°R
True Vapor Pressure Eq. 1-25:				**True Vapor Pressure Eq. 1-25:**				**True Vapor Pressure Eq. 1-25:**			
PvA = exp(A-(B/TLA))	**P_{vA}**	4.026	psia	PvA = exp(A-(B/TLA))	**P_{vA}**	3.196	psia	PvA = exp(A-(B/TLA))	**P_{vA}**	2.501	psia
Vapor pressure function Eq. 2-4:				**Vapor pressure function Eq. 2-4:**				**Vapor pressure function Eq. 2-4:**			
$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.081	NA	$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.062	NA	$P^* = P_{vA}/P_A/(1+(1-(P_{vA}/P_A))^{0.5})^2$	**P***	0.047	NA
Rim Seal Losses Eq. 2-3:				**Rim Seal Losses Eq. 2-3:**				**Rim Seal Losses Eq. 2-3:**			
$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**75.56**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**57.90**	lb/month	$L_R = ((K_{Ra} + K_{Rb} v^n)DP^* M_v K_c)/12$ months	**L_R**	**44.06**	lb/month
Withdrawal losses Eq. 2-19:				**Withdrawal losses Eq. 2-19:**				**Withdrawal losses Eq. 2-19:**			
$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**0.33**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**0.33**	lb/month	$L_W=[((0.943)QCsW_v)/D]*[1+(N_cF_c/D)]$	**L_W**	**0.33**	lb/month
Deck Fitting Losses Eq.2-13:				**Deck Fitting Losses Eq.2-13:**				**Deck Fitting Losses Eq.2-13:**			
$L_F = F_F P^* M_v K_c)$	**LF**	**261.22**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**200.16**	lb/month	$L_F = F_F P^* M_v K_c)$	**LF**	**152.31**	lb/month
Deck Seam Losses Eq. 2-18:				**Deck Seam Losses Eq. 2-18:**				**Deck Seam Losses Eq. 2-18:**			
$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**72.13**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**55.27**	lb/month	$L_D = K_D S_D D^2 P^* M_v K_c)/12$ months	**LD**	**42.06**	lb/month
HAPS Speciation				**HAPS Speciation**				**HAPS Speciation**			
Product - same as January		Gasoline		**Product - same as January**		Gasoline		**Product - same as January**		Gasoline	
Total HAP Monthly Emissions		10.782	lb/month	**Total HAP Monthly Emissions**		7.401	lb/month	**Total HAP Monthly Emissions**		5.005	lb/month
Individual HAP Monthly Emissions Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Emissions** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$				**Individual HAP Monthly Em** Eq. 40-2 $L_{Ti} = Z_{vi}(L_R + L_F + L_D) + Z_{Li}L_W$			
		L_{Ti}				**L_{Ti}**				**L_{Ti}**	
hexane		2.1987	lb/month	**hexane**		1.5599	lb/month	**hexane**		1.0907	lb/month
benzene		2.3969	lb/month	**benzene**		1.6669	lb/month	**benzene**		1.1407	lb/month
2,2,4 TMP		2.6984	lb/month	**2,2,4 TMP**		1.8547	lb/month	**TMP**		1.2541	lb/month
toluene		2.5923	lb/month	**toluene**		1.7391	lb/month	**toluene**		1.1473	lb/month
ethylbenzene		0.1614	lb/month	**ethylbenzene**		0.1046	lb/month	**ethylbenzene**		0.0669	lb/month
xylenes		0.7046	lb/month	**xylenes**		0.4564	lb/month	**xylenes**		0.2921	lb/month
naphthalene		0.0024	lb/month	**naphthalene**		0.0019	lb/month	**naphthalene**		0.0017	lb/month
cumene		0.0270	lb/month	**cumene**		0.0173	lb/month	**cumene**		0.0111	lb/month
Individual HAP Monthly Emissions Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Emissions** Standing losses $= Z_{vi}(L_R + L_F + L_D)$				**Individual HAP Monthly Em** Standing losses $= Z_{vi}(L_R + L_F + L_D)$			
		Standing losses				**Standing losses**				**Standing losses**	
hexane		2.1954	lb/month	**hexane**		1.5566	lb/month	**hexane**		1.0874	lb/month
benzene		2.3910	lb/month	**benzene**		1.6610	lb/month	**benzene**		1.1348	lb/month
2,2,4 TMP		2.6851	lb/month	**2,2,4 TMP**		1.8415	lb/month	**TMP**		1.2409	lb/month
toluene		2.5692	lb/month	**toluene**		1.7160	lb/month	**toluene**		1.1242	lb/month
ethylbenzene		0.1568	lb/month	**ethylbenzene**		0.1000	lb/month	**ethylbenzene**		0.0623	lb/month
xylenes		0.6815	lb/month	**xylenes**		0.4332	lb/month	**xylenes**		0.2690	lb/month
naphthalene		0.0010	lb/month	**naphthalene**		0.0006	lb/month	**naphthalene**		0.0003	lb/month
cumene		0.0254	lb/month	**cumene**		0.0157	lb/month	**cumene**		0.0094	lb/month
Individual HAP Monthly Emissions Working losses $= Z_{Li}L_W$				**Individual HAP Monthly Emissions** Working losses $= Z_{Li}L_W$				**Individual HAP Monthly Em** Working losses $= Z_{Li}L_W$			
		Working losses				**Working losses**				**Working losses**	
hexane		0.0033	lb/month	**hexane**		0.0033	lb/month	**hexane**		0.0033	lb/month
benzene		0.0059	lb/month	**benzene**		0.0059	lb/month	**benzene**		0.0059	lb/month
2,2,4 TMP		0.0132	lb/month	**2,2,4 TMP**		0.0132	lb/month	**TMP**		0.0132	lb/month
toluene		0.0231	lb/month	**toluene**		0.0231	lb/month	**toluene**		0.0231	lb/month
ethylbenzene		0.0046	lb/month	**ethylbenzene**		0.0046	lb/month	**ethylbenzene**		0.0046	lb/month
xylenes		0.0231	lb/month	**xylenes**		0.0231	lb/month	**xylenes**		0.0231	lb/month
naphthalene		0.0014	lb/month	**naphthalene**		0.0014	lb/month	**naphthalene**		0.0014	lb/month
cumene		0.0017	lb/month	**cumene**		0.0017	lb/month	**cumene**		0.0017	lb/month
Vapor Weight Concentrations Eq. 40-6 $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentrations Eq. 40-6** $Z_{Vi} = y_i M_i / M_v$				**Vapor Weight Concentratior** $Z_{Vi} = y_i M_i / M_v$			
	M_i	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**		**M_i**	**M_v**	**Z_{Vi}**
hexane	86.18	68	0.00537	hexane	86.18	68	0.00497	hexane	86.18	68	0.00456
benzene	78.11	68	0.00585	benzene	78.11	68	0.00530	benzene	78.11	68	0.00476
2,2,4 TMP	114.23	68	0.00657	2,2,4 TMP	114.23	68	0.00588	2,2,4 TMP	114.23	68	0.00520
toluene	92.14	68	0.00628	toluene	92.14	68	0.00548	toluene	92.14	68	0.00472
ethylbenzene	106.17	68	0.00038	ethylbenzene	106.17	68	0.00032	ethylbenzene	106.17	68	0.00026
xylenes	106.17	68	0.00167	xylenes	106.17	68	0.00138	xylenes	106.17	68	0.00113
naphthalene	128.17	68	0.00000	naphthalene	128.17	68	0.00000	naphthalene	128.17	68	0.00000
cumene	120.19	68	0.00006	cumene	120.19	68	0.00005	cumene	120.19	68	0.00004
Vapor Mole Fraction Eq. 40-5 $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$				**Vapor Mole Fraction Eq. 40-5** $y_i = P_i / P_{VA}$			
	$P_i = P_{VAi}(X_i)$	**P_{VA}**	**y_i**		**$P_i = P_{VAi}(X_i)$**	**P_{VA}**	**y_i**		**$P_i = P_{VAi}(X_i)$**	**P_{VA}**	**y_i**
hexane	0.017057	4.026	0.00424	hexane	0.012528	3.196	0.00392	hexane	0.009001	2.501	0.00360
benzene	0.020496	4.026	0.00509	benzene	0.014749	3.196	0.00461	benzene	0.010364	2.501	0.00414
2,2,4 TMP	0.015739	4.026	0.00391	2,2,4 TMP	0.011182	3.196	0.00350	2,2,4 TMP	0.007749	2.501	0.00310
toluene	0.018670	4.026	0.00464	toluene	0.012918	3.196	0.00404	toluene	0.008704	2.501	0.00348
ethylbenzene	0.000989	4.026	0.00025	ethylbenzene	0.000653	3.196	0.00020	ethylbenzene	0.000418	2.501	0.00017
xylenes	0.004298	4.026	0.00107	xylenes	0.002830	3.196	0.00089	xylenes	0.001807	2.501	0.00072
naphthalene	0.000005	4.026	0.00000	naphthalene	0.000003	3.196	0.00000	naphthalene	0.000002	2.501	0.00000
cumene	0.000141	4.026	0.00004	cumene	0.000090	3.196	0.00003	cumene	0.000056	2.501	0.00002
Liquid Mole Fraction Eq. 40-4 $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$				**Liquid Mole Fraction Eq. 40-4** $x_i = (Z_{Li}M_L)/M_i$			
	Z_{Li}	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0.01	92	86.18	0.01068	0.01	92	86.18	0.01068	0.01	92	86.18	0.01068
benzene	0.018	92	78.11	0.02120	0.018	92	78.11	0.02120	0.018	92	78.11	0.02120
2,2,4 TMP	0.04	92	114.23	0.03222	0.04	92	114.23	0.03222	0.04	92	114.23	0.03222
toluene	0.07	92	92.14	0.06989	0.07	92	92.14	0.06989	0.07	92	92.14	0.06989
ethylbenzene	0.014	92	106.17	0.01213	0.014	92	106.17	0.01213	0.014	92	106.17	0.01213
xylenes	0.07	92	106.17	0.06066	0.07	92	106.17	0.06066	0.07	92	106.17	0.06066
naphthalene	0.00415	92	128.17	0.00298	0.00415	92	128.17	0.00298	0.00415	92	128.17	0.00298
cumene	0.005	92	120.19	0.00383	0.005	92	120.19	0.00383	0.005	92	120.19	0.00383
Component Vapor pressure $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$				**Component Vapor pressure** $P_{VA}=(0.019337)10^{(A-(B/(TLA+C)))}$			
	A	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.5978	6.878	1171.5	224.37	1.1735	6.878	1171.5	224.37	0.8431
benzene	6.906	1211	220.79	0.9667	6.906	1211	220.79	0.6957	6.906	1211	220.79	0.4888
2,2,4 TMP	6.812	1257.8	220.74	0.4886	6.812	1257.8	220.74	0.3471	6.812	1257.8	220.74	0.2405
toluene	7.017	1377.6	222.64	0.2671	7.017	1377.6	222.64	0.1848	7.017	1377.6	222.64	0.1245
ethylbenzene	6.95	1419.3	212.61	0.0815	6.95	1419.3	212.61	0.0538	6.95	1419.3	212.61	0.0345
xylenes	7.009	1462.3	215.11	0.0709	7.009	1462.3	215.11	0.0467	7.009	1462.3	215.11	0.0298
naphthalene	7.146	1831.6	211.82	0.0017	7.146	1831.6	211.82	0.0010	7.146	1831.6	211.82	0.0006
cumene	6.929	1455.8	207.2	0.0369	6.929	1455.8	207.2	0.0236	6.929	1455.8	207.2	0.0146

FRT TANK EMISSION CALCULATION

Tank No.		28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS		Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
					Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**912.86**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)		**LT**	**2,330.69**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
			1.17	ton/year	Stock Vapor Density	Wv	0.0001	lb/ft3
		Time Period	**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Nearest US Location			Albany, NY		Vented Vapor Saturation Factor	Ks	0.99	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7		I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure		P_A	14.55	psi				
Ideal Gas Constant		R	10.73	psia ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1,417.83**	lb/yr
Product Information					Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
Product Type			Distillate Fuel Oil No.2		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight		Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density		WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure		RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00					
Vapor Pressure Equation Constant A		A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure Equation Constant B		B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
					Vapor Space Outage	Hvo	23.80	ft
Tank design data								
Shell height		Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0656**	**per day**
Diameter		D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	33.70	°R
Throughput		Q	**80,699,334**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
Turnovers		N	**20.44**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:			Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Cone Roof Slope (If unknown, use 0.0625)		SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	515.42	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))		RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)		HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)		HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)		HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)			Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**33.70**	**°R**
Tank Construction (pick from drop down list)			Riveted		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**31.92**	°R
Tank Shell Color (pick from drop down list)			Red, primer		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)			Average					
Tank Interior Condition (pick from drop down list)			Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00321**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)		PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00743	psia
		PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00422	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	523.85	°R
Not Insulated		P_{VA}	0.005628014		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.00	°R
Partially Insulated		P_{VA}	0.005688417					
Fully Insulated		P_{VA}	0.004910539		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00306**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00740	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN		**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0043363	psia
Average daily maximum ambient temperature, Table 7.1-7		TAX	517.10	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.25	TLX	523.72	°R
Average daily minimum ambient temperature, Table 7.1-7		TAN	499.30	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	507.76	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I		TB	511.39	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)					**Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I		**TLA**	**515.42**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I		**TLA**	**515.74**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB		**TLA**	**511.4**					
					Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)					Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I		**Tv**	**518.71**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I		**Tv**	**520.09**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB		**Tv**	**511.39**	**°R**				
					Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated		Wv	1.314E-04		Tank shell radius	Rs	62.50	ft
Partially Insulated		Wv	1.325E-04					
Fully Insulated		Wv	1.163E-04		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667(RR-(**	**HRO**	**8.57**	ft
					Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
					Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/yr
Product	Diesel
Total HAP Emissions =	**204.307**

Individual HAPS	L_{Ti} (lb/yr)
hexane	1.0244
benzene	4.9806
2,2,4 TMP	0.0000
toluene	55.5289
ethylbenzene	6.9530
xylenes	134.9311
naphthalene	0.8885
cumene	0.0000
methanol	0.0000

Vapor Weight Concentrations

Eq. 40-6 ZVi = yiMi / MV

Individual HAPS	M_i	M_V	Z_{Vi}
hexane	86.18	130	0.00044
benzene	78.11	130	0.00214
2,2,4 TMP	114.23	130	0.00000
toluene	92.14	130	0.02383
ethylbenzene	106.17	130	0.00298
xylenes	106.17	130	0.05789
naphthalene	128.17	130	3.81E-04
cumene	120.19	130	0.00E+00
methanol	32.04	130	0.00E+00

Vapor Mole Fraction

Eq. 40-5 yi = Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000004	0.006	**0.00066**
benzene	0.000020	0.006	**0.00356**
2,2,4 TMP	0.000000	0.006	-
toluene	0.000189	0.006	**0.03361**
ethylbenzene	0.000021	0.006	**0.00365**
xylenes	0.000399	0.006	**0.07089**
naphthalene	0.000002	0.006	**3.87E-04**
cumene	0.000000	0.006	**0.00E+00**
methanol	0.000000	0.006	**0.00E+00**

Liquid Mole Fraction

Eq. 40-4 xi = (ZLi/ML)/Mi

Individual HAPS	Z_{Li}	M_L	M_i	X_i
hexane	0.0000010	188	86.18	0.00000
benzene	0.0000080	188	78.11	0.00002
2,2,4 TMP	0.0000000	188	114.23	0.00000
toluene	0.0003200	188	92.14	0.00065
ethylbenzene	0.0001300	188	106.17	0.00023
xylenes	0.0029000	188	106.17	0.00514
naphthalene	0.0007565	188	128.17	0.00111
cumene	0.0000000	188	120.19	0.00000
methanol	0.0000000	188	32.04	0.00000

Component Vapor Pressure

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	A	B	C	P_{VAi}
hexane	6.878	1171.5	224.37	1.7105
benzene	6.906	1211	220.79	1.0396
2,2,4 TMP	6.812	1257.8	220.74	0.5318
toluene	7.017	1377.6	222.64	0.2898
ethylbenzene	6.95	1419.3	212.61	0.0893
xylenes	7.009	1462.3	215.11	0.0777
naphthalene	7.146	1831.6	211.82	0.0020
cumene	6.929	1455.8	207.2	0.0407
methanol	8.079	1581.3	239.65	1.3054

Monthly Calculations - JANUARY

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	63.57	lb/month
		3.18E-02	ton/month
Time Period		January	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	532.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002015063	
Partially Insulated	P_{VA}	0.002025981	
Fully Insulated	P_{VA}	0.001881227	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	483.25	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.69	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	486.51	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	486.65	°R
Fully Insulated: TLA = TB	TLA	484.7	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	487.99	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	488.61	°R
Fully Insulated; Tv = TB	Tv	484.69	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.002E-05	
Partially Insulated	Wv	5.023E-05	
Fully Insulated	Wv	4.702E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	18.60	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	44.97	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0412	per day
Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	20.01	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	18.52	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00076	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00243	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00167	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00071	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00241	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0016994	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	491.28	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	482.02	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	5.332

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T); Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0342	0.0100	0.0242	86.18	130	0.00054	0.000002	0.002	0.00081
benzene	0.1576	0.0461	0.1115	78.11	130	0.00248	0.000008	0.002	0.00413
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.5826	0.4631	1.1195	92.14	130	0.02490	0.000071	0.002	0.03513
ethylbenzene	0.1748	0.0512	0.1237	106.17	130	0.00275	0.000007	0.002	0.00337
xylenes	3.3663	0.9851	2.3812	106.17	130	0.05295	0.000131	0.002	0.06484
naphthalene	0.0160	0.0047	0.0113	128.17	130	2.52E-04	0.000001	0.002	2.56E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	0.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4318
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2125
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1084
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0295
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0254
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0005
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.4890

Monthly Calculations (continued) **FEBRUARY**

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	76.36	lb/month
		3.82E-02	ton/month
Time Period		February	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	789.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	22.21	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002350191	
Partially Insulated	P_{VA}	0.002368781	
Fully Insulated	P_{VA}	0.002125695	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	485.80	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	490.63	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	490.84	°R
Fully Insulated: TLA = TB	TLA	487.9	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	492.83	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	493.75	°R
Fully Insulated; Tv = TB	Tv	487.93	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.777E-05	
Partially Insulated	Wv	5.812E-05	
Fully Insulated	Wv	5.278E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	24.43	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	51.93	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0519	per day
Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	490.63	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	25.40	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	23.80	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00111	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00296	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00185	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00105	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00294	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0018959	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	496.79	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.89	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	6.457

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T); Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0400	0.0128	0.0272	86.18	130	0.00052	0.000002	0.002	0.00079
benzene	0.1854	0.0593	0.1261	78.11	130	0.00243	0.000009	0.002	0.00404
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.8915	0.6051	1.2864	92.14	130	0.02477	0.000082	0.002	0.03495
ethylbenzene	0.2130	0.0682	0.1449	106.17	130	0.00279	0.000008	0.002	0.00342
xylenes	4.1067	1.3137	2.7930	106.17	130	0.05378	0.000155	0.002	0.06586
naphthalene	0.0205	0.0066	0.0140	128.17	130	2.69E-04	0.000001	0.002	2.73E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	0.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4933
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2446
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1258
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0349
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0301
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5637

Monthly Calculations (continued) **MARCH**

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	123.29	lb/month
		6.16E-02	ton/month
Time Period		March	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1096.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003484427	
Partially Insulated	P_{VA}	0.003521114	
Fully Insulated	P_{VA}	0.003048229	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	494.80	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	497.76	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	501.51	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	501.80	°R
Fully Insulated: TLA = TB	TLA	497.8	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	504.57	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	505.85	°R
Fully Insulated; Tv = TB	Tv	497.76	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.366E-05	
Partially Insulated	Wv	8.433E-05	
Fully Insulated	Wv	7.419E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	48.09	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	75.20	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0638	per day
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	31.91	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	30.17	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00199	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00460	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00261	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	509.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00189	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00458	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0026857	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	509.35	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	494.26	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	10.621

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T); Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0597	0.0233	0.0364	86.18	130	0.00048	0.000003	0.003	0.00073
benzene	0.2832	0.1105	0.1728	78.11	130	0.00230	0.000013	0.003	0.00382
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.003	-
toluene	3.0077	1.1732	1.8346	92.14	130	0.02440	0.000120	0.003	0.03442
ethylbenzene	0.3557	0.1387	0.2169	106.17	130	0.00288	0.000012	0.003	0.00353
xylenes	6.8758	2.6819	4.1939	106.17	130	0.05577	0.000238	0.003	0.06829
naphthalene	0.0390	0.0152	0.0238	128.17	130	3.16E-04	0.000001	0.003	3.21E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.003	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.003	0.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.6919
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3483
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1837
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0535
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0463
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0010
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8206

Monthly Calculations (continued) APRIL

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**216.80**	lb/month
		1.08E-01	ton/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005855374	
Partially Insulated	P_{VA}	0.00593478	
Fully Insulated	P_{VA}	0.004927826	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.49	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**516.61**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**517.01**	°R
Fully Insulated: TLA = TB	**TLA**	**511.5**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**520.78**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.53**	**°R**
Fully Insulated; Tv = TB	**Tv**	**511.49**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.362E-04	
Partially Insulated	Wv	1.376E-04	
Fully Insulated	Wv	1.167E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**94.36**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**122.44**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**41.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**38.99**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00406**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00390**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	507.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	19.027
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0945	0.0411	0.0534	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	0.4604	0.2004	0.2600	78.11	130	0.00212	0.000021	0.006	**0.00353**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	5.1539	2.2432	2.9107	92.14	130	0.02377	0.000196	0.006	**0.03354**
ethylbenzene	0.6483	0.2822	0.3662	106.17	130	0.00299	0.000021	0.006	**0.00366**
xylenes	12.5858	5.4778	7.1079	106.17	130	0.05805	0.000416	0.006	**0.07108**
naphthalene	0.0839	0.0365	0.0474	128.17	130	3.87E-04	0.000002	0.006	**3.93E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0749
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5519
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.3008
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0931
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0811
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0021
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.3415

Monthly Calculations (continued) MAY

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**330.27**	lb/month
		1.65E-01	ton/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.008643068	
Partially Insulated	P_{VA}	0.008773316	
Fully Insulated	P_{VA}	0.007134727	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	522.60	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**528.54**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**529.01**	°R
Fully Insulated: TLA = TB	**TLA**	**522.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.39**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.43**	**°R**
Fully Insulated; Tv = TB	**Tv**	**522.60**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.963E-04	
Partially Insulated	Wv	1.985E-04	
Fully Insulated	Wv	1.654E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**153.81**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**176.46**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0875**	**per day**
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**46.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**43.90**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00643**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01237	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00594	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00621**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0061410	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	518.04	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	29.266
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1325	0.0617	0.0708	86.18	130	0.00040	0.000005	0.009	**0.00061**
benzene	0.6588	0.3068	0.3520	78.11	130	0.00199	0.000029	0.009	**0.00332**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.6688	3.5716	4.0973	92.14	130	0.02322	0.000283	0.009	**0.03276**
ethylbenzene	1.0088	0.4698	0.5390	106.17	130	0.00305	0.000032	0.009	**0.00374**
xylenes	19.6499	9.1514	10.4985	106.17	130	0.05950	0.000630	0.009	**0.07285**
naphthalene	0.1476	0.0688	0.0789	128.17	130	4.47E-04	0.000004	0.009	**4.53E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.4901
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.7759
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4337
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1404
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1226
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0035
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.9347

Monthly Calculations (continued) JUNE

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**440.13**	lb/month
		2.20E-01	ton/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011908818	
Partially Insulated	P_{VA}	0.012092866	
Fully Insulated	P_{VA}	0.009781779	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	532.45	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.79**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**539.29**	°R
Fully Insulated: TLA = TB	**TLA**	**532.5**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**543.96**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.13**	**°R**
Fully Insulated; Tv = TB	**Tv**	**532.45**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.652E-04	
Partially Insulated	Wv	2.682E-04	
Fully Insulated	Wv	2.226E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**201.72**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**238.41**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0881**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**47.14**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.17**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00874**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01697	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00823	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00848**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01697	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0084939	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.58	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	528.00	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	39.204
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1647	0.0755	0.0892	86.18	130	0.00037	0.000007	0.012	**0.00056**
benzene	0.8316	0.3812	0.4505	78.11	130	0.00189	0.000037	0.012	**0.00314**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	9.9974	4.5821	5.4153	92.14	130	0.02271	0.000382	0.012	**0.03205**
ethylbenzene	1.3630	0.6247	0.7383	106.17	130	0.00310	0.000045	0.012	**0.00379**
xylenes	26.6268	12.2038	14.4230	106.17	130	0.06050	0.000882	0.012	**0.07408**
naphthalene	0.2204	0.1010	0.1194	128.17	130	5.01E-04	0.000006	0.012	**5.08E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.9450
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0236
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5845
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1962
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1718
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0055
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.6110

Monthly Calculations (continued) JULY

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**499.56**	lb/month
		2.50E-01	ton/month
Time Period		**July**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.013458315	
Partially Insulated	P_{VA}	0.013665337	
Fully Insulated	P_{VA}	0.011064547	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**531.35**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	536.40	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**542.81**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**543.31**	°R
Fully Insulated: TLA = TB	**TLA**	**536.4**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**548.03**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**550.22**	**°R**
Fully Insulated; Tv = TB	**Tv**	**536.40**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.975E-04	
Partially Insulated	Wv	3.009E-04	
Fully Insulated	Wv	2.499E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**232.14**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**267.42**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0876**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Average Daily Liquid Surface Temperature	TLA	542.81	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**47.21**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.28**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00974**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01908	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00935	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00945**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01910	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0096413	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	554.63	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	531.99	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**44.557**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations (Eq. 40-6 ZVi = yiMi / MV); Vapor Mole Fraction (Eq. 40-5 yi = Pi / PVA)

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1819	0.0845	0.0974	86.18	130	0.00036	0.000007	0.013	**0.00055**
benzene	0.9241	0.4294	0.4947	78.11	130	0.00185	0.000041	0.013	**0.00308**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.013	-
toluene	11.2457	5.2257	6.0200	92.14	130	0.02251	0.000427	0.013	**0.03176**
ethylbenzene	1.5538	0.7220	0.8318	106.17	130	0.00311	0.000051	0.013	**0.00381**
xylenes	30.3905	14.1220	16.2685	106.17	130	0.06083	0.001002	0.013	**0.07449**
naphthalene	0.2610	0.1213	0.1397	128.17	130	5.22E-04	0.000007	0.013	**5.30E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.013	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.013	**0.00E+00**

Liquid Mole Fraction (Eq. 40-4 xi = (ZLiML)/Mi); Component Vapor Pressure (PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.1519
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.1368
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6547
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2227
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1952
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0064
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.9263

Monthly Calculations (continued) AUGUST

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**445.49**	lb/month
		2.23E-01	ton/month
Time Period		**August**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.01242878	
Partially Insulated	P_{VA}	0.012597769	
Fully Insulated	P_{VA}	0.010454313	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**530.15**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**540.19**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**540.63**	°R
Fully Insulated: TLA = TB	**TLA**	**534.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**544.76**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.68**	**°R**
Fully Insulated; Tv = TB	**Tv**	**534.58**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.764E-04	
Partially Insulated	Wv	2.792E-04	
Fully Insulated	Wv	2.369E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**197.04**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**248.45**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0800**	**per day**
Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Average Daily Liquid Surface Temperature	TLA	540.19	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**42.89**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**40.98**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00823**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01713	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00890	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00795**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01711	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0091640	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.87	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	530.38	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**39.701**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations (Eq. 40-6 ZVi = yiMi / MV); Vapor Mole Fraction (Eq. 40-5 yi = Pi / PVA)

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1651	0.0730	0.0921	86.18	130	0.00037	0.000007	0.012	**0.00056**
benzene	0.8356	0.3696	0.4660	78.11	130	0.00188	0.000039	0.012	**0.00312**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	10.0877	4.4618	5.6259	92.14	130	0.02264	0.000397	0.012	**0.03195**
ethylbenzene	1.3818	0.6112	0.7706	106.17	130	0.00310	0.000047	0.012	**0.00380**
xylenes	27.0047	11.9442	15.0605	106.17	130	0.06062	0.000923	0.012	**0.07422**
naphthalene	0.2264	0.1002	0.1263	128.17	130	5.08E-04	0.000006	0.012	**5.16E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	**0.00E+00**

Liquid Mole Fraction (Eq. 40-4 xi = (ZLiML)/Mi); Component Vapor Pressure (PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.0150
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0602
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6082
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2051
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1796
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0058
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.7172

Monthly Calculations (continued) SEPTEMBER

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**309.46**	lb/month
		1.55E-01	ton/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009054711	
Partially Insulated	P_{VA}	0.009155981	
Fully Insulated	P_{VA}	0.00785475	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	525.56	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.01**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**530.36**	°R
Fully Insulated: TLA = TB	**TLA**	**525.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.63**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.15**	**°R**
Fully Insulated; Tv = TB	**Tv**	**525.56**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.056E-04	
Partially Insulated	Wv	2.073E-04	
Fully Insulated	Wv	1.811E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**124.68**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**184.78**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0700**	**per day**
Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Average Daily Liquid Surface Temperature	TLA	530.01	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**36.91**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**34.98**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00535**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01207	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00672	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	539.23	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.78	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00511**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01202	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0069091	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	521.61	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**27.447**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations (Eq. 40-6 ZVi = yiMi / MV); Vapor Mole Fraction (Eq. 40-5 yi = Pi / PVA)

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1229	0.0495	0.0734	86.18	130	0.00040	0.000005	0.009	**0.00060**
benzene	0.6125	0.2468	0.3657	78.11	130	0.00198	0.000030	0.009	**0.00329**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.1637	2.8863	4.2774	92.14	130	0.02315	0.000296	0.009	**0.03266**
ethylbenzene	0.9473	0.3817	0.5656	106.17	130	0.00306	0.000034	0.009	**0.00375**
xylenes	18.4599	7.4375	11.0224	106.17	130	0.05965	0.000661	0.009	**0.07304**
naphthalene	0.1407	0.0567	0.0840	128.17	130	4.55E-04	0.000004	0.009	**4.61E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	**0.00E+00**

Liquid Mole Fraction (Eq. 40-4 xi = (ZLiML)/Mi); Component Vapor Pressure (PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.5491
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.8051
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4529
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1474
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1288
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0038
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.0210

Monthly Calculations (continued) **OCTOBER**

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**183.21**	lb/month
		9.16E-02	ton/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005576566	
Partially Insulated	P_{VA}	0.005621296	
Fully Insulated	P_{VA}	0.005036616	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	512.13	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.15**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**515.39**	°R
Fully Insulated: TLA = TB	**TLA**	**512.1**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**517.61**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**518.64**	**°R**
Fully Insulated; Tv = TB	**Tv**	**512.13**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.305E-04	
Partially Insulated	Wv	1.313E-04	
Fully Insulated	Wv	1.191E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**65.89**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**117.32**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0561**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Average Daily Liquid Surface Temperature	TLA	515.15	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**28.83**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**26.98**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00272**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00708	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00436	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	522.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00256**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00703	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0044701	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	522.13	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	508.64	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	**16.056**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	Vapor Weight Concentrations, Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	Vapor Mole Fraction, Eq. 40-5 yi = Pi / PVA: $P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0807	0.0290	0.0517	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	0.3921	0.1410	0.2511	78.11	130	0.00214	0.000020	0.006	**0.00356**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	**-**
toluene	4.3672	1.5706	2.7966	92.14	130	0.02384	0.000188	0.006	**0.03363**
ethylbenzene	0.5463	0.1964	0.3498	106.17	130	0.00298	0.000020	0.006	**0.00365**
xylenes	10.5998	3.8120	6.7878	106.17	130	0.05786	0.000395	0.006	**0.07084**
naphthalene	0.0696	0.0250	0.0446	128.17	130	3.80E-04	0.000002	0.006	**3.85E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

Individual HAPS	Liquid Mole Fraction, Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure, PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0315
2,2,4-TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5263
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.2872
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0884
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0769
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0019
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.2812

Monthly Calculations (continued) **NOVEMBER**

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**110.57**	lb/month
		5.53E-02	ton/month
Time Period		**November**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003681787	
Partially Insulated	P_{VA}	0.003700512	
Fully Insulated	P_{VA}	0.003451775	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	501.24	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**503.07**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**503.21**	°R
Fully Insulated: TLA = TB	**TLA**	**501.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.56**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.18**	**°R**
Fully Insulated; Tv = TB	**Tv**	**501.24**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.840E-05	
Partially Insulated	Wv	8.874E-05	
Fully Insulated	Wv	8.343E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**31.11**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**79.46**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0403**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Average Daily Liquid Surface Temperature	TLA	503.07	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.25**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.73**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00132**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00439	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00308	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	508.13	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00122**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00436	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0031337	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	507.90	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	498.53	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	**9.547**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	Vapor Weight Concentrations, Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	Vapor Mole Fraction, Eq. 40-5 yi = Pi / PVA: $P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0530	0.0149	0.0381	86.18	130	0.00048	0.000003	0.004	**0.00072**
benzene	0.2520	0.0709	0.1811	78.11	130	0.00228	0.000014	0.004	**0.00379**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.004	**-**
toluene	2.6909	0.7571	1.9338	92.14	130	0.02434	0.000126	0.004	**0.03434**
ethylbenzene	0.3203	0.0901	0.2302	106.17	130	0.00290	0.000013	0.004	**0.00355**
xylenes	6.1953	1.7431	4.4522	106.17	130	0.05603	0.000253	0.004	**0.06861**
naphthalene	0.0357	0.0101	0.0257	128.17	130	3.23E-04	0.000001	0.004	**3.28E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.004	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.004	**0.00E+00**

Individual HAPS	Liquid Mole Fraction, Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure, PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.7252
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3640
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1936
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0567
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0492
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0011
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8647

Monthly Calculations (continued) **DECEMBER**

Tank No.	28		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**72.19**	lb/month
		3.61E-02	ton/month
Time Period		**December**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002421037	
Partially Insulated	P_{VA}	0.00243123	
Fully Insulated	P_{VA}	0.002295179	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.99	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**491.43**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**491.55**	°R
Fully Insulated: TLA = TB	**TLA**	**490.0**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.61**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.10**	**°R**
Fully Insulated; Tv = TB	**Tv**	**489.99**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.954E-05	
Partially Insulated	Wv	5.973E-05	
Fully Insulated	Wv	5.675E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**18.67**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**53.52**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0347**	**per day**
Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	491.43	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**17.05**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.70**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00076**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00283	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00207	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	495.69	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00071**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00281	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0021013	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	495.47	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	487.62	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	**6.114**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	Vapor Weight Concentrations, Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	Vapor Mole Fraction, Eq. 40-5 yi = Pi / PVA: $P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0376	0.0097	0.0278	86.18	130	0.00052	0.000002	0.002	**0.00078**
benzene	0.1746	0.0452	0.1294	78.11	130	0.00242	0.000010	0.002	**0.00403**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	**-**
toluene	1.7865	0.4621	1.3244	92.14	130	0.02475	0.000085	0.002	**0.03492**
ethylbenzene	0.2020	0.0522	0.1497	106.17	130	0.00280	0.000008	0.002	**0.00343**
xylenes	3.8940	1.0071	2.8869	106.17	130	0.05394	0.000160	0.002	**0.06605**
naphthalene	0.0197	0.0051	0.0146	128.17	130	2.72E-04	0.000001	0.002	**2.76E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

Individual HAPS	Liquid Mole Fraction, Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure, PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.5061
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2503
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1295
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0360
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0311
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.		29		Tank type	Fixed Roof Tank				
ROUTINE EMISSIONS CALCULATIONS		Symbol		Units	ROUTINE EMISSIONS CALCULATIONS		Symbol		Units
					Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)		**Ls**	**912.86**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)		LT	**2,330.69**	lb/year	Vapor Space Volume		Vv	292095.5	ft3
			1.17	ton/year	Stock Vapor Density		Wv	0.0001	lb/ft3
	Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5		KE	0.066	per day
Nearest US Location			Albany, NY		Vented Vapor Saturation Factor		Ks	0.99	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7		I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year		365	365	days/year
Absolute Pressure		P_A	14.55	psi					
Ideal Gas Constant		R	10.73	psia ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB		**Lw**	**1,417.83**	lb/yr
Product Information					Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)		VQ	10,786.811	ft3/yr
Product Type			Distillate Fuel Oil No.2		Working Loss Turnover Factor		KN	1.0000	
Vapor Molecular weight		Mv	**130**	Lb/lb-mole	Working Loss Product Factor		Kp	1.00	
Average organic liquid density		WL	**7.10**	lb/gal	Stock Vapor Density		Wv	0.0001	lb/ft3
Average Reid Vapor Pressure		RVP	**0.02**		Vent Setting Correction Factor		KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00						
Vapor Pressure Equation Constant A		A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))		**Ks**	**0.99**	
Vapor Pressure Equation Constant B		B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp		PvA	0.0056	psia
					Vapor Space Outage		Hvo	23.80	ft
Tank design data									
Shell height		Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**		**KE**	**0.0656**	**per day**
Diameter		D	**125.00**	ft	Average Daily Vapor Temperature Range		ΔTv	33.70	°R
Throughput		Q	**80,699,334**	gal/yr	Average Daily Vapor Pressure Range		ΔPv	0.0032	psi
Turnovers		N	**20.44**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)		ΔPB	0.0000	psi
Roof Type:			Cone		Vapor Pressure at Avg Daily Liq Surface Temp		PvA	0.0056	psia
Tank Cone Roof Slope (If unknown, use 0.0625)		SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature		TLA	515.42	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))		RR	**NA**	ft	Atmospheric Pressure		P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)		HLX	**44.00**	ft					
Minimum Filling Height (use 1 if unknown)		HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**				
Liquid height (assume 1/2 Hs)		HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)		ΔTA	17.8	°R
Tank Insulation (pick from drop down list)			Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**		**ΔTv**	**33.70**	**°R**
Tank Construction (pick from drop down list)			Riveted		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**		**ΔTv**	**31.92**	°R
Tank Shell Color (pick from drop down list)			Red, primer		**Fully Insulated, constant temperature**		**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)			Average						
Tank Interior Condition (pick from drop down list)			Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**				
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**		**ΔPv**	**0.00321**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)		PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A		PVX	0.00743	psia
		PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A		PVN	0.00422	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV		TLX	523.85	°R
Not Insulated		P_{VA}	0.005628014		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV		TLN	507.00	°R
Partially Insulated		P_{VA}	0.005688417						
Fully Insulated		P_{VA}	0.004910539		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**		**ΔPv**	**0.00306**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using		PVX	0.00740	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN		**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using		PVN	0.0043363	psia
Average daily maximum ambient temperature, Table 7.1-7		TAX	517.10	°R	Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0.25		TLX	523.72	°R
Average daily minimum ambient temperature, Table 7.1-7		TAN	499.30	°R	Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.25		TLN	507.76	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I		TB	511.39	°R	**Fully Insulated (ΔPv = 0)**		**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)					**Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo**		**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I		**TLA**	**515.42**	°R	Tank diameter		D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I		**TLA**	**515.74**	°R	Vapor Space Outage; see Equation 1-16		Hvo	23.80	ft
Fully Insulated: TLA = TB		**TLA**	**511.4**						
					Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)		**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)					Tank shell height		Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I		**Tv**	**518.71**	**°R**	Liquid Height		HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I		**Tv**	**520.09**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)		HRO	1.30	ft
Fully Insulated; Tv = TB		**Tv**	**511.39**	**°R**					
					Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)		**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					Tank cone roof slope (If unknown, use 0.0625)		SR	0.0625	ft/ft
Not Insulated		Wv	1.314E-04		Tank shell radius		Rs	62.50	ft
Partially Insulated		Wv	1.325E-04						
Fully Insulated		Wv	1.163E-04		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(**		**HRO**	**8.57**	ft
					Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))		RR	125.00	ft
					Tank shell radius		Rs	62.50	ft

HAPS Speciation	lb/yr
Product	Diesel
Total HAP Emissions =	**204.307**
Eq. 40-2 $L_{Ti} = C_{Vi}(L_T)$	

	Vapor Weight Concentrations				Vapor Mole Fraction		
	Eq. 40-6 ZVi = yiMi / MV				Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} **(lb/yr)**	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	1.0244	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	4.9806	78.11	130	0.00214	0.000020	0.006	**0.00356**
2,2,4 TMP	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	55.5289	92.14	130	0.02383	0.000189	0.006	**0.03361**
ethylbenzene	6.9530	106.17	130	0.00298	0.000021	0.006	**0.00365**
xylenes	134.9311	106.17	130	0.05789	0.000399	0.006	**0.07089**
naphthalene	0.8885	128.17	130	3.81E-04	0.000002	0.006	**3.87E-04**
cumene	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000010	188	86.18	0.00000	6.878	1171.5	224.37	1.7105
benzene	0.0000080	188	78.11	0.00002	6.906	1211	220.79	1.0396
2,2,4 TMP	0.0000000	188	114.23	0.00000	6.812	1257.8	220.74	0.5318
toluene	0.0003200	188	92.14	0.00065	7.017	1377.6	222.64	0.2898
ethylbenzene	0.0001300	188	106.17	0.00023	6.95	1419.3	212.61	0.0893
xylenes	0.0029000	188	106.17	0.00514	7.009	1462.3	215.11	0.0777
naphthalene	0.0007565	188	128.17	0.00111	7.146	1831.6	211.82	0.0020
cumene	0.0000000	188	120.19	0.00000	6.929	1455.8	207.2	0.0407
methanol	0.0000000	188	32.04	0.00000	8.079	1581.3	239.65	1.3054

Monthly Calculations - JANUARY

Tank No.	**29**						
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**18.60**	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**63.57**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
		3.18E-02	ton/month	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		**January**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Nearest US Location		**Albany, NY**		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	31	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**44.97**	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Product Type		**Distillate Fuel Oil No.2**		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0412**	**per day**
Diameter	D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Throughput	Q	**6,724,944**	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Turnovers	N	**20.06**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		**Cone**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	486.51	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Tank Insulation (pick from drop down list)		**Not Insulated**		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.01**	**°R**
Tank Construction (pick from drop down list)		**Riveted**		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**18.52**	°R
Tank Shell Color (pick from drop down list)		**Red, primer**		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00243	psia
	PBV	**-0.03**		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00167	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Not Insulated	P_{VA}	0.002015063		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Partially Insulated	P_{VA}	0.002025981					
Fully Insulated	P_{VA}	0.001881227		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00241	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0016994	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	491.28	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	482.02	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.69	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**486.65**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	**TLA**	**484.7**					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	**Tv**	**484.69**	**°R**				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	5.002E-05		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	5.023E-05					
Fully Insulated	Wv	4.702E-05		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(**	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**5.332**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0342	0.0100	0.0242	86.18	130	0.00054	0.000002	0.002	**0.00081**
benzene	0.1576	0.0461	0.1115	78.11	130	0.00248	0.000008	0.002	**0.00413**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	**-**
toluene	1.5826	0.4631	1.1195	92.14	130	0.02490	0.000071	0.002	**0.03513**
ethylbenzene	0.1748	0.0512	0.1237	106.17	130	0.00275	0.000007	0.002	**0.00337**
xylenes	3.3663	0.9851	2.3812	106.17	130	0.05295	0.000131	0.002	**0.06484**
naphthalene	0.0160	0.0047	0.0113	128.17	130	2.52E-04	0.000001	0.002	**2.56E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4318
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2125
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1084
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0295
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0254
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0005
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.4890

Monthly Calculations (continued) **FEBRUARY**

Tank No.	**29**						
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**24.43**	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**76.36**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
		3.82E-02	ton/month	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		**February**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Nearest US Location		**Albany, NY**		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	28	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**51.93**	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Product Type		**Distillate Fuel Oil No.2**		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0519**	**per day**
Diameter	D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Throughput	Q	**6,724,944**	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Turnovers	N	**22.21**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		**Cone**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	490.63	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Tank Insulation (pick from drop down list)		**Not Insulated**		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**25.40**	**°R**
Tank Construction (pick from drop down list)		**Riveted**		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**23.80**	°R
Tank Shell Color (pick from drop down list)		**Red, primer**		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00111**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00296	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00185	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Not Insulated	P_{VA}	0.002350191		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Partially Insulated	P_{VA}	0.002368781					
Fully Insulated	P_{VA}	0.002125695		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00105**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00294	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0018959	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	496.79	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.89	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.93	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**490.84**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	**TLA**	**487.9**					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	**Tv**	**487.93**	**°R**				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	5.777E-05		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	5.812E-05					
Fully Insulated	Wv	5.278E-05		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(**	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**6.457**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0400	0.0128	0.0272	86.18	130	0.00052	0.000002	0.002	**0.00079**
benzene	0.1854	0.0593	0.1261	78.11	130	0.00243	0.000009	0.002	**0.00404**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	**-**
toluene	1.8915	0.6051	1.2864	92.14	130	0.02477	0.000082	0.002	**0.03495**
ethylbenzene	0.2130	0.0682	0.1449	106.17	130	0.00279	0.000008	0.002	**0.00342**
xylenes	4.1067	1.3137	2.7930	106.17	130	0.05378	0.000155	0.002	**0.06586**
naphthalene	0.0205	0.0066	0.0140	128.17	130	2.69E-04	0.000001	0.002	**2.73E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4933
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2446
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1258
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0349
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0301
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5637

Monthly Calculations (continued) **MARCH**

Tank No.	**29**						
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.09**	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**123.29**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
		6.16E-02	ton/month	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		**March**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Nearest US Location		**Albany, NY**		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	31	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**75.20**	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Product Type		**Distillate Fuel Oil No.2**		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0638**	**per day**
Diameter	D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Throughput	Q	**6,724,944**	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Turnovers	N	**20.06**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		**Cone**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	501.51	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Tank Insulation (pick from drop down list)		**Not Insulated**		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**31.91**	**°R**
Tank Construction (pick from drop down list)		**Riveted**		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**30.17**	°R
Tank Shell Color (pick from drop down list)		**Red, primer**		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00199**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00460	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00261	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	509.48	°R
Not Insulated	P_{VA}	0.003484427		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Partially Insulated	P_{VA}	0.003521114					
Fully Insulated	P_{VA}	0.003048229		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00189**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00458	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0026857	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	509.35	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	494.26	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	497.76	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**501.80**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	**TLA**	**497.8**					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	**Tv**	**497.76**	**°R**				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	8.366E-05		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	8.433E-05					
Fully Insulated	Wv	7.419E-05		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(**	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**10.621**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0597	0.0233	0.0364	86.18	130	0.00048	0.000003	0.003	**0.00073**
benzene	0.2832	0.1105	0.1728	78.11	130	0.00230	0.000013	0.003	**0.00382**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.003	**-**
toluene	3.0077	1.1732	1.8346	92.14	130	0.02440	0.000120	0.003	**0.03442**
ethylbenzene	0.3557	0.1387	0.2169	106.17	130	0.00288	0.000012	0.003	**0.00353**
xylenes	6.8758	2.6819	4.1939	106.17	130	0.05577	0.000238	0.003	**0.06829**
naphthalene	0.0390	0.0152	0.0238	128.17	130	3.16E-04	0.000001	0.003	**3.21E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.003	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.003	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.6919
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3483
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1837
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0535
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0463
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0010
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8206

TANK 29 DISTILLATE

Monthly Calculations (continued) — APRIL

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	216.80	lb/month
		1.08E-01	ton/month
Time Period		April	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1496.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.73	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005855374	
Partially Insulated	P_{VA}	0.00593478	
Fully Insulated	P_{VA}	0.004927826	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	507.45	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.49	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	516.61	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	517.01	°R
Fully Insulated: TLA = TB	TLA	511.5	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	520.78	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	522.53	°R
Fully Insulated; Tv = TB	Tv	511.49	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.362E-04	
Partially Insulated	Wv	1.376E-04	
Fully Insulated	Wv	1.167E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	94.36	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	122.44	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0796	per day
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	41.00	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	38.99	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00406	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00390	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	507.26	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	19.027
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
hexane	0.0945	0.0411	0.0534	86.18	130	0.00044	0.000004	0.006	0.00066
benzene	0.4604	0.2004	0.2600	78.11	130	0.00212	0.000021	0.006	0.00353
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	5.1539	2.2432	2.9107	92.14	130	0.02377	0.000196	0.006	0.03354
ethylbenzene	0.6483	0.2822	0.3662	106.17	130	0.00299	0.000021	0.006	0.00366
xylenes	12.5858	5.4778	7.1079	106.17	130	0.05805	0.000416	0.006	0.07108
naphthalene	0.0839	0.0365	0.0474	128.17	130	3.87E-04	0.000002	0.006	3.93E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	0.00E+00

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0749
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5519
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.3008
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0931
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0811
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0021
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.3415

Monthly Calculations (continued) — MAY

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	330.27	lb/month
		1.65E-01	ton/month
Time Period		May	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1739.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.008643068	
Partially Insulated	P_{VA}	0.008773316	
Fully Insulated	P_{VA}	0.007134727	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	517.90	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	522.60	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	528.54	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	529.01	°R
Fully Insulated: TLA = TB	TLA	522.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	533.39	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	535.43	°R
Fully Insulated; Tv = TB	Tv	522.60	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.963E-04	
Partially Insulated	Wv	1.985E-04	
Fully Insulated	Wv	1.654E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	153.81	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	176.46	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0875	per day
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	46.00	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	43.90	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00643	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01237	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00594	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00621	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0061410	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	518.04	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	29.266
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
hexane	0.1325	0.0617	0.0708	86.18	130	0.00040	0.000005	0.009	0.00061
benzene	0.6588	0.3068	0.3520	78.11	130	0.00199	0.000029	0.009	0.00332
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.6688	3.5716	4.0973	92.14	130	0.02322	0.000283	0.009	0.03276
ethylbenzene	1.0088	0.4698	0.5390	106.17	130	0.00305	0.000032	0.009	0.00374
xylenes	19.6499	9.1514	10.4985	106.17	130	0.05950	0.000630	0.009	0.07285
naphthalene	0.1476	0.0688	0.0789	128.17	130	4.47E-04	0.000004	0.009	4.53E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	0.00E+00

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.4901
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.7759
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4337
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1404
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1226
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0035
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.9347

Monthly Calculations (continued) — JUNE

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	440.13	lb/month
		2.20E-01	ton/month
Time Period		June	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1853.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.73	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011908818	
Partially Insulated	P_{VA}	0.012092866	
Fully Insulated	P_{VA}	0.009781779	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	527.45	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	532.45	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	538.79	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	539.29	°R
Fully Insulated: TLA = TB	TLA	532.5	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	543.96	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	546.13	°R
Fully Insulated; Tv = TB	Tv	532.45	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.652E-04	
Partially Insulated	Wv	2.682E-04	
Fully Insulated	Wv	2.226E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	201.72	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	238.41	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0881	per day
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	47.14	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	45.17	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00874	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01697	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00823	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00848	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01697	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0084939	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.58	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	528.00	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	39.204
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
hexane	0.1647	0.0755	0.0892	86.18	130	0.00037	0.000007	0.012	0.00056
benzene	0.8316	0.3812	0.4505	78.11	130	0.00189	0.000037	0.012	0.00314
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	9.9974	4.5821	5.4153	92.14	130	0.02271	0.000382	0.012	0.03205
ethylbenzene	1.3630	0.6247	0.7383	106.17	130	0.00310	0.000045	0.012	0.00379
xylenes	26.6268	12.2038	14.4230	106.17	130	0.06050	0.000882	0.012	0.07408
naphthalene	0.2204	0.1010	0.1194	128.17	130	5.01E-04	0.000006	0.012	5.08E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	0.00E+00

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.9450
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0236
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5845
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1962
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1718
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0055
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.6110

Monthly Calculations (continued) **JULY**

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	499.56	lb/month
		2.50E-01	ton/month
Time Period		July	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1872.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.013458315	
Partially Insulated	P_{VA}	0.013665337	
Fully Insulated	P_{VA}	0.011064547	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	531.35	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	536.40	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	542.81	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	543.31	°R
Fully Insulated: TLA = TB	TLA	536.4	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	548.03	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	550.22	°R
Fully Insulated; Tv = TB	Tv	536.40	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.975E-04	
Partially Insulated	Wv	3.009E-04	
Fully Insulated	Wv	2.499E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	232.14	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	267.42	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.98	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0876	per day
Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Average Daily Liquid Surface Temperature	TLA	542.81	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	47.21	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	45.28	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00974	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01908	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00935	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00945	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01910	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0096413	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	554.63	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	531.99	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	44.557
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1819	0.0845	0.0974	86.18	130	0.00036	0.000007	0.013	0.00055
benzene	0.9241	0.4294	0.4947	78.11	130	0.00185	0.000041	0.013	0.00308
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.013	-
toluene	11.2457	5.2257	6.0200	92.14	130	0.02251	0.000427	0.013	0.03176
ethylbenzene	1.5538	0.7220	0.8318	106.17	130	0.00311	0.000051	0.013	0.00381
xylenes	30.3905	14.1220	16.2685	106.17	130	0.06083	0.001002	0.013	0.07449
naphthalene	0.2610	0.1213	0.1397	128.17	130	5.22E-04	0.000007	0.013	5.30E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.013	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.013	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.1519
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.1368
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6547
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2227
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1952
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0064
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.9263

Monthly Calculations (continued) **AUGUST**

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	445.49	lb/month
		2.23E-01	ton/month
Time Period		August	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1640.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.01242878	
Partially Insulated	P_{VA}	0.012597769	
Fully Insulated	P_{VA}	0.010454313	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	530.15	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	540.19	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	540.63	°R
Fully Insulated: TLA = TB	TLA	534.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	544.76	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	546.68	°R
Fully Insulated; Tv = TB	Tv	534.58	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.764E-04	
Partially Insulated	Wv	2.792E-04	
Fully Insulated	Wv	2.369E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	197.04	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	248.45	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.98	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0800	per day
Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Average Daily Liquid Surface Temperature	TLA	540.19	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	42.89	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	40.98	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00823	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01713	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00890	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00795	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01711	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0091640	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.87	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	530.38	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	39.701
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1651	0.0730	0.0921	86.18	130	0.00037	0.000007	0.012	0.00056
benzene	0.8356	0.3696	0.4660	78.11	130	0.00188	0.000039	0.012	0.00312
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	10.0877	4.4618	5.6259	92.14	130	0.02264	0.000397	0.012	0.03195
ethylbenzene	1.3818	0.6112	0.7706	106.17	130	0.00310	0.000047	0.012	0.00380
xylenes	27.0047	11.9442	15.0605	106.17	130	0.06062	0.000923	0.012	0.07422
naphthalene	0.2264	0.1002	0.1263	128.17	130	5.08E-04	0.000006	0.012	5.16E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.0150
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0602
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6082
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2051
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1796
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0058
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.7172

Monthly Calculations (continued) **SEPTEMBER**

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	309.46	lb/month
		1.55E-01	ton/month
Time Period		September	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1300.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.73	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009054711	
Partially Insulated	P_{VA}	0.009155981	
Fully Insulated	P_{VA}	0.00785475	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	522.05	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	525.56	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	530.01	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	530.36	°R
Fully Insulated: TLA = TB	TLA	525.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	533.63	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	535.15	°R
Fully Insulated; Tv = TB	Tv	525.56	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.056E-04	
Partially Insulated	Wv	2.073E-04	
Fully Insulated	Wv	1.811E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	124.68	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	184.78	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0700	per day
Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Average Daily Liquid Surface Temperature	TLA	530.01	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	36.91	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	34.98	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00535	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01207	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00672	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	539.23	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.78	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00511	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01202	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0069091	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	521.61	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	27.447
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1229	0.0495	0.0734	86.18	130	0.00040	0.000005	0.009	0.00060
benzene	0.6125	0.2468	0.3657	78.11	130	0.00198	0.000030	0.009	0.00329
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.1637	2.8863	4.2774	92.14	130	0.02315	0.000296	0.009	0.03266
ethylbenzene	0.9473	0.3817	0.5656	106.17	130	0.00306	0.000034	0.009	0.00375
xylenes	18.4599	7.4375	11.0224	106.17	130	0.05965	0.000661	0.009	0.07304
naphthalene	0.1407	0.0567	0.0840	128.17	130	4.55E-04	0.000004	0.009	4.61E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.5491
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.8051
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4529
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1474
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1288
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0038
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.0210

Monthly Calculations (continued) OCTOBER

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**183.21**	lb/month
		9.16E-02	ton/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005576566	
Partially Insulated	P_{VA}	0.005621296	
Fully Insulated	P_{VA}	0.005036616	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	512.13	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.15**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**515.39**	°R
Fully Insulated: TLA = TB	**TLA**	**512.1**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**517.61**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**518.64**	**°R**
Fully Insulated; Tv = TB	**Tv**	**512.13**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.305E-04	
Partially Insulated	Wv	1.313E-04	
Fully Insulated	Wv	1.191E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**65.89**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**117.32**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0561**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Average Daily Liquid Surface Temperature	TLA	515.15	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**28.83**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**26.98**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00272**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00708	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00436	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	522.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00256**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00703	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0044701	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	522.13	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	508.64	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**16.056**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0807	0.0290	0.0517	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	0.3921	0.1410	0.2511	78.11	130	0.00214	0.000020	0.006	**0.00356**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	**-**
toluene	4.3672	1.5706	2.7966	92.14	130	0.02384	0.000188	0.006	**0.03363**
ethylbenzene	0.5463	0.1964	0.3498	106.17	130	0.00298	0.000020	0.006	**0.00365**
xylenes	10.5998	3.8120	6.7878	106.17	130	0.05786	0.000395	0.006	**0.07084**
naphthalene	0.0696	0.0250	0.0446	128.17	130	3.80E-04	0.000002	0.006	**3.85E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0315
2,2,4-TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5263
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.2872
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0884
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0769
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0019
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.2812

Monthly Calculations (continued) NOVEMBER

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**110.57**	lb/month
		5.53E-02	ton/month
Time Period		**November**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003681787	
Partially Insulated	P_{VA}	0.003700512	
Fully Insulated	P_{VA}	0.003451775	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	501.24	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**503.07**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**503.21**	°R
Fully Insulated: TLA = TB	**TLA**	**501.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.56**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.18**	**°R**
Fully Insulated; Tv = TB	**Tv**	**501.24**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.840E-05	
Partially Insulated	Wv	8.874E-05	
Fully Insulated	Wv	8.343E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**31.11**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**79.46**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0403**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Average Daily Liquid Surface Temperature	TLA	503.07	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.25**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.73**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00132**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00439	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00308	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	508.13	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00122**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00436	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0031337	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	507.90	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	498.53	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**9.547**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0530	0.0149	0.0381	86.18	130	0.00048	0.000003	0.004	**0.00072**
benzene	0.2520	0.0709	0.1811	78.11	130	0.00228	0.000014	0.004	**0.00379**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.004	**-**
toluene	2.6909	0.7571	1.9338	92.14	130	0.02434	0.000126	0.004	**0.03434**
ethylbenzene	0.3203	0.0901	0.2302	106.17	130	0.00290	0.000013	0.004	**0.00355**
xylenes	6.1953	1.7431	4.4522	106.17	130	0.05603	0.000253	0.004	**0.06861**
naphthalene	0.0357	0.0101	0.0257	128.17	130	3.23E-04	0.000001	0.004	**3.28E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.004	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.004	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.7252
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3640
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1936
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0567
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0492
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0011
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8647

Monthly Calculations (continued) DECEMBER

Tank No.	29		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**72.19**	lb/month
		3.61E-02	ton/month
Time Period		**December**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002421037	
Partially Insulated	P_{VA}	0.00243123	
Fully Insulated	P_{VA}	0.002295179	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.99	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**491.43**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**491.55**	°R
Fully Insulated: TLA = TB	**TLA**	**490.0**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.61**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.10**	**°R**
Fully Insulated; Tv = TB	**Tv**	**489.99**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.954E-05	
Partially Insulated	Wv	5.973E-05	
Fully Insulated	Wv	5.675E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**18.67**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**53.52**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0347**	**per day**
Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	491.43	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**17.05**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.70**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00076**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00283	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00207	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	495.69	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00071**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00281	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0021013	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	495.47	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	487.62	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**6.114**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0376	0.0097	0.0278	86.18	130	0.00052	0.000002	0.002	**0.00078**
benzene	0.1746	0.0452	0.1294	78.11	130	0.00242	0.000010	0.002	**0.00403**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	**-**
toluene	1.7865	0.4621	1.3244	92.14	130	0.02475	0.000085	0.002	**0.03492**
ethylbenzene	0.2020	0.0522	0.1497	106.17	130	0.00280	0.000008	0.002	**0.00343**
xylenes	3.8940	1.0071	2.8869	106.17	130	0.05394	0.000160	0.002	**0.06605**
naphthalene	0.0197	0.0051	0.0146	128.17	130	2.72E-04	0.000001	0.002	**2.76E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.5061
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2503
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1295
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0360
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0311
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.		64		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**657.79**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**1,920.13**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
		0.96	ton/year	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.051	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	0.99	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1,262.35**	lb/yr
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,396,370	ft3/yr
Product Type		Distillate Fuel Oil No.2		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0511**	**per day**
Diameter	D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	26.15	°R
Throughput	Q	**77,778,331**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0023	psi
Turnovers	N	**19.70**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	512.85	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)		Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**26.15**	**°R**
Tank Construction (pick from drop down list)		Riveted		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**24.37**	°R
Tank Shell Color (pick from drop down list)		Gray, light		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00230**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00642	psia
	PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00412	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.39	°R
Not Insulated	P_{VA}	0.005161549		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.32	°R
Partially Insulated	P_{VA}	0.005197548					
Fully Insulated	P_{VA}	0.004724283		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00215**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00637	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0042189	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R	Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0.25	TLX	519.15	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R	Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.25	TLN	506.97	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	510.25	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**512.85**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.06**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	**TLA**	**510.3**					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**514.98**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**515.87**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	**Tv**	**510.25**	**°R**				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	1.214E-04		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	1.221E-04					
Fully Insulated	Wv	1.122E-04		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(**	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/hr
Product	Diesel
Total HAP Emissions =	**167.859**

Individual HAPS	L_{Ti} (lb/yr)	Vapor Weight Concentrations Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ M_i	M_v	Z_{Vi}	Vapor Mole Fraction Eq. 40-5 $yi = Pi / PVA$ $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.8592	86.18	130	0.00045	0.000003	0.005	**0.00067**
benzene	4.1587	78.11	130	0.00217	0.000019	0.005	**0.00360**
2,2,4 TMP	0.0000	114.23	130	0.00000	0.000000	0.005	-
toluene	45.9614	92.14	130	0.02394	0.000174	0.005	**0.03377**
ethylbenzene	5.6969	106.17	130	0.00297	0.000019	0.005	**0.00363**
xylenes	110.4745	106.17	130	0.05753	0.000364	0.005	**0.07045**
naphthalene	0.7082	128.17	130	3.69E-04	0.000002	0.005	**3.74E-04**
cumene	0.0000	120.19	130	0.00E+00	0.000000	0.005	**0.00E+00**
methanol	0.0000	32.04	130	0.00E+00	0.000000	0.005	**0.00E+00**

Individual HAPS	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C))) A	B	C	P_{VAi}
hexane	0.0000010	188	86.18	0.00000	6.878	1171.5	224.37	1.5971
benzene	0.0000080	188	78.11	0.00002	6.906	1211	220.79	0.9663
2,2,4 TMP	0.0000000	188	114.23	0.00000	6.812	1257.8	220.74	0.4913
toluene	0.0003200	188	92.14	0.00065	7.017	1377.6	222.64	0.2670
ethylbenzene	0.0001300	188	106.17	0.00023	6.95	1419.3	212.61	0.0815
xylenes	0.0029000	188	106.17	0.00514	7.009	1462.3	215.11	0.0708
naphthalene	0.0007565	188	128.17	0.00111	7.146	1831.6	211.82	0.0017
cumene	0.0000000	188	120.19	0.00000	6.929	1455.8	207.2	0.0369
methanol	0.0000000	188	32.04	0.00000	8.079	1581.3	239.65	1.1988

Monthly Calculations - JANUARY

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**56.50**	lb/month
		2.82E-02	ton/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.33**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.001928963	
Partially Insulated	P_{VA}	0.001935725	
Fully Insulated	P_{VA}	0.001845112	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.18	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**485.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**485.44**	°R
Fully Insulated: TLA = TB	**TLA**	**484.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**486.30**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**486.71**	**°R**
Fully Insulated; Tv = TB	**Tv**	**484.18**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	4.805E-05	
Partially Insulated	Wv	4.818E-05	
Fully Insulated	Wv	4.617E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**14.87**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.034	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**41.63**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0019	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0342**	**per day**
Average Daily Vapor Temperature Range	ΔTv	16.60	°R
Average Daily Vapor Pressure Range	ΔPv	0.0006	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0019	psia
Average Daily Liquid Surface Temperature	TLA	485.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**16.60**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.11**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00061**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00225	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00165	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	489.50	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.20	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00055**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00223	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0016763	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	489.22	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	481.66	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	**4.727**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0307	0.0081	0.0226	86.18	130	0.00054	0.000002	0.002	**0.00082**
benzene	0.1409	0.0371	0.1038	78.11	130	0.00249	0.000008	0.002	**0.00415**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.4083	0.3706	1.0378	92.14	130	0.02493	0.000068	0.002	**0.03517**
ethylbenzene	0.1547	0.0407	0.1140	106.17	130	0.00274	0.000006	0.002	**0.00335**
xylenes	2.9782	0.7836	2.1946	106.17	130	0.05271	0.000125	0.002	**0.06455**
naphthalene	0.0140	0.0037	0.0103	128.17	130	2.47E-04	0.000000	0.002	**2.51E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.7246
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4158
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2040
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1039
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0281
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0242
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0004
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0117
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.4681

Monthly Calculations (continued) FEBRUARY

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**65.72**	lb/month
		3.29E-02	ton/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**21.40**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002205041	
Partially Insulated	P_{VA}	0.002216347	
Fully Insulated	P_{VA}	0.002066212	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.17	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**488.91**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**489.05**	°R
Fully Insulated: TLA = TB	**TLA**	**487.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**490.33**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.93**	**°R**
Fully Insulated; Tv = TB	**Tv**	**487.17**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.448E-05	
Partially Insulated	Wv	5.469E-05	
Fully Insulated	Wv	5.138E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**18.52**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.042	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**47.20**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0417**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Average Daily Liquid Surface Temperature	TLA	488.91	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.35**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.75**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00084**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00266	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00182	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.00	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.82	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00078**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00263	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0018581	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.74	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.36	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	**5.539**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0348	0.0098	0.0250	86.18	130	0.00053	0.000002	0.002	**0.00080**
benzene	0.1610	0.0454	0.1156	78.11	130	0.00245	0.000009	0.002	**0.00408**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.6315	0.4598	1.1717	92.14	130	0.02482	0.000077	0.002	**0.03503**
ethylbenzene	0.1823	0.0514	0.1309	106.17	130	0.00277	0.000007	0.002	**0.00340**
xylenes	3.5124	0.9899	2.5225	106.17	130	0.05344	0.000144	0.002	**0.06544**
naphthalene	0.0172	0.0048	0.0124	128.17	130	2.62E-04	0.000001	0.002	**2.66E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.8076
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4669
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2304
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1183
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0325
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0281
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0005
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0137
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5303

Monthly Calculations (continued) MARCH

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**101.92**	lb/month
		5.10E-02	ton/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.33**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003200929	
Partially Insulated	P_{VA}	0.00322282	
Fully Insulated	P_{VA}	0.002934849	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	496.71	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**499.12**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**499.31**	°R
Fully Insulated: TLA = TB	**TLA**	**496.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.92**	**°R**
Fully Insulated; Tv = TB	**Tv**	**496.71**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	7.739E-05	
Partially Insulated	Wv	7.779E-05	
Fully Insulated	Wv	7.158E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**34.88**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.050	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**67.04**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0032	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0500**	**per day**
Average Daily Vapor Temperature Range	ΔTv	24.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0014	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0032	psia
Average Daily Liquid Surface Temperature	TLA	499.12	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**24.89**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.15**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00143**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00399	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00256	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	505.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.90	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00134**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00395	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0026144	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	493.52	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	**8.748**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0502	0.0172	0.0330	86.18	130	0.00049	0.000002	0.003	**0.00074**
benzene	0.2370	0.0811	0.1559	78.11	130	0.00233	0.000012	0.003	**0.00387**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.003	-
toluene	2.4954	0.8539	1.6415	92.14	130	0.02448	0.000111	0.003	**0.03454**
ethylbenzene	0.2920	0.0999	0.1921	106.17	130	0.00287	0.000011	0.003	**0.00351**
xylenes	5.6421	1.9307	3.7114	106.17	130	0.05536	0.000217	0.003	**0.06778**
naphthalene	0.0311	0.0107	0.0205	128.17	130	3.05E-04	0.000001	0.003	**3.10E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.003	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.003	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.0907
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.6434
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3220
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1694
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0488
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0423
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0009
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0212
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.7570

Monthly Calculations (continued) APRIL

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**172.63**	lb/month
		8.63E-02	ton/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.98**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005248947	
Partially Insulated	P_{VA}	0.005295307	
Fully Insulated	P_{VA}	0.004692031	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	510.05	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.61**	°R
Fully Insulated: TLA = TB	**TLA**	**510.1**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**516.04**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**517.17**	**°R**
Fully Insulated; Tv = TB	**Tv**	**510.05**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.232E-04	
Partially Insulated	Wv	1.240E-04	
Fully Insulated	Wv	1.114E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**65.87**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**106.76**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0614**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.42	°R
Average Daily Vapor Pressure Range	ΔPv	0.0028	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Average Daily Liquid Surface Temperature	TLA	513.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.42**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**29.41**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00281**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00682	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00401	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	521.21	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.49	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00265**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00676	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0041162	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	520.96	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	506.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	15.099
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0770	0.0294	0.0476	86.18	130	0.00045	0.000004	0.005	**0.00067**
benzene	0.3729	0.1423	0.2306	78.11	130	0.00216	0.000019	0.005	**0.00360**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.005	-
toluene	4.1284	1.5753	2.5531	92.14	130	0.02392	0.000177	0.005	**0.03374**
ethylbenzene	0.5127	0.1956	0.3171	106.17	130	0.00297	0.000019	0.005	**0.00364**
xylenes	9.9441	3.7944	6.1497	106.17	130	0.05761	0.000370	0.005	**0.07053**
naphthalene	0.0641	0.0245	0.0396	128.17	130	3.71E-04	0.000002	0.005	**3.76E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.005	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.005	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.6185
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.9801
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.4994
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.2713
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0829
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0721
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0018
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0376
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.2100

Monthly Calculations (continued) MAY

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**257.34**	lb/month
		1.29E-01	ton/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.33**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.007654065	
Partially Insulated	P_{VA}	0.007729302	
Fully Insulated	P_{VA}	0.006755472	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	520.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**524.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**525.06**	°R
Fully Insulated: TLA = TB	**TLA**	**520.9**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**527.89**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**529.20**	**°R**
Fully Insulated; Tv = TB	**Tv**	**520.93**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.757E-04	
Partially Insulated	Wv	1.769E-04	
Fully Insulated	Wv	1.571E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**105.16**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.067	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**152.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0077	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0668**	**per day**
Average Daily Vapor Temperature Range	ΔTv	34.87	°R
Average Daily Vapor Pressure Range	ΔPv	0.0044	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0077	psia
Average Daily Liquid Surface Temperature	TLA	524.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**34.87**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**32.77**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00435**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01010	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00575	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	533.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	516.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00412**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01003	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0059069	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	533.25	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	516.87	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	22.744
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1060	0.0433	0.0627	86.18	130	0.00041	0.000005	0.008	**0.00062**
benzene	0.5236	0.2140	0.3096	78.11	130	0.00203	0.000026	0.008	**0.00339**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.008	-
toluene	6.0217	2.4607	3.5610	92.14	130	0.02340	0.000253	0.008	**0.03301**
ethylbenzene	0.7813	0.3193	0.4620	106.17	130	0.00304	0.000028	0.008	**0.00372**
xylenes	15.2015	6.2119	8.9896	106.17	130	0.05907	0.000554	0.008	**0.07233**
naphthalene	0.1100	0.0450	0.0651	128.17	130	4.28E-04	0.000003	0.008	**4.34E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.008	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.008	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.1802
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.3462
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.6951
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.3870
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1236
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1078
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0030
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0578
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.7262

Monthly Calculations (continued) JUNE

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**340.94**	lb/month
		1.70E-01	ton/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.98**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.010513185	
Partially Insulated	P_{VA}	0.010619231	
Fully Insulated	P_{VA}	0.009248362	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	530.67	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**534.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**535.08**	°R
Fully Insulated: TLA = TB	**TLA**	**530.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**538.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**539.49**	**°R**
Fully Insulated; Tv = TB	**Tv**	**530.67**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.367E-04	
Partially Insulated	Wv	2.385E-04	
Fully Insulated	Wv	2.111E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**135.88**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**205.06**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0105	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0664**	**per day**
Average Daily Vapor Temperature Range	ΔTv	35.28	°R
Average Daily Vapor Pressure Range	ΔPv	0.0058	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0105	psia
Average Daily Liquid Surface Temperature	TLA	534.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**35.28**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.31**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00583**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01378	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00795	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	543.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	525.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00554**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01371	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0081618	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	543.41	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	526.75	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	30.317
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1311	0.0523	0.0789	86.18	130	0.00038	0.000006	0.011	**0.00058**
benzene	0.6581	0.2623	0.3958	78.11	130	0.00193	0.000034	0.011	**0.00321**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.011	-
toluene	7.8132	3.1139	4.6992	92.14	130	0.02292	0.000340	0.011	**0.03233**
ethylbenzene	1.0506	0.4187	0.6319	106.17	130	0.00308	0.000040	0.011	**0.00377**
xylenes	20.5006	8.1705	12.3301	106.17	130	0.06013	0.000774	0.011	**0.07362**
naphthalene	0.1634	0.0651	0.0983	128.17	130	4.79E-04	0.000005	0.011	**4.86E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.011	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.011	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.7955
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.7540
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.9152
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5206
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1723
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1507
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0046
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0826
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.3241

Monthly Calculations (continued) JULY

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	386.18	lb/month
		1.93E-01	ton/month
Time Period		**July**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.33**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011887936	
Partially Insulated	P_{VA}	0.012007295	
Fully Insulated	P_{VA}	0.010463857	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**531.35**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.61	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.73**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**539.06**	°R
Fully Insulated: TLA = TB	**TLA**	**534.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**542.10**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**543.51**	**°R**
Fully Insulated; Tv = TB	**Tv**	**534.61**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.657E-04	
Partially Insulated	Wv	2.676E-04	
Fully Insulated	Wv	2.371E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**156.02**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**230.16**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0658**	**per day**
Average Daily Vapor Temperature Range	ΔTv	35.23	°R
Average Daily Vapor Pressure Range	ΔPv	0.0065	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.73	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**35.23**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.30**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00648**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01551	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00903	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	547.54	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00617**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01544	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0092662	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	547.38	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	530.74	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	34.398
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1445	0.0584	0.0861	86.18	130	0.00037	0.000007	0.012	**0.00056**
benzene	0.7299	0.2949	0.4350	78.11	130	0.00189	0.000037	0.012	**0.00315**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	8.7731	3.5444	5.2287	92.14	130	0.02272	0.000381	0.012	**0.03205**
ethylbenzene	1.1958	0.4831	0.7127	106.17	130	0.00310	0.000045	0.012	**0.00379**
xylenes	23.3612	9.4381	13.9231	106.17	130	0.06049	0.000881	0.012	**0.07407**
naphthalene	0.1933	0.0781	0.1152	128.17	130	5.01E-04	0.000006	0.012	**5.08E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.0764
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.9422
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0173
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5836
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1958
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1715
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0054
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0948
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.6067

Monthly Calculations (continued) AUGUST

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	352.32	lb/month
		1.76E-01	ton/month
Time Period		**August**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.33**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011137977	
Partially Insulated	P_{VA}	0.01123667	
Fully Insulated	P_{VA}	0.009952251	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**530.15**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	533.00	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**536.62**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**536.90**	°R
Fully Insulated: TLA = TB	**TLA**	**533.0**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**539.57**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**540.80**	**°R**
Fully Insulated; Tv = TB	**Tv**	**533.00**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.501E-04	
Partially Insulated	Wv	2.517E-04	
Fully Insulated	Wv	2.262E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**135.66**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**216.65**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0111	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0608**	**per day**
Average Daily Vapor Temperature Range	ΔTv	32.39	°R
Average Daily Vapor Pressure Range	ΔPv	0.0056	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0111	psia
Average Daily Liquid Surface Temperature	TLA	536.62	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**32.39**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.48**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00562**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01426	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00864	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	544.72	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	528.52	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00532**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01417	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0088491	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	544.52	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	529.28	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	31.355
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1338	0.0515	0.0823	86.18	130	0.00038	0.000006	0.011	**0.00057**
benzene	0.6734	0.2593	0.4141	78.11	130	0.00191	0.000035	0.011	**0.00318**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.011	-
toluene	8.0412	3.0963	4.9448	92.14	130	0.02282	0.000359	0.011	**0.03220**
ethylbenzene	1.0882	0.4190	0.6692	106.17	130	0.00309	0.000042	0.011	**0.00378**
xylenes	21.2457	8.1809	13.0648	106.17	130	0.06030	0.000822	0.011	**0.07384**
naphthalene	0.1724	0.0664	0.1060	128.17	130	4.89E-04	0.000006	0.011	**4.96E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.011	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.011	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.9242
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.8401
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.9609
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5493
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1830
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1602
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0050
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0881
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.4529

Monthly Calculations (continued) SEPTEMBER

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	253.46	lb/month
		1.27E-01	ton/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,481,528**	gal/month
Turnovers	N	**19.98**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.008273917	
Partially Insulated	P_{VA}	0.008334091	
Fully Insulated	P_{VA}	0.007544197	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	524.31	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**527.18**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**527.40**	°R
Fully Insulated: TLA = TB	**TLA**	**524.3**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**529.51**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**530.49**	**°R**
Fully Insulated; Tv = TB	**Tv**	**524.31**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.893E-04	
Partially Insulated	Wv	1.903E-04	
Fully Insulated	Wv	1.743E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**89.46**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.054	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**164.00**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0083	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0545**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.59	°R
Average Daily Vapor Pressure Range	ΔPv	0.0038	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0083	psia
Average Daily Liquid Surface Temperature	TLA	527.18	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**28.59**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**26.66**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00381**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01037	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00656	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	534.32	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.03	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00358**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01029	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0067140	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	534.07	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	520.74	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	22.440
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1027	0.0362	0.0664	86.18	130	0.00041	0.000005	0.008	**0.00061**
benzene	0.5092	0.1797	0.3295	78.11	130	0.00201	0.000028	0.008	**0.00334**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.008	-
toluene	5.9018	2.0831	3.8187	92.14	130	0.02329	0.000272	0.008	**0.03285**
ethylbenzene	0.7725	0.2727	0.4999	106.17	130	0.00305	0.000031	0.008	**0.00373**
xylenes	15.0418	5.3091	9.7327	106.17	130	0.05935	0.000601	0.008	**0.07267**
naphthalene	0.1115	0.0394	0.0722	128.17	130	4.40E-04	0.000004	0.008	**4.46E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.008	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.008	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.3177
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.4368
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.7421
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4163
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1341
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1171
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0033
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0631
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.8571

Monthly Calculations (continued) — **OCTOBER**

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	156.71	lb/month
		7.84E-02	ton/month
Time Period		October	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	882.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,481,528	gal/month
Turnovers	N	19.33	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.00522741	
Partially Insulated	P_{VA}	0.005254601	
Fully Insulated	P_{VA}	0.004893619	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	509.75	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.28	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	513.23	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	513.38	°R
Fully Insulated: TLA = TB	TLA	511.3	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	514.81	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	515.48	°R
Fully Insulated; Tv = TB	Tv	511.28	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.230E-04	
Partially Insulated	Wv	1.235E-04	
Fully Insulated	Wv	1.159E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	50.14	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.045	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	106.57	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0453	per day
Average Daily Vapor Temperature Range	ΔTv	23.18	°R
Average Daily Vapor Pressure Range	ΔPv	0.0021	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Average Daily Liquid Surface Temperature	TLA	513.23	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	23.18	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	21.33	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00206	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00635	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00429	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.02	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.43	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00190	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00628	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0043797	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	518.71	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	508.05	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	13.705
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0699	0.0224	0.0476	86.18	130	0.00045	0.000004	0.005	0.00067
benzene	0.3387	0.1084	0.2304	78.11	130	0.00216	0.000019	0.005	0.00360
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.005	-
toluene	3.7485	1.1993	2.5492	92.14	130	0.02392	0.000176	0.005	0.03375
ethylbenzene	0.4653	0.1489	0.3164	106.17	130	0.00297	0.000019	0.005	0.00364
xylenes	9.0245	2.8873	6.1372	106.17	130	0.05759	0.000369	0.005	0.07051
naphthalene	0.0581	0.0186	0.0395	128.17	130	3.71E-04	0.000002	0.005	3.76E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.005	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.005	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.6132
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.9767
2,2,4-TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.4960
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.2702
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0826
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0718
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0018
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0374
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.2053

Monthly Calculations (continued) — **NOVEMBER**

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	98.72	lb/month
		4.94E-02	ton/month
Time Period		November	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	534.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,481,528	gal/month
Turnovers	N	19.98	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.00353392	
Partially Insulated	P_{VA}	0.003545547	
Fully Insulated	P_{VA}	0.003389546	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	499.80	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	500.73	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	501.91	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	502.00	°R
Fully Insulated: TLA = TB	TLA	500.7	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	502.87	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	503.27	°R
Fully Insulated; Tv = TB	Tv	500.73	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.513E-05	
Partially Insulated	Wv	8.535E-05	
Fully Insulated	Wv	8.201E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	24.97	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.034	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	73.76	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0336	per day
Average Daily Vapor Temperature Range	ΔTv	16.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.91	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	16.83	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	15.31	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00105	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00410	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00304	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	506.11	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	497.70	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00096	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00406	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0030936	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.83	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	498.17	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	8.510
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0477	0.0121	0.0356	86.18	130	0.00048	0.000003	0.004	0.00073
benzene	0.2263	0.0572	0.1691	78.11	130	0.00229	0.000013	0.004	0.00382
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.004	-
toluene	2.4069	0.6087	1.7982	92.14	130	0.02438	0.000122	0.004	0.03440
ethylbenzene	0.2851	0.0721	0.2130	106.17	130	0.00289	0.000012	0.004	0.00354
xylenes	5.5123	1.3939	4.1183	106.17	130	0.05584	0.000242	0.004	0.06837
naphthalene	0.0314	0.0079	0.0234	128.17	130	3.18E-04	0.000001	0.004	3.22E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.004	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.004	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.1808
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.7003
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3505
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1862
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0543
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0470
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0010
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0238
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8317

Monthly Calculations (continued) — **DECEMBER**

Tank No.	64		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	65.26	lb/month
		3.26E-02	ton/month
Time Period		December	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	422.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,481,528	gal/month
Turnovers	N	19.33	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002340269	
Partially Insulated	P_{VA}	0.002346638	
Fully Insulated	P_{VA}	0.002260914	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	488.85	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	490.51	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	490.59	°R
Fully Insulated: TLA = TB	TLA	489.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	491.27	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	491.59	°R
Fully Insulated; Tv = TB	Tv	489.58	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.771E-05	
Partially Insulated	Wv	5.783E-05	
Fully Insulated	Wv	5.594E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	15.26	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.029	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	50.00	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0023	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0293	per day
Average Daily Vapor Temperature Range	ΔTv	14.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0006	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0023	psia
Average Daily Liquid Surface Temperature	TLA	490.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	14.35	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	13.00	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00062	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00267	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00205	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.10	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	486.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00057	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00264	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0020791	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.84	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	487.34	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	5.517
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0342	0.0080	0.0262	86.18	130	0.00052	0.000002	0.002	0.00079
benzene	0.1586	0.0371	0.1215	78.11	130	0.00243	0.000009	0.002	0.00404
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.6168	0.3781	1.2387	92.14	130	0.02478	0.000082	0.002	0.03496
ethylbenzene	0.1820	0.0426	0.1394	106.17	130	0.00279	0.000008	0.002	0.00342
xylenes	3.5083	0.8204	2.6879	106.17	130	0.05376	0.000154	0.002	0.06583
naphthalene	0.0175	0.0041	0.0134	128.17	130	2.68E-04	0.000001	0.002	2.72E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	0.8475
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4915
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2425
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1253
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0347
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0300
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0147
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5614

FRT TANK EMISSION CALCULATION

Tank No.		33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**912.86**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**2,320.58**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
		1.16	ton/year	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	0.99	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1,407.71**	lb/yr
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,709,864	ft3/yr
Product Type		Distillate Fuel Oil No.2		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0656**	**per day**
Diameter	D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	33.70	°R
Throughput	Q	**80,123,668**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
Turnovers	N	**20.30**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	515.42	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)		Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**33.70**	**°R**
Tank Construction (pick from drop down list)		Riveted		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**31.92**	°R
Tank Shell Color (pick from drop down list)		Red, primer		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00321**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00743	psia
	PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00422	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	523.85	°R
Not Insulated	P_{VA}	0.005628014		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.00	°R
Partially Insulated	P_{VA}	0.005688417					
Fully Insulated	P_{VA}	0.004910539		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00306**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00740	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0043363	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R	Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0.25	TLX	523.72	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R	Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.25	TLN	507.76	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.39	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.42**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**515.74**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	**TLA**	**511.4**					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**518.71**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**520.09**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	**Tv**	**511.39**	**°R**				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	1.314E-04		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	1.325E-04					
Fully Insulated	Wv	1.163E-04		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(**	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/yr
Product	Diesel
Total HAP Emissions =	**203.420**
Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$	

Vapor Weight Concentrations				Vapor Mole Fraction		
Eq. 40-6 ZVi = yiMi / MV				Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**
hexane	1.0199	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	4.9590	78.11	130	0.00214	0.000020	0.006	**0.00356**
2,2,4 TMP	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	55.2880	92.14	130	0.02383	0.000189	0.006	**0.03361**
ethylbenzene	6.9229	106.17	130	0.00298	0.000021	0.006	**0.00365**
xylenes	134.3456	106.17	130	0.05789	0.000399	0.006	**0.07089**
naphthalene	0.8846	128.17	130	3.81E-04	0.000002	0.006	**3.87E-04**
cumene	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

Liquid Mole Fraction					Component Vapor Pressure			
Eq. 40-4 xi = (ZLiML)/Mi					PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.0000010	188	86.18	0.00000	6.878	1171.5	224.37	1.7105
benzene	0.0000080	188	78.11	0.00002	6.906	1211	220.79	1.0396
2,2,4 TMP	0.0000000	188	114.23	0.00000	6.812	1257.8	220.74	0.5318
toluene	0.0003200	188	92.14	0.00065	7.017	1377.6	222.64	0.2898
ethylbenzene	0.0001300	188	106.17	0.00023	6.95	1419.3	212.61	0.0893
xylenes	0.0029000	188	106.17	0.00514	7.009	1462.3	215.11	0.0777
naphthalene	0.0007565	188	128.17	0.00111	7.146	1831.6	211.82	0.0020
cumene	0.0000000	188	120.19	0.00000	6.929	1455.8	207.2	0.0407
methanol	0.0000000	188	32.04	0.00000	8.079	1581.3	239.65	1.3054

Monthly Calculations - JANUARY

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**63.25**	lb/month
		3.16E-02	ton/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002015063	
Partially Insulated	P_{VA}	0.002025981	
Fully Insulated	P_{VA}	0.001881227	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.69	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**486.65**	°R
Fully Insulated: TLA = TB	**TLA**	**484.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	**°R**
Fully Insulated; Tv = TB	**Tv**	**484.69**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.002E-05	
Partially Insulated	Wv	5.023E-05	
Fully Insulated	Wv	4.702E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**18.60**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**44.65**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0412**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.01**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.52**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00076**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00243	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00167	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00071**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00241	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0016994	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	491.28	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	482.02	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	5.305

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0341	0.0100	0.0241	86.18	130	0.00054	0.000002	0.002	**0.00081**
benzene	0.1568	0.0461	0.1107	78.11	130	0.00248	0.000008	0.002	**0.00413**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.5746	0.4631	1.1115	92.14	130	0.02490	0.000071	0.002	**0.03513**
ethylbenzene	0.1739	0.0512	0.1228	106.17	130	0.00275	0.000007	0.002	**0.00337**
xylenes	3.3494	0.9851	2.3642	106.17	130	0.05295	0.000131	0.002	**0.06484**
naphthalene	0.0159	0.0047	0.0113	128.17	130	2.52E-04	0.000001	0.002	**2.56E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4318
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2125
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1084
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0295
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0254
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0005
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.4890

Monthly Calculations (continued) FEBRUARY

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**75.99**	lb/month
		3.80E-02	ton/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**22.05**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002350191	
Partially Insulated	P_{VA}	0.002368781	
Fully Insulated	P_{VA}	0.002125695	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**490.84**	°R
Fully Insulated: TLA = TB	**TLA**	**487.9**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	**°R**
Fully Insulated; Tv = TB	**Tv**	**487.93**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.777E-05	
Partially Insulated	Wv	5.812E-05	
Fully Insulated	Wv	5.278E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**24.43**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**51.56**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0519**	**per day**
Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	490.63	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**25.40**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.80**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00111**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00296	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00185	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00105**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00294	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0018959	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	496.79	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.89	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	6.426

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0398	0.0128	0.0270	86.18	130	0.00052	0.000002	0.002	**0.00079**
benzene	0.1845	0.0593	0.1252	78.11	130	0.00243	0.000009	0.002	**0.00404**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.8823	0.6051	1.2772	92.14	130	0.02477	0.000082	0.002	**0.03495**
ethylbenzene	0.2120	0.0682	0.1439	106.17	130	0.00279	0.000008	0.002	**0.00342**
xylenes	4.0868	1.3137	2.7731	106.17	130	0.05378	0.000155	0.002	**0.06586**
naphthalene	0.0204	0.0066	0.0139	128.17	130	2.69E-04	0.000001	0.002	**2.73E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4933
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2446
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1258
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0349
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0301
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5637

Monthly Calculations (continued) MARCH

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**122.76**	lb/month
		6.14E-02	ton/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003484427	
Partially Insulated	P_{VA}	0.003521114	
Fully Insulated	P_{VA}	0.003048229	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	497.76	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**501.80**	°R
Fully Insulated: TLA = TB	**TLA**	**497.8**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**
Fully Insulated; Tv = TB	**Tv**	**497.76**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.366E-05	
Partially Insulated	Wv	8.433E-05	
Fully Insulated	Wv	7.419E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.09**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**74.67**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.91**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.17**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00199**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00460	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00261	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	509.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00189**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00458	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0026857	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	509.35	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	494.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	10.575

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0595	0.0233	0.0362	86.18	130	0.00048	0.000003	0.003	**0.00073**
benzene	0.2820	0.1105	0.1715	78.11	130	0.00230	0.000013	0.003	**0.00382**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.003	-
toluene	2.9946	1.1732	1.8215	92.14	130	0.02440	0.000120	0.003	**0.03442**
ethylbenzene	0.3541	0.1387	0.2154	106.17	130	0.00288	0.000012	0.003	**0.00353**
xylenes	6.8459	2.6819	4.1640	106.17	130	0.05577	0.000238	0.003	**0.06829**
naphthalene	0.0388	0.0152	0.0236	128.17	130	3.16E-04	0.000001	0.003	**3.21E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.003	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.003	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.6919
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3483
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1837
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0535
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0463
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0010
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8206

Monthly Calculations (continued) APRIL

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	215.92	lb/month
		1.08E-01	ton/month
Time Period		April	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1496.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	20.58	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005855374	
Partially Insulated	P_{VA}	0.00593478	
Fully Insulated	P_{VA}	0.004927826	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	507.45	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.49	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	516.61	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	517.01	°R
Fully Insulated: TLA = TB	TLA	511.5	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	520.78	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	522.53	°R
Fully Insulated; Tv = TB	Tv	511.49	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.362E-04	
Partially Insulated	Wv	1.376E-04	
Fully Insulated	Wv	1.167E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	94.36	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	121.56	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0796	per day
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	41.00	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	38.99	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00406	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00390	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	507.26	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	18.950
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0941	0.0411	0.0530	86.18	130	0.00044	0.000004	0.006	0.00066
benzene	0.4586	0.2004	0.2582	78.11	130	0.00212	0.000021	0.006	0.00353
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	5.1331	2.2432	2.8899	92.14	130	0.02377	0.000196	0.006	0.03354
ethylbenzene	0.6457	0.2822	0.3635	106.17	130	0.00299	0.000021	0.006	0.00366
xylenes	12.5351	5.4778	7.0572	106.17	130	0.05805	0.000416	0.006	0.07108
naphthalene	0.0836	0.0365	0.0470	128.17	130	3.87E-04	0.000002	0.006	3.93E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0749
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5519
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.3008
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0931
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0811
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0021
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.3415

Monthly Calculations (continued) MAY

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	329.01	lb/month
		1.65E-01	ton/month
Time Period		May	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1739.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	19.91	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.008643068	
Partially Insulated	P_{VA}	0.008773316	
Fully Insulated	P_{VA}	0.007134727	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	517.90	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	522.60	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	528.54	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	529.01	°R
Fully Insulated: TLA = TB	TLA	522.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	533.39	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	535.43	°R
Fully Insulated; Tv = TB	Tv	522.60	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.963E-04	
Partially Insulated	Wv	1.985E-04	
Fully Insulated	Wv	1.654E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	153.81	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	175.20	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0875	per day
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	46.00	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	43.90	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00643	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01237	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00594	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00621	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0061410	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	518.04	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	29.155
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1320	0.0617	0.0703	86.18	130	0.00040	0.000005	0.009	0.00061
benzene	0.6562	0.3068	0.3494	78.11	130	0.00199	0.000029	0.009	0.00332
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.6396	3.5716	4.0680	92.14	130	0.02322	0.000283	0.009	0.03276
ethylbenzene	1.0050	0.4698	0.5351	106.17	130	0.00305	0.000032	0.009	0.00374
xylenes	19.5750	9.1514	10.4236	106.17	130	0.05950	0.000630	0.009	0.07285
naphthalene	0.1471	0.0688	0.0783	128.17	130	4.47E-04	0.000004	0.009	4.53E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.4901
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.7759
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4337
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1404
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1226
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0035
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.9347

Monthly Calculations (continued) JUNE

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	438.43	lb/month
		2.19E-01	ton/month
Time Period		June	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1853.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	20.58	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011908818	
Partially Insulated	P_{VA}	0.012092866	
Fully Insulated	P_{VA}	0.009781779	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	527.45	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	532.45	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	538.79	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	539.29	°R
Fully Insulated: TLA = TB	TLA	532.5	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	543.96	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	546.13	°R
Fully Insulated; Tv = TB	Tv	532.45	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.652E-04	
Partially Insulated	Wv	2.682E-04	
Fully Insulated	Wv	2.226E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	201.72	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	236.70	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0881	per day
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	47.14	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	45.17	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00874	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01697	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00823	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00848	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01697	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0084939	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.58	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	528.00	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	39.052
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1640	0.0755	0.0886	86.18	130	0.00037	0.000007	0.012	0.00056
benzene	0.8284	0.3812	0.4473	78.11	130	0.00189	0.000037	0.012	0.00314
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	9.9588	4.5821	5.3767	92.14	130	0.02271	0.000382	0.012	0.03205
ethylbenzene	1.3577	0.6247	0.7330	106.17	130	0.00310	0.000045	0.012	0.00379
xylenes	26.5239	12.2038	14.3201	106.17	130	0.06050	0.000882	0.012	0.07408
naphthalene	0.2196	0.1010	0.1185	128.17	130	5.01E-04	0.000006	0.012	5.08E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.9450
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0236
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5845
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1962
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1718
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0055
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.6110

Monthly Calculations (continued) JULY

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	497.66	lb/month
		2.49E-01	ton/month
Time Period		July	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1872.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	19.91	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.013458315	
Partially Insulated	P_{VA}	0.013665337	
Fully Insulated	P_{VA}	0.011064547	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	531.35	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	536.40	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	542.81	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	543.31	°R
Fully Insulated: TLA = TB	TLA	536.4	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	548.03	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	550.22	°R
Fully Insulated; Tv = TB	Tv	536.40	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.975E-04	
Partially Insulated	Wv	3.009E-04	
Fully Insulated	Wv	2.499E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	232.14	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	265.52	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.98	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0876	per day
Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Average Daily Liquid Surface Temperature	TLA	542.81	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	47.21	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	45.28	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00974	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01908	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00935	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00945	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01910	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0096413	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	554.63	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	531.99	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	44.387
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1812	0.0845	0.0967	86.18	130	0.00036	0.000007	0.013	0.00055
benzene	0.9206	0.4294	0.4912	78.11	130	0.00185	0.000041	0.013	0.00308
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.013	-
toluene	11.2027	5.2257	5.9770	92.14	130	0.02251	0.000427	0.013	0.03176
ethylbenzene	1.5479	0.7220	0.8259	106.17	130	0.00311	0.000051	0.013	0.00381
xylenes	30.2745	14.1220	16.1525	106.17	130	0.06083	0.001002	0.013	0.07449
naphthalene	0.2600	0.1213	0.1387	128.17	130	5.22E-04	0.000007	0.013	5.30E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.013	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.013	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.1519
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.1368
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6547
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2227
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1952
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0064
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.9263

Monthly Calculations (continued) AUGUST

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	443.72	lb/month
		2.22E-01	ton/month
Time Period		August	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1640.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	19.91	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.01242878	
Partially Insulated	P_{VA}	0.012597769	
Fully Insulated	P_{VA}	0.010454313	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	530.15	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	540.19	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	540.63	°R
Fully Insulated: TLA = TB	TLA	534.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	544.76	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	546.68	°R
Fully Insulated; Tv = TB	Tv	534.58	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.764E-04	
Partially Insulated	Wv	2.792E-04	
Fully Insulated	Wv	2.369E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	197.04	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	246.68	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.98	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0800	per day
Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Average Daily Liquid Surface Temperature	TLA	540.19	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	42.89	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	40.98	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00823	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01713	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00890	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00795	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01711	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0091640	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.87	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	530.38	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	39.543
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1644	0.0730	0.0914	86.18	130	0.00037	0.000007	0.012	0.00056
benzene	0.8323	0.3696	0.4627	78.11	130	0.00188	0.000039	0.012	0.00312
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	10.0476	4.4618	5.5858	92.14	130	0.02264	0.000397	0.012	0.03195
ethylbenzene	1.3763	0.6112	0.7651	106.17	130	0.00310	0.000047	0.012	0.00380
xylenes	26.8972	11.9442	14.9531	106.17	130	0.06062	0.000923	0.012	0.07422
naphthalene	0.2255	0.1002	0.1254	128.17	130	5.08E-04	0.000006	0.012	5.16E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.0150
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0602
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6082
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2051
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1796
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0058
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.7172

Monthly Calculations (continued) SEPTEMBER

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	308.14	lb/month
		1.54E-01	ton/month
Time Period		September	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1300.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	20.58	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009054711	
Partially Insulated	P_{VA}	0.009155981	
Fully Insulated	P_{VA}	0.00785475	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	522.05	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	525.56	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	530.01	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	530.36	°R
Fully Insulated: TLA = TB	TLA	525.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	533.63	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	535.15	°R
Fully Insulated; Tv = TB	Tv	525.56	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.056E-04	
Partially Insulated	Wv	2.073E-04	
Fully Insulated	Wv	1.811E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	124.68	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	183.46	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0700	per day
Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Average Daily Liquid Surface Temperature	TLA	530.01	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	36.91	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	34.98	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00535	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01207	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00672	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	539.23	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.78	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00511	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01202	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0069091	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	521.61	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	27.330
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1224	0.0495	0.0729	86.18	130	0.00040	0.000005	0.009	0.00060
benzene	0.6099	0.2468	0.3631	78.11	130	0.00198	0.000030	0.009	0.00329
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.1332	2.8863	4.2469	92.14	130	0.02315	0.000296	0.009	0.03266
ethylbenzene	0.9433	0.3817	0.5616	106.17	130	0.00306	0.000034	0.009	0.00375
xylenes	18.3813	7.4375	10.9437	106.17	130	0.05965	0.000661	0.009	0.07304
naphthalene	0.1401	0.0567	0.0834	128.17	130	4.55E-04	0.000004	0.009	4.61E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.5491
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.8051
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4529
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1474
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1288
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0038
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.0210

Monthly Calculations (continued) — OCTOBER

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	182.37	lb/month
		9.12E-02	ton/month
Time Period		October	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	882.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	19.91	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005576566	
Partially Insulated	P_{VA}	0.005621296	
Fully Insulated	P_{VA}	0.005036616	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	509.75	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	512.13	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	515.15	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	515.39	°R
Fully Insulated: TLA = TB	TLA	512.1	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	517.61	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	518.64	°R
Fully Insulated; Tv = TB	Tv	512.13	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.305E-04	
Partially Insulated	Wv	1.313E-04	
Fully Insulated	Wv	1.191E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	65.89	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	116.49	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0561	per day
Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Average Daily Liquid Surface Temperature	TLA	515.15	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	28.83	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	26.98	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00272	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00708	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00436	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	522.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00256	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00703	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0044701	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	522.13	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	508.64	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	15.982

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0803	0.0290	0.0513	86.18	130	0.00044	0.000004	0.006	0.00066
benzene	0.3903	0.1410	0.2493	78.11	130	0.00214	0.000020	0.006	0.00356
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	4.3473	1.5706	2.7767	92.14	130	0.02384	0.000188	0.006	0.03363
ethylbenzene	0.5438	0.1964	0.3473	106.17	130	0.00298	0.000020	0.006	0.00365
xylenes	10.5514	3.8120	6.7393	106.17	130	0.05786	0.000395	0.006	0.07084
naphthalene	0.0693	0.0250	0.0443	128.17	130	3.80E-04	0.000002	0.006	3.85E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	0.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0315
2,2,4-TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5263
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.2872
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0884
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0769
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0019
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.2812

Monthly Calculations (continued) — NOVEMBER

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	110.01	lb/month
		5.50E-02	ton/month
Time Period		November	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	534.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	20.58	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003681787	
Partially Insulated	P_{VA}	0.003700512	
Fully Insulated	P_{VA}	0.003451775	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	499.80	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	501.24	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	503.07	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	503.21	°R
Fully Insulated: TLA = TB	TLA	501.2	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	504.56	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	505.18	°R
Fully Insulated; Tv = TB	Tv	501.24	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.840E-05	
Partially Insulated	Wv	8.874E-05	
Fully Insulated	Wv	8.343E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	31.11	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	78.90	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0403	per day
Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Average Daily Liquid Surface Temperature	TLA	503.07	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	20.25	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	18.73	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00132	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00439	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00308	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	508.13	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00122	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00436	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0031337	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	507.90	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	498.53	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	9.498

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0527	0.0149	0.0378	86.18	130	0.00048	0.000003	0.004	0.00072
benzene	0.2507	0.0709	0.1798	78.11	130	0.00228	0.000014	0.004	0.00379
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.004	-
toluene	2.6771	0.7571	1.9200	92.14	130	0.02434	0.000126	0.004	0.03434
ethylbenzene	0.3187	0.0901	0.2286	106.17	130	0.00290	0.000013	0.004	0.00355
xylenes	6.1636	1.7431	4.4205	106.17	130	0.05603	0.000253	0.004	0.06861
naphthalene	0.0355	0.0101	0.0255	128.17	130	3.23E-04	0.000001	0.004	3.28E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.004	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.004	0.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.7252
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3640
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1936
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0567
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0492
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0011
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8647

Monthly Calculations (continued) — DECEMBER

Tank No.	33		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	71.81	lb/month
		3.59E-02	ton/month
Time Period		December	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	422.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Distillate Fuel Oil No.2	
Vapor Molecular weight	Mv	130	Lb/lb-mole
Average organic liquid density	WL	7.10	lb/gal
Average Reid Vapor Pressure	RVP	0.02	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,676,972	gal/month
Turnovers	N	19.91	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002421037	
Partially Insulated	P_{VA}	0.00243123	
Fully Insulated	P_{VA}	0.002295179	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	488.85	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.99	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	491.43	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	491.55	°R
Fully Insulated: TLA = TB	TLA	490.0	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	492.61	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	493.10	°R
Fully Insulated; Tv = TB	Tv	489.99	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.954E-05	
Partially Insulated	Wv	5.973E-05	
Fully Insulated	Wv	5.675E-05	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	18.67	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	53.14	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0347	per day
Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	491.43	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	17.05	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	15.70	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00076	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00283	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00207	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	495.69	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00071	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00281	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0021013	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	495.47	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	487.62	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	6.082

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0374	0.0097	0.0276	86.18	130	0.00052	0.000002	0.002	0.00078
benzene	0.1737	0.0452	0.1285	78.11	130	0.00242	0.000010	0.002	0.00403
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.7770	0.4621	1.3150	92.14	130	0.02475	0.000085	0.002	0.03492
ethylbenzene	0.2009	0.0522	0.1487	106.17	130	0.00280	0.000008	0.002	0.00343
xylenes	3.8734	1.0071	2.8663	106.17	130	0.05394	0.000160	0.002	0.06605
naphthalene	0.0196	0.0051	0.0145	128.17	130	2.72E-04	0.000001	0.002	2.76E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	0.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.5061
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2503
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1295
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0360
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0311
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.		30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**912.86**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**2,330.69**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
		1.17	ton/year	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	0.99	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1,417.83**	lb/yr
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
Product Type		Distillate Fuel Oil No.2		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.10**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.02**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**12.10**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	**45.00**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0656**	**per day**
Diameter	D	**125.00**	ft	Average Daily Vapor Temperature Range	ΔTv	33.70	°R
Throughput	Q	**80,699,334**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
Turnovers	N	**20.44**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	515.42	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft				
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)		Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**33.70**	**°R**
Tank Construction (pick from drop down list)		Riveted		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**31.92**	°R
Tank Shell Color (pick from drop down list)		Red, primer		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00321**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00743	psia
	PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00422	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	523.85	°R
Not Insulated	P_{VA}	0.005628014		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.00	°R
Partially Insulated	P_{VA}	0.005688417					
Fully Insulated	P_{VA}	0.004910539		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00306**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00740	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0043363	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R	Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0.25	TLX	523.72	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R	Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.25	TLN	507.76	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.39	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo**	**Vv**	**292,095.51**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.42**	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**515.74**	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	**TLA**	**511.4**					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**518.71**	**°R**	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**520.09**	**°R**	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	**Tv**	**511.39**	**°R**				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	1.314E-04		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	1.325E-04					
Fully Insulated	Wv	1.163E-04		**Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667(RR-(**	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/yr
Product	Diesel
Total HAP Emissions =	**204.307**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Vapor Weight Concentrations M_i	M_V	Z_{Vi}	Vapor Mole Fraction $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	1.0244	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	4.9806	78.11	130	0.00214	0.000020	0.006	**0.00356**
2,2,4 TMP	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	55.5289	92.14	130	0.02383	0.000189	0.006	**0.03361**
ethylbenzene	6.9530	106.17	130	0.00298	0.000021	0.006	**0.00365**
xylenes	134.9311	106.17	130	0.05789	0.000399	0.006	**0.07089**
naphthalene	0.8885	128.17	130	3.81E-04	0.000002	0.006	**3.87E-04**
cumene	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Liquid Mole Fraction Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure A	B	C	P_{VAi}
hexane	0.0000010	188	86.18	0.00000	6.878	1171.5	224.37	1.7105
benzene	0.0000080	188	78.11	0.00002	6.906	1211	220.79	1.0396
2,2,4 TMP	0.0000000	188	114.23	0.00000	6.812	1257.8	220.74	0.5318
toluene	0.0003200	188	92.14	0.00065	7.017	1377.6	222.64	0.2898
ethylbenzene	0.0001300	188	106.17	0.00023	6.95	1419.3	212.61	0.0893
xylenes	0.0029000	188	106.17	0.00514	7.009	1462.3	215.11	0.0777
naphthalene	0.0007565	188	128.17	0.00111	7.146	1831.6	211.82	0.0020
cumene	0.0000000	188	120.19	0.00000	6.929	1455.8	207.2	0.0407
methanol	0.0000000	188	32.04	0.00000	8.079	1581.3	239.65	1.3054

Monthly Calculations - JANUARY

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**63.57**	lb/month
		3.18E-02	ton/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002015063	
Partially Insulated	P_{VA}	0.002025981	
Fully Insulated	P_{VA}	0.001881227	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.69	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**486.65**	°R
Fully Insulated: TLA = TB	**TLA**	**484.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	**°R**
Fully Insulated; Tv = TB	**Tv**	**484.69**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.002E-05	
Partially Insulated	Wv	5.023E-05	
Fully Insulated	Wv	4.702E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**18.60**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**44.97**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0412**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.01**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.52**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00076**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00243	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00167	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00071**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00241	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0016994	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	491.28	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	482.02	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	5.332

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0342	0.0100	0.0242	86.18	130	0.00054	0.000002	0.002	**0.00081**
benzene	0.1576	0.0461	0.1115	78.11	130	0.00248	0.000008	0.002	**0.00413**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.5826	0.4631	1.1195	92.14	130	0.02490	0.000071	0.002	**0.03513**
ethylbenzene	0.1748	0.0512	0.1237	106.17	130	0.00275	0.000007	0.002	**0.00337**
xylenes	3.3663	0.9851	2.3812	106.17	130	0.05295	0.000131	0.002	**0.06484**
naphthalene	0.0160	0.0047	0.0113	128.17	130	2.52E-04	0.000001	0.002	**2.56E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4318
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2125
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1084
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0295
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0254
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0005
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.4890

Monthly Calculations (continued) **FEBRUARY**

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**76.36**	lb/month
		3.82E-02	ton/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**22.21**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002350191	
Partially Insulated	P_{VA}	0.002368781	
Fully Insulated	P_{VA}	0.002125695	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**490.84**	°R
Fully Insulated: TLA = TB	**TLA**	**487.9**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	**°R**
Fully Insulated; Tv = TB	**Tv**	**487.93**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.777E-05	
Partially Insulated	Wv	5.812E-05	
Fully Insulated	Wv	5.278E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**24.43**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**51.93**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0519**	**per day**
Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	490.63	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**25.40**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.80**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00111**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00296	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00185	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00105**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00294	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0018959	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	496.79	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.89	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	6.457

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0400	0.0128	0.0272	86.18	130	0.00052	0.000002	0.002	**0.00079**
benzene	0.1854	0.0593	0.1261	78.11	130	0.00243	0.000009	0.002	**0.00404**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.8915	0.6051	1.2864	92.14	130	0.02477	0.000082	0.002	**0.03495**
ethylbenzene	0.2130	0.0682	0.1449	106.17	130	0.00279	0.000008	0.002	**0.00342**
xylenes	4.1067	1.3137	2.7930	106.17	130	0.05378	0.000155	0.002	**0.06586**
naphthalene	0.0205	0.0066	0.0140	128.17	130	2.69E-04	0.000001	0.002	**2.73E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.4933
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2446
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1258
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0349
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0301
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5637

Monthly Calculations (continued) **MARCH**

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**123.29**	lb/month
		6.16E-02	ton/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003484427	
Partially Insulated	P_{VA}	0.003521114	
Fully Insulated	P_{VA}	0.003048229	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	497.76	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**501.80**	°R
Fully Insulated: TLA = TB	**TLA**	**497.8**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**
Fully Insulated; Tv = TB	**Tv**	**497.76**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.366E-05	
Partially Insulated	Wv	8.433E-05	
Fully Insulated	Wv	7.419E-05	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.09**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**75.20**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.91**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.17**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00199**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00460	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00261	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	509.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00189**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00458	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0026857	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	509.35	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	494.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	10.621

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0597	0.0233	0.0364	86.18	130	0.00048	0.000003	0.003	**0.00073**
benzene	0.2832	0.1105	0.1728	78.11	130	0.00230	0.000013	0.003	**0.00382**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.003	-
toluene	3.0077	1.1732	1.8346	92.14	130	0.02440	0.000120	0.003	**0.03442**
ethylbenzene	0.3557	0.1387	0.2169	106.17	130	0.00288	0.000012	0.003	**0.00353**
xylenes	6.8758	2.6819	4.1939	106.17	130	0.05577	0.000238	0.003	**0.06829**
naphthalene	0.0390	0.0152	0.0238	128.17	130	3.16E-04	0.000001	0.003	**3.21E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.003	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.003	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.6919
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3483
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1837
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0535
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0463
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0010
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8206

Monthly Calculations (continued) APRIL

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**216.80**	lb/month
		1.08E-01	ton/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005855374	
Partially Insulated	P_{VA}	0.00593478	
Fully Insulated	P_{VA}	0.004927826	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.49	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**516.61**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**517.01**	°R
Fully Insulated: TLA = TB	**TLA**	**511.5**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**520.78**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.53**	**°R**
Fully Insulated; Tv = TB	**Tv**	**511.49**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.362E-04	
Partially Insulated	Wv	1.376E-04	
Fully Insulated	Wv	1.167E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**94.36**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**122.44**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**41.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**38.99**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00406**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00390**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	507.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**19.027**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0945	0.0411	0.0534	86.18	130	0.00044	0.000004	0.006	**0.00066**
benzene	0.4604	0.2004	0.2600	78.11	130	0.00212	0.000021	0.006	**0.00353**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	**-**
toluene	5.1539	2.2432	2.9107	92.14	130	0.02377	0.000196	0.006	**0.03354**
ethylbenzene	0.6483	0.2822	0.3662	106.17	130	0.00299	0.000021	0.006	**0.00366**
xylenes	12.5858	5.4778	7.1079	106.17	130	0.05805	0.000416	0.006	**0.07108**
naphthalene	0.0839	0.0365	0.0474	128.17	130	3.87E-04	0.000002	0.006	**3.93E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	188	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0749
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5519
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.3008
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0931
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0811
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0021
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.3415

Monthly Calculations (continued) MAY

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**330.27**	lb/month
		1.65E-01	ton/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.008643068	
Partially Insulated	P_{VA}	0.008773316	
Fully Insulated	P_{VA}	0.007134727	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	522.60	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**528.54**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**529.01**	°R
Fully Insulated: TLA = TB	**TLA**	**522.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.39**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.43**	**°R**
Fully Insulated; Tv = TB	**Tv**	**522.60**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.963E-04	
Partially Insulated	Wv	1.985E-04	
Fully Insulated	Wv	1.654E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**153.81**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**176.46**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0875**	**per day**
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**46.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**43.90**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00643**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01237	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00594	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00621**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0061410	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	518.04	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**29.266**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.1325	0.0617	0.0708	86.18	130	0.00040	0.000005	0.009	**0.00061**
benzene	0.6588	0.3068	0.3520	78.11	130	0.00199	0.000029	0.009	**0.00332**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	**-**
toluene	7.6688	3.5716	4.0973	92.14	130	0.02322	0.000283	0.009	**0.03276**
ethylbenzene	1.0088	0.4698	0.5390	106.17	130	0.00305	0.000032	0.009	**0.00374**
xylenes	19.6499	9.1514	10.4985	106.17	130	0.05950	0.000630	0.009	**0.07285**
naphthalene	0.1476	0.0688	0.0789	128.17	130	4.47E-04	0.000004	0.009	**4.53E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.4901
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.7759
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4337
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1404
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1226
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0035
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.9347

Monthly Calculations (continued) JUNE

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**440.13**	lb/month
		2.20E-01	ton/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011908818	
Partially Insulated	P_{VA}	0.012092866	
Fully Insulated	P_{VA}	0.009781779	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	532.45	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.79**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**539.29**	°R
Fully Insulated: TLA = TB	**TLA**	**532.5**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**543.96**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.13**	**°R**
Fully Insulated; Tv = TB	**Tv**	**532.45**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.652E-04	
Partially Insulated	Wv	2.682E-04	
Fully Insulated	Wv	2.226E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**201.72**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**238.41**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0881**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**47.14**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.17**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00874**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01697	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00823	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00848**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01697	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0084939	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.58	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	528.00	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	**lb/month**
Product	Diesel
Total HAP Emissions =	**39.204**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**lb/yr Standing**	**lb/yr Working**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.1647	0.0755	0.0892	86.18	130	0.00037	0.000007	0.012	**0.00056**
benzene	0.8316	0.3812	0.4505	78.11	130	0.00189	0.000037	0.012	**0.00314**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	**-**
toluene	9.9974	4.5821	5.4153	92.14	130	0.02271	0.000382	0.012	**0.03205**
ethylbenzene	1.3630	0.6247	0.7383	106.17	130	0.00310	0.000045	0.012	**0.00379**
xylenes	26.6268	12.2038	14.4230	106.17	130	0.06050	0.000882	0.012	**0.07408**
naphthalene	0.2204	0.1010	0.1194	128.17	130	5.01E-04	0.000006	0.012	**5.08E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.9450
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0236
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.5845
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1962
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1718
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0055
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.6110

Monthly Calculations (continued) JULY

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	**499.56**	lb/month
		2.50E-01	ton/month
Time Period		**July**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.013458315	
Partially Insulated	P_{VA}	0.013665337	
Fully Insulated	P_{VA}	0.011064547	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**531.35**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	536.40	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**542.81**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**543.31**	°R
Fully Insulated: TLA = TB	**TLA**	**536.4**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**548.03**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**550.22**	**°R**
Fully Insulated; Tv = TB	**Tv**	**536.40**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.975E-04	
Partially Insulated	Wv	3.009E-04	
Fully Insulated	Wv	2.499E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**232.14**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**267.42**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0876**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Average Daily Liquid Surface Temperature	TLA	542.81	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**47.21**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.28**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00974**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01908	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00935	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00945**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01910	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0096413	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	554.63	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	531.99	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	44.557
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1819	0.0845	0.0974	86.18	130	0.00036	0.000007	0.013	**0.00055**
benzene	0.9241	0.4294	0.4947	78.11	130	0.00185	0.000041	0.013	**0.00308**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.013	-
toluene	11.2457	5.2257	6.0200	92.14	130	0.02251	0.000427	0.013	**0.03176**
ethylbenzene	1.5538	0.7220	0.8318	106.17	130	0.00311	0.000051	0.013	**0.00381**
xylenes	30.3905	14.1220	16.2685	106.17	130	0.06083	0.001002	0.013	**0.07449**
naphthalene	0.2610	0.1213	0.1397	128.17	130	5.22E-04	0.000007	0.013	**5.30E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.013	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.013	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.1519
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.1368
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6547
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2227
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1952
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0064
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.9263

Monthly Calculations (continued) AUGUST

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	**445.49**	lb/month
		2.23E-01	ton/month
Time Period		**August**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.01242878	
Partially Insulated	P_{VA}	0.012597769	
Fully Insulated	P_{VA}	0.010454313	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**530.15**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**540.19**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**540.63**	°R
Fully Insulated: TLA = TB	**TLA**	**534.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**544.76**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.68**	**°R**
Fully Insulated; Tv = TB	**Tv**	**534.58**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.764E-04	
Partially Insulated	Wv	2.792E-04	
Fully Insulated	Wv	2.369E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**197.04**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0003	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**248.45**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0800**	**per day**
Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Average Daily Liquid Surface Temperature	TLA	540.19	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**42.89**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**40.98**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00823**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01713	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00890	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00795**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01711	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0091640	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	550.87	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	530.38	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	39.701
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1651	0.0730	0.0921	86.18	130	0.00037	0.000007	0.012	**0.00056**
benzene	0.8356	0.3696	0.4660	78.11	130	0.00188	0.000039	0.012	**0.00312**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.012	-
toluene	10.0877	4.4618	5.6259	92.14	130	0.02264	0.000397	0.012	**0.03195**
ethylbenzene	1.3818	0.6112	0.7706	106.17	130	0.00310	0.000047	0.012	**0.00380**
xylenes	27.0047	11.9442	15.0605	106.17	130	0.06062	0.000923	0.012	**0.07422**
naphthalene	0.2264	0.1002	0.1263	128.17	130	5.08E-04	0.000006	0.012	**5.16E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.012	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.012	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	2.0150
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	1.0602
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.6082
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.2051
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1796
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0058
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.7172

Monthly Calculations (continued) SEPTEMBER

Tank No.	30		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	**309.46**	lb/month
		1.55E-01	ton/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Distillate Fuel Oil No.2**	
Vapor Molecular weight	Mv	**130**	Lb/lb-mole
Average organic liquid density	WL	**7.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.02**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009054711	
Partially Insulated	P_{VA}	0.009155981	
Fully Insulated	P_{VA}	0.00785475	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	525.56	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.01**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**530.36**	°R
Fully Insulated: TLA = TB	**TLA**	**525.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.63**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.15**	**°R**
Fully Insulated; Tv = TB	**Tv**	**525.56**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.056E-04	
Partially Insulated	Wv	2.073E-04	
Fully Insulated	Wv	1.811E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**124.68**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0002	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**184.78**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0700**	**per day**
Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Average Daily Liquid Surface Temperature	TLA	530.01	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**36.91**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**34.98**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00535**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.01207	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00672	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	539.23	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.78	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00511**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.01202	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0069091	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	539.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	521.61	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	27.447
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.1229	0.0495	0.0734	86.18	130	0.00040	0.000005	0.009	**0.00060**
benzene	0.6125	0.2468	0.3657	78.11	130	0.00198	0.000030	0.009	**0.00329**
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.009	-
toluene	7.1637	2.8863	4.2774	92.14	130	0.02315	0.000296	0.009	**0.03266**
ethylbenzene	0.9473	0.3817	0.5656	106.17	130	0.00306	0.000034	0.009	**0.00375**
xylenes	18.4599	7.4375	11.0224	106.17	130	0.05965	0.000661	0.009	**0.07304**
naphthalene	0.1407	0.0567	0.0840	128.17	130	4.55E-04	0.000004	0.009	**4.61E-04**
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.009	**0.00E+00**
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.009	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.5491
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.8051
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.4529
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.1474
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.1288
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0038
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	2.0210

Monthly Calculations (continued) **OCTOBER**

Tank No.	30						
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	65.89	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	LT	183.21	lb/month	Vapor Space Volume	Vv	292095.5	ft3
		9.16E-02	ton/month	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		October		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	0.99	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	882.0	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	31	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	117.32	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Product Type		Distillate Fuel Oil No.2		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	130	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	7.10	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	0.02		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	12.10		Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	0.99	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	45.00	ft	Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0561	per day
Diameter	D	125.00	ft	Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Throughput	Q	6,724,944	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Turnovers	N	20.06	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft	Average Daily Liquid Surface Temperature	TLA	515.15	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft				
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft	Average Daily Vapor Temperature Range (ΔTv)			
Liquid height (assume 1/2 Hs)	HL	22.50	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Tank Insulation (pick from drop down list)		Not Insulated		Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	28.83	°R
Tank Construction (pick from drop down list)		Riveted		Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	26.98	°R
Tank Shell Color (pick from drop down list)		Red, primer		Fully Insulated, constant temperature	ΔTv	0.00	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		Average Daily Vapor Pressure Range (ΔPv)			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9		Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00272	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00708	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00436	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	522.35	°R
Not Insulated	P_{VA}	0.005576566		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.94	°R
Partially Insulated	P_{VA}	0.005621296					
Fully Insulated	P_{VA}	0.005036616		Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00256	psia
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00703	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	509.75	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0044701	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	522.13	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	508.64	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	512.13	°R	Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Average Daily Liquid Surface Temperature (TLA)				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	515.15	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	515.39	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	TLA	512.1					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	517.61	°R	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	518.64	°R	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	Tv	512.13	°R				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	1.305E-04		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	1.313E-04					
Fully Insulated	Wv	1.191E-04		Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	16.056
Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0807	0.0290	0.0517	86.18	130	0.00044	0.000004	0.006	0.00066
benzene	0.3921	0.1410	0.2511	78.11	130	0.00214	0.000020	0.006	0.00356
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.006	-
toluene	4.3672	1.5706	2.7966	92.14	130	0.02384	0.000188	0.006	0.03363
ethylbenzene	0.5463	0.1964	0.3498	106.17	130	0.00298	0.000020	0.006	0.00365
xylenes	10.5998	3.8120	6.7878	106.17	130	0.05786	0.000395	0.006	0.07084
naphthalene	0.0696	0.0250	0.0446	128.17	130	3.80E-04	0.000002	0.006	3.85E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.006	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.006	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	1.0315
2,2,4-TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.5263
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.2872
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0884
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0769
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0019
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	1.2812

Monthly Calculations (continued) **NOVEMBER**

Tank No.	30						
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	31.11	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	LT	110.57	lb/month	Vapor Space Volume	Vv	292095.5	ft3
		5.53E-02	ton/month	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		November		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	534.0	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	30	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	79.46	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Product Type		Distillate Fuel Oil No.2		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	130	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	7.10	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	0.02		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	12.10		Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	45.00	ft	Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0403	per day
Diameter	D	125.00	ft	Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Throughput	Q	6,724,944	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Turnovers	N	20.73	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft	Average Daily Liquid Surface Temperature	TLA	503.07	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft				
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft	Average Daily Vapor Temperature Range (ΔTv)			
Liquid height (assume 1/2 Hs)	HL	22.50	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Tank Insulation (pick from drop down list)		Not Insulated		Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	20.25	°R
Tank Construction (pick from drop down list)		Riveted		Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	18.73	°R
Tank Shell Color (pick from drop down list)		Red, primer		Fully Insulated, constant temperature	ΔTv	0.00	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		Average Daily Vapor Pressure Range (ΔPv)			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9		Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00132	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00439	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00308	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	508.13	°R
Not Insulated	P_{VA}	0.003681787		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Partially Insulated	P_{VA}	0.003700512					
Fully Insulated	P_{VA}	0.003451775		Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00122	psia
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00436	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	499.80	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0031337	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	507.90	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	498.53	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	501.24	°R	Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Average Daily Liquid Surface Temperature (TLA)				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	503.07	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	503.21	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	TLA	501.2					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	504.56	°R	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	505.18	°R	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	Tv	501.24	°R				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	8.840E-05		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	8.874E-05					
Fully Insulated	Wv	8.343E-05		Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	9.547
Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0530	0.0149	0.0381	86.18	130	0.00048	0.000003	0.004	0.00072
benzene	0.2520	0.0709	0.1811	78.11	130	0.00228	0.000014	0.004	0.00379
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.004	-
toluene	2.6909	0.7571	1.9338	92.14	130	0.02434	0.000126	0.004	0.03434
ethylbenzene	0.3203	0.0901	0.2302	106.17	130	0.00290	0.000013	0.004	0.00355
xylenes	6.1953	1.7431	4.4522	106.17	130	0.05603	0.000253	0.004	0.06861
naphthalene	0.0357	0.0101	0.0257	128.17	130	3.23E-04	0.000001	0.004	3.28E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.004	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.004	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.7252
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.3640
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1936
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0567
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0492
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0011
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.8647

Monthly Calculations (continued) **DECEMBER**

Tank No.	30						
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	18.67	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	LT	72.19	lb/month	Vapor Space Volume	Vv	292095.5	ft3
		3.61E-02	ton/month	Stock Vapor Density	Wv	0.0001	lb/ft3
Time Period		December		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	422.0	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	31	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	53.52	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Product Type		Distillate Fuel Oil No.2		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	130	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	7.10	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	0.02		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	12.10		Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	8907.0	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Tank design data							
Shell height	Hs	45.00	ft	Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0347	per day
Diameter	D	125.00	ft	Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Throughput	Q	6,724,944	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Turnovers	N	20.06	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Roof Type:		Cone		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft	Average Daily Liquid Surface Temperature	TLA	491.43	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft				
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft	Average Daily Vapor Temperature Range (ΔTv)			
Liquid height (assume 1/2 Hs)	HL	22.50	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Tank Insulation (pick from drop down list)		Not Insulated		Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	17.05	°R
Tank Construction (pick from drop down list)		Riveted		Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	15.70	°R
Tank Shell Color (pick from drop down list)		Red, primer		Fully Insulated, constant temperature	ΔTv	0.00	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		Average Daily Vapor Pressure Range (ΔPv)			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9		Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00076	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	0.00283	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	0.00207	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	495.69	°R
Not Insulated	P_{VA}	0.002421037		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Partially Insulated	P_{VA}	0.00243123					
Fully Insulated	P_{VA}	0.002295179		Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00071	psia
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	0.00281	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	488.85	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	0.0021013	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	495.47	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	487.62	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.99	°R	Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Average Daily Liquid Surface Temperature (TLA)				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	491.43	°R	Tank diameter	D	125.00	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	491.55	°R	Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Fully Insulated: TLA = TB	TLA	490.0					
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Average Vapor Temperature (Tv)				Tank shell height	Hs	45.00	ft
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	492.61	°R	Liquid Height	HL	22.50	ft
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	493.10	°R	Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Fully Insulated; Tv = TB	Tv	489.99	°R				
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Not Insulated	Wv	5.954E-05		Tank shell radius	Rs	62.50	ft
Partially Insulated	Wv	5.973E-05					
Fully Insulated	Wv	5.675E-05		Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.16667((RR-(	HRO	8.57	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

HAPS Speciation	lb/month
Product	Diesel
Total HAP Emissions =	6.114
Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	lb/yr Standing	lb/yr Working	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0376	0.0097	0.0278	86.18	130	0.00052	0.000002	0.002	0.00078
benzene	0.1746	0.0452	0.1294	78.11	130	0.00242	0.000010	0.002	0.00403
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	130	0.00000	0.000000	0.002	-
toluene	1.7865	0.4621	1.3244	92.14	130	0.02475	0.000085	0.002	0.03492
ethylbenzene	0.2020	0.0522	0.1497	106.17	130	0.00280	0.000008	0.002	0.00343
xylenes	3.8940	1.0071	2.8869	106.17	130	0.05394	0.000160	0.002	0.06605
naphthalene	0.0197	0.0051	0.0146	128.17	130	2.72E-04	0.000001	0.002	2.76E-04
cumene	0.0000	0.0000	0.0000	120.19	130	0.00E+00	0.000000	0.002	0.00E+00
methanol	0.0000	0.0000	0.0000	32.04	130	0.00E+00	0.000000	0.002	0.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.000001	188	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.00001	188	78.11	0.00002	6.906	1211	220.79	0.5061
2,2,4 TMP	0.00000	188	114.23	0.00000	6.812	1257.8	220.74	0.2503
toluene	0.00032	188	92.14	0.00065	7.017	1377.6	222.64	0.1295
ethylbenzene	0.00013	188	106.17	0.00023	6.95	1419.3	212.61	0.0360
xylenes	0.00290	188	106.17	0.00514	7.009	1462.3	215.11	0.0311
naphthalene	0.00076	188	128.17	0.00111	7.146	1831.6	211.82	0.0006
cumene	0.00000	188	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.00000	188	32.04	0.00000	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**224.99**	lb/yr
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**574.43**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
				Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
	Time Period	**Annual**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		Albany, NY		Constant; Number of Daily Events in a Year	365	365	days/year
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**224.99**	lb/yr
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Product Information				Diameter	D	125.0000	ft
Product Type		Biodiesel		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	365	days/year
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**349.44**	lb/yr
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**80,699,334**	gal/yr				
Turnovers	N	**20.44**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**349.44**	lb/yr
Roof Type:		Cone		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		Not Insulated		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		Riveted		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Shell Color (pick from drop down list)		Red, primer		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0656**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	33.70	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
	PBV	-0.03		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Not Insulated	P_{VA}	0.005628014		Average Daily Liquid Surface Temperature	TLA	515.42	°R
Partially Insulated	P_{VA}	0.005688417		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.004910539					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0656**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R	Average Daily Vapor Temperature Range	ΔTv	33.70	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	511.39	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	515.42	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.8	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**33.70**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**31.92**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.42**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR	**TLA**	**515.74**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**511.4**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00321**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00743	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00422	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**518.71**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	523.85	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**520.09**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.00	°R
Fully Insulated; unheated Tv = TB	**Tv**	**511.39**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00306**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00740	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0043363	psia
Not Insulated	Wv	3.240E-05		Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0	TLX	523.72	°R
Partially Insulated	Wv	3.266E-05		Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.	TLN	507.76	°R
Fully Insulated, unheated	Wv	2.867E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**574.426**

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_T **(lb/yr)**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	574.4257	32.04	32	1.00E+00	5.63E-03	0.006	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7105
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0396
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5269
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2898
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0893
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0777
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0020
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0407
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2923

Monthly Calculations - JANUARY

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.58**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**15.67**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**15.67**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Time Period		**January**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**4.58**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.08**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.08**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0412**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Not Insulated	P_{VA}	0.002015063		Average Daily Liquid Surface Temperature	TLA	486.51	°R
Partially Insulated	P_{VA}	0.002025981		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.001881227					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**483.25**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0412**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R	Average Daily Vapor Temperature Range	ΔTv	20.01	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	484.69	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	486.51	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.01**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.52**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**486.65**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**484.7**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00243	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00167	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	491.51	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Fully Insulated; unheated Tv = TB	**Tv**	**484.69**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00241	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0016994	psia
Not Insulated	Wv	1.233E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	491.28	°R
Partially Insulated	Wv	1.238E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	482.02	°R
Fully Insulated, unheated	Wv	1.159E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**15.668**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing$_L$ lb/yr**	**Working$_L$ lb/yr**	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0.000	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	15.668	4.585	11.083	32.04	32	1.00E+00	2.02E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4318
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2115
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1084
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0295
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0254
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4865

Monthly Calculations - FEBRUARY

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**6.02**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**18.82**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**18.82**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Time Period		**February**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	28	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**6.02**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	28	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.80**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**22.21**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.80**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0519**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002350191		Average Daily Liquid Surface Temperature	TLA	490.63	°R
Partially Insulated	P_{VA}	0.002368781		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002125695					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**485.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0519**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R	Average Daily Vapor Temperature Range	ΔTv	25.40	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	487.93	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	490.63	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**25.40**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.80**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**490.84**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**487.9**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00111**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00296	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00185	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	496.98	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Fully Insulated; unheated Tv = TB	**Tv**	**487.93**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00105**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00294	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0018959	psia
Not Insulated	Wv	1.424E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	496.79	°R
Partially Insulated	Wv	1.432E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	484.89	°R
Fully Insulated, unheated	Wv	1.301E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**18.819**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing$_L$ lb/yr**	**Working$_L$ lb/yr**	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	18.8190	6.020	12.799	32.04	32	1.00E+00	2.35E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4933
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2426
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1258
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0349
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0301
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5637

Monthly Calculations - MARCH

Tank No.		28		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**			**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**30.39**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**30.39**	lb/month	
Time Period		**March**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.06**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.003484427		
Partially Insulated	P_{VA}	0.003521114		
Fully Insulated, unheated	P_{VA}	0.003048229		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	497.76	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**501.80**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**497.8**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**497.76**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	2.062E-05		
Partially Insulated	Wv	2.078E-05		
Fully Insulated, unheated	Wv	1.828E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**11.85**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**11.85**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.91**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.17**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00199**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00460	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00261	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	509.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTA	TLN	493.53	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00189**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00458	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0026857	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	509.35	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	494.26	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**30.387**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.003	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	30.3866	11.852	18.534	32.04	32	1.00E+00	3.48E-03	0.003	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6919
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3451
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1837
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0535
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0463
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8206

Monthly Calculations - APRIL

Tank No.		28		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**			**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**53.43**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**53.43**	lb/month	
Time Period		**April**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.73**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.005855374		
Partially Insulated	P_{VA}	0.00593478		
Fully Insulated, unheated	P_{VA}	0.004927826		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	511.49	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**516.61**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**517.01**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**511.5**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**520.78**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.53**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**511.49**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	3.357E-05		
Partially Insulated	Wv	3.391E-05		
Fully Insulated, unheated	Wv	2.877E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**23.26**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**23.26**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**30.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**30.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**41.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**38.99**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00406**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTA	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00390**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.26	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**53.432**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	53.4320	23.256	30.176	32.04	32	1.00E+00	5.86E-03	0.006	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

Eq. 40-5 yi = Pi / PVA

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0749
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5455
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3008
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0931
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0811
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0021
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.3415

Monthly Calculations - MAY

Tank No.	28		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	81.40	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	81.40	lb/month
Time Period		May	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1739.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.008643068	
Partially Insulated	P_{VA}	0.008773316	
Fully Insulated, unheated	P_{VA}	0.007134727	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	517.90	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	522.60	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	528.54	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	TLA	529.01	°R
Fully Insulated, unheated: TLA = TB	TLA	522.6	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	533.39	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	535.43	°R
Fully Insulated; unheated Tv = TB	Tv	522.60	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	4.838E-05	
Partially Insulated	Wv	4.892E-05	
Fully Insulated, unheated	Wv	4.076E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	37.91	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	Ls	37.91	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	43.49	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	43.49	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	KE	0.0875	per day
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	KE	0.0875	per day
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	46.00	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	43.90	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00643	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01237	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00594	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00621	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0061410	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	518.04	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	81.399

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	0.00E+00
methanol	81.3988	37.909	43.489	32.04	32	1.00E+00	8.64E-03	0.009	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.4901
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7659
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4337
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1404
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1226
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0035
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.9347

Monthly Calculations - JUNE

Tank No.	28		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	108.47	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	108.47	lb/month
Time Period		June	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1853.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.73	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.9	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.011908818	
Partially Insulated	P_{VA}	0.012092866	
Fully Insulated, unheated	P_{VA}	0.009781779	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	527.45	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	532.45	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	538.79	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	TLA	539.29	°R
Fully Insulated, unheated: TLA = TB	TLA	532.5	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	543.96	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	546.13	°R
Fully Insulated; unheated Tv = TB	Tv	532.45	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	6.537E-05	
Partially Insulated	Wv	6.611E-05	
Fully Insulated, unheated	Wv	5.485E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	49.72	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	Ls	49.72	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	58.76	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00007	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	58.76	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	KE	0.0881	per day
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	KE	0.0881	per day
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	47.14	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	45.17	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00874	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01697	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00823	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00848	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01697	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0084939	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.58	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	528.00	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	108.475

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	0.00E+00
methanol	108.4746	49.717	58.758	32.04	32	1.00E+00	1.19E-02	0.012	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.9450
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0102
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5845
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1962
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1718
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0055
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.6110

Monthly Calculations - JULY

Tank No.	28		**Tank type**	**Fixed Roof Tank**			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**57.21**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**123.12**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**123.12**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Time Period		**July**		Vented Vapor Saturation Factor	Ks	0.98	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**57.21**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.98	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.91**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.91**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0876**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Not Insulated	P_{VA}	0.013458315		Average Daily Liquid Surface Temperature	TLA	542.81	°R
Partially Insulated	P_{VA}	0.013665337		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.011064547					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**531.35**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0876**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R	Average Daily Vapor Temperature Range	ΔTv	47.21	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	536.40	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	542.81	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**47.21**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.28**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**542.81**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**543.31**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**536.4**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00974**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01908	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00935	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**548.03**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	554.61	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**550.22**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTA	TLN	531.01	°R
Fully Insulated; unheated Tv = TB	**Tv**	**536.40**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00945**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01910	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0096413	psia
Not Insulated	Wv	7.332E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	554.63	°R
Partially Insulated	Wv	7.415E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	531.99	°R
Fully Insulated, unheated	Wv	6.159E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**123.123**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ | Eq. 40-6 $Z_{Vi} = y_i M_i / MV$ | Eq. 40-5 $y_i = P_i / P_{VA}$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.013	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.013	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.013	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.013	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.013	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.013	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.013	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.013	**0.00E+00**
methanol	123.1234	57.213	65.910	32.04	32	1.00E+00	1.35E-02	0.013	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi | **Component Vapor Pressure** — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.1519
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.1220
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6547
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2227
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1952
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0064
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.9263

Monthly Calculations - AUGUST

Tank No.	28		**Tank type**	**Fixed Roof Tank**			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.56**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**109.80**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**109.80**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Time Period		**August**		Vented Vapor Saturation Factor	Ks	0.98	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**48.56**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.98	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**61.23**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**61.23**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0800**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Not Insulated	P_{VA}	0.01242878		Average Daily Liquid Surface Temperature	TLA	540.19	°R
Partially Insulated	P_{VA}	0.012597769		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.010454313					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**530.15**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0800**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R	Average Daily Vapor Temperature Range	ΔTv	42.89	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	534.58	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	540.19	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.1	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**42.89**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**40.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**540.19**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**540.63**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**534.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00823**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01713	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00890	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**544.76**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	550.91	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.68**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTA	TLN	529.46	°R
Fully Insulated; unheated Tv = TB	**Tv**	**534.58**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00795**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01711	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0091640	psia
Not Insulated	Wv	6.812E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.87	°R
Partially Insulated	Wv	6.880E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	530.38	°R
Fully Insulated, unheated	Wv	5.839E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**109.796**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ | Eq. 40-6 $Z_{Vi} = y_i M_i / MV$ | Eq. 40-5 $y_i = P_i / P_{VA}$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	109.7956	48.563	61.233	32.04	32	1.00E+00	1.24E-02	0.012	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi | **Component Vapor Pressure** — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.0150
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0480
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6082
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2051
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1796
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0058
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.7172

Monthly Calculations - SEPTEMBER

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**30.73**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**76.27**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**76.27**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Time Period		**September**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**30.73**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.54**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00005	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.73**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.54**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0700**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Not Insulated	P_{VA}	0.009054711		Average Daily Liquid Surface Temperature	TLA	530.01	°R
Partially Insulated	P_{VA}	0.009155981		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.00785475					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0700**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R	Average Daily Vapor Temperature Range	ΔTv	36.91	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	525.56	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	530.01	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**36.91**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**34.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.01**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**530.36**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**525.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00535**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01207	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00672	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.63**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	539.23	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.15**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	520.78	°R
Fully Insulated; unheated Tv = TB	**Tv**	**525.56**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00511**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01202	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0069091	psia
Not Insulated	Wv	5.066E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.10	°R
Partially Insulated	Wv	5.108E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	521.61	°R
Fully Insulated, unheated	Wv	4.462E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**76.269**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	76.2693	30.729	45.540	32.04	32	1.00E+00	9.05E-03	0.009	**1.00E+00**

Eq. 40-4 $x_i = (ZLiML)/Mi$

Eq. 40-5 $y_i = P_i / PVA$

Eq. 40-6 $ZVi = yiMi / MV$

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.5491
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7974
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4529
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1474
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1288
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0038
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.0210

Monthly Calculations - OCTOBER

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**16.24**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**45.15**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**45.15**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Time Period		**October**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**16.24**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.92**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.92**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0561**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Not Insulated	P_{VA}	0.005576566		Average Daily Liquid Surface Temperature	TLA	515.15	°R
Partially Insulated	P_{VA}	0.005621296		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.005036616					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0561**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R	Average Daily Vapor Temperature Range	ΔTv	28.83	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	512.13	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	515.15	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**28.83**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**26.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.15**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**515.39**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**512.1**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00272**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00708	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00436	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**517.61**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	522.35	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**518.64**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	507.94	°R
Fully Insulated; unheated Tv = TB	**Tv**	**512.13**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00256**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00703	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0044701	psia
Not Insulated	Wv	3.217E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	522.13	°R
Partially Insulated	Wv	3.236E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	508.64	°R
Fully Insulated, unheated	Wv	2.936E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**45.154**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	45.1544	16.239	28.915	32.04	32	1.00E+00	5.58E-03	0.006	**1.00E+00**

Eq. 40-4 $x_i = (ZLiML)/Mi$

Eq. 40-5 $y_i = P_i / PVA$

Eq. 40-6 $ZVi = yiMi / MV$

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0315
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5226
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2872
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0884
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0019
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2812

Monthly Calculations - NOVEMBER

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**7.67**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**27.25**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**27.25**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Time Period		**November**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_v$	**Ls**	**7.67**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.58**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00002	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.73**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.58**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0403**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Not Insulated	P_{VA}	0.003681787		Average Daily Liquid Surface Temperature	TLA	503.07	°R
Partially Insulated	P_{VA}	0.003700512		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.003451775					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0403**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R	Average Daily Vapor Temperature Range	ΔTv	20.25	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	501.24	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	503.07	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	15.2	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.25**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.73**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**503.07**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**503.21**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**501.2**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00132**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00439	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00308	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.56**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	508.13	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.18**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Fully Insulated; unheated Tv = TB	**Tv**	**501.24**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00122**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00436	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0031337	psia
Not Insulated	Wv	2.179E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	507.90	°R
Partially Insulated	Wv	2.187E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	498.53	°R
Fully Insulated, unheated	Wv	2.056E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr:
Product	biodiesel
Total HAP Emissions =	**27.252**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0	0.000	0.000	114.23	32	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	27.2519	7.667	19.584	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$

Vapor Mole Fraction — Eq. 40-5 $y_i = P_i / P_{VA}$

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.004	-
benzene	0.000000	0.004	-
2,2,4 TMP	0.000000	0.004	**0**
toluene	0.000000	0.004	-
ethylbenzene	0.000000	0.004	-
xylenes	0.000000	0.004	-
naphthalene	0.00E+00	0.004	**0.00E+00**
cumene	0.00E+00	0.004	**0.00E+00**
methanol	3.68E-03	0.004	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 $x_i = (ZLiML)/M_i$

Component Vapor Pressure — $PVAi=(0.019337)10^{(A-(B/(TLA+C)))}$

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.7252
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3624
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1936
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0567
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0492
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0011
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8647

Monthly Calculations - DECEMBER

Tank No.	28		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.60**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**17.79**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**17.79**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Time Period		**December**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_v$	**Ls**	**4.60**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.19**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.19**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0347**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002421037		Average Daily Liquid Surface Temperature	TLA	491.43	°R
Partially Insulated	P_{VA}	0.00243123		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002295179					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0347**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R	Average Daily Vapor Temperature Range	ΔTv	17.05	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.99	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	491.43	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	13.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**17.05**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.70**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**491.43**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**491.55**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**490.0**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00283	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00207	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.61**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	495.69	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.10**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Fully Insulated; unheated Tv = TB	**Tv**	**489.99**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00281	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0021013	psia
Not Insulated	Wv	1.467E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	495.47	°R
Partially Insulated	Wv	1.472E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	487.62	°R
Fully Insulated, unheated	Wv	1.399E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr:
Product	biodiesel
Total HAP Emissions =	**17.792**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0.00000
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	17.7923	4.602	13.191	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 $Z_{Vi} = y_i M_i / M_V$

Vapor Mole Fraction — Eq. 40-5 $y_i = P_i / P_{VA}$

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	**0**
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.00E+00	0.002	**0.00E+00**
cumene	0.00E+00	0.002	**0.00E+00**
methanol	2.42E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 $x_i = (ZLiML)/M_i$

Component Vapor Pressure — $PVAi=(0.019337)10^{(A-(B/(TLA+C)))}$

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.5061
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2494
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1295
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0360
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0311
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.	29		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**
Total Losses, unheaded (Eq.1-1: LT = LS+LW)	**LT**	**574.43**	lb/year	Vapor Space Volume
				Stock Vapor Density
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5
Time Period		**Annual**		Vented Vapor Saturation Factor
Nearest US Location		Albany, NY		Constant; Number of Daily Events in a Year
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5
Product Information				Diameter
Product Type		Biodiesel		Vapor Space Outage
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00		
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)
				Working Loss Turnover Factor
Tank design data				Working Loss Product Factor
Shell height	Hs	**45.00**	ft	Stock Vapor Density
Diameter	D	**125.00**	ft	Vent Setting Correction Factor
Throughput	Q	**80,699,334**	gal/yr	
Turnovers	N	**20.44**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB
Roof Type:		Cone		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		Not Insulated		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H
Tank Construction (pick from drop down list)		Riveted		Vapor Pressure at Avg Daily Liq Surface Temp
Tank Shell Color (pick from drop down list)		Red, primer		Vapor Space Outage
Tank Shell Condition (pick from drop down list)		Average		
Tank Interior Condition (pick from drop down list)		Light Rust		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Average Daily Vapor Pressure Range
	PBV	-0.03		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp
Not Insulated	P_{VA}	0.005628014		Average Daily Liquid Surface Temperature
Partially Insulated	P_{VA}	0.005688417		Atmospheric Pressure
Fully Insulated, unheated	P_{VA}	0.004910539		
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA
				Vapor Pressure at Avg Daily Liq Surface Temp
				Vapor Space Outage
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R	Average Daily Vapor Temperature Range
				Average Daily Vapor Pressure Range
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	511.39	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)
				Vapor Pressure at Avg Daily Liq Surface Temp
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.42**	°R	**Fully Insulated, not heated**
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR	**TLA**	**515.74**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**511.4**	°R	**Average Daily Vapor Pressure Range (ΔPv)**
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**518.71**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**520.09**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV
Fully Insulated; unheated Tv = TB	**Tv**	**511.39**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us
Not Insulated	Wv	3.240E-05		Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0
Partially Insulated	Wv	3.266E-05		Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.
Fully Insulated, unheated	Wv	2.867E-05		
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us
				Maximum heated bulk liquid temperature (from process setpoints)
				Minimum heated bulk liquid temperature (from process setpoints)
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo				**Vv**
Tank diameter				D
Vapor Space Outage; see Equation 1-16				Hvo
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)				**Hvo**
Tank shell height				Hs
Liquid Height				HL
Roof Outage (for a Cone Roof vs Dome Roof)				HRO
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)				**HRO**
Tank cone roof slope (If unknown, use 0.0625)				SR
Tank shell radius				Rs
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666				**HRO**
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))				RR
Tank shell radius				Rs

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**574.426**

Eq. 40-2 $L_T = \Sigma(L_{T_i})$

Vapor Weight Concentrations

Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{T_i} **(lb/yr)**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	574.4257	32.04	32	1.00E+00	5.63E-03	0.006	**1.00E+00**

Liquid Mole Fraction

Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7105
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0396
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5269
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2898
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0893
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0777
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0020
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0407
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2923

Monthly Calculations - JANUARY

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.58**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**15.67**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**15.67**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Time Period		**January**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**4.58**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.08**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.08**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0412**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Not Insulated	P_{VA}	0.002015063		Average Daily Liquid Surface Temperature	TLA	486.51	°R
Partially Insulated	P_{VA}	0.002025981		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.001881227					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**483.25**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0412**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R	Average Daily Vapor Temperature Range	ΔTv	20.01	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	484.69	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	486.51	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.01**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.52**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**486.65**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**484.7**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00243	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00167	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Fully Insulated; unheated Tv = TB	**Tv**	**484.69**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00241	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0016994	psia
Not Insulated	Wv	1.233E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	491.28	°R
Partially Insulated	Wv	1.238E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	482.02	°R
Fully Insulated, unheated	WV	1.159E-05					
Fully Insulated, heated	WV	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**15.668**

Eq. 40-2 $L_T = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	Standing$_i$ **lb/yr**	Working$_i$ **lb/yr**	M_i	M_y	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0.000	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	15.668	4.585	11.083	32.04	32	1.00E+00	2.02E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — $PVAi=(0.019337)10^{(A-(B/(TLA+C)))}$

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4318
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2115
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1084
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0295
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0254
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4865

Monthly Calculations - FEBRUARY

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**6.02**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**18.82**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**18.82**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Time Period		**February**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	28	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**6.02**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	28	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.80**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**22.21**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.80**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0519**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002350191		Average Daily Liquid Surface Temperature	TLA	490.63	°R
Partially Insulated	P_{VA}	0.002368781		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002125695					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**485.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0519**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R	Average Daily Vapor Temperature Range	ΔTv	25.40	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	487.93	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	490.63	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**25.40**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.80**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**490.84**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**487.9**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00111**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00296	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00185	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Fully Insulated; unheated Tv = TB	**Tv**	**487.93**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00105**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00294	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0018959	psia
Not Insulated	Wv	1.424E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	496.79	°R
Partially Insulated	Wv	1.432E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	484.89	°R
Fully Insulated, unheated	WV	1.301E-05					
Fully Insulated, heated	WV	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**18.819**

Eq. 40-2 $L_T = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	Standing$_i$ **lb/yr**	Working$_i$ **lb/yr**	M_i	M_y	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	18.8190	6.020	12.799	32.04	32	1.00E+00	2.35E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — $PVAi=(0.019337)10^{(A-(B/(TLA+C)))}$

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4933
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2426
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1258
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0349
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0301
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5637

Monthly Calculations - MARCH

Tank No.		29		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**			**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**30.39**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**30.39**	lb/month	
Time Period		**March**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.06**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.003484427		
Partially Insulated	P_{VA}	0.003521114		
Fully Insulated, unheated	P_{VA}	0.003048229		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	497.76	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**501.80**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**497.8**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**497.76**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	2.062E-05		
Partially Insulated	Wv	2.078E-05		
Fully Insulated, unheated	Wv	1.828E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**11.85**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**11.85**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00199**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00460	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00261	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	509.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00189**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00458	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0026857	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	509.35	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	494.26	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**30.387**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.003	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	30.3866	11.852	18.534	32.04	32	1.00E+00	3.48E-03	0.003	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6919
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3451
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1837
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0535
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0463
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8206

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Monthly Calculations - APRIL

Tank No.		29		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**			**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**53.43**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**53.43**	lb/month	
Time Period		**April**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.73**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.005855374		
Partially Insulated	P_{VA}	0.00593478		
Fully Insulated, unheated	P_{VA}	0.004927826		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	511.49	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**516.61**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**517.01**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**511.5**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**520.78**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.53**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**511.49**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	3.357E-05		
Partially Insulated	Wv	3.391E-05		
Fully Insulated, unheated	Wv	2.877E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**23.26**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**23.26**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**30.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**30.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00406**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00390**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.26	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**53.432**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	53.4320	23.256	30.176	32.04	32	1.00E+00	5.86E-03	0.006	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0749
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5455
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3008
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0931
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0811
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0021
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.3415

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Monthly Calculations - MAY

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**37.91**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**81.40**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**81.40**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Time Period		**May**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**37.91**	lb/month
Ideal Gas Constant	R	10.73	plai ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.49**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00005	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.49**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0875**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Not Insulated	P_{VA}	0.008643068		Average Daily Liquid Surface Temperature	TLA	528.54	°R
Partially Insulated	P_{VA}	0.008773316		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.007134727					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**517.90**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0875**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R	Average Daily Vapor Temperature Range	ΔTv	46.00	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	522.60	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	528.54	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**46.00**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**43.90**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**528.54**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**529.01**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**522.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00643**	psia
				Vapor pressure at ave, daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01237	psia
				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00594	psia
Average Vapor Temperature (Tv)				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.39**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.43**	**°R**				
Fully Insulated; unheated Tv = TB	**Tv**	**522.60**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00621**	**psia**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01235	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0061410	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.99	°R
Not Insulated	Wv	4.838E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	518.04	°R
Partially Insulated	Wv	4.892E-05					
Fully Insulated, unheated	Wv	4.076E-05		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated	Wv	1.344E-04					
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**81.399**

Eq. 40-2 $L_T = \Sigma_i(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
							Eq. 40-5 $y_i = P_i / PVA$		
							Vapor Weight Concentrations		Vapor Mole Fraction
							Eq. 40-6 $ZVi = yiMi / MV$		
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	81.3988	37.909	43.489	32.04	32	1.00E+00	8.64E-03	0.009	**1.00E+00**

Individual HAPS	Liquid Mole Fraction Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure A	B	C	P_{VAi}
	Eq. 40-4 $xi = (ZLiML)/Mi$				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.4901
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7659
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4337
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1404
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1226
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0035
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.9347

Monthly Calculations - JUNE

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**49.72**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**108.47**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**108.47**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Time Period		**June**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**49.72**	lb/month
Ideal Gas Constant	R	10.73	plai ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**58.76**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.73**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**58.76**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0881**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Not Insulated	P_{VA}	0.011908818		Average Daily Liquid Surface Temperature	TLA	538.79	°R
Partially Insulated	P_{VA}	0.012092866		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.009781779					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**527.45**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0881**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R	Average Daily Vapor Temperature Range	ΔTv	47.14	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	532.45	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	538.79	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**47.14**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.17**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.79**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**539.29**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**532.5**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00874**	psia
				Vapor pressure at ave, daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01697	psia
				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00823	psia
Average Vapor Temperature (Tv)				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**543.96**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.13**	**°R**				
Fully Insulated; unheated Tv = TB	**Tv**	**532.45**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00848**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01697	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0084939	psia
Not Insulated	Wv	6.537E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.58	°R
Partially Insulated	Wv	6.611E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	528.00	°R
Fully Insulated, unheated	Wv	5.485E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**108.475**

Eq. 40-2 $L_T = \Sigma_i(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
							Eq. 40-5 $y_i = P_i / PVA$		
							Vapor Weight Concentrations		Vapor Mole Fraction
							Eq. 40-6 $ZVi = yiMi / MV$		
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	108.4746	49.717	58.758	32.04	32	1.00E+00	1.19E-02	0.012	**1.00E+00**

Individual HAPS	Liquid Mole Fraction Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure A	B	C	P_{VAi}
	Eq. 40-4 $xi = (ZLiML)/Mi$				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.9450
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0102
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5845
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1962
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1718
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0055
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.6110

Monthly Calculations - JULY

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**57.21**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**123.12**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**123.12**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Time Period		**July**		Vented Vapor Saturation Factor	Ks	0.98	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**57.21**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.98	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.91**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.91**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0876**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Not Insulated	P_{VA}	0.013458315		Average Daily Liquid Surface Temperature	TLA	542.81	°R
Partially Insulated	P_{VA}	0.013665337		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.011064547					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**531.35**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0876**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R	Average Daily Vapor Temperature Range	ΔTv	47.21	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	536.40	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	542.81	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**47.21**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.28**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**542.81**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**543.31**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**536.4**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00974**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01908	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00935	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**548.03**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**550.22**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Fully Insulated; unheated Tv = TB	**Tv**	**536.40**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00945**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01910	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0096413	psia
Not Insulated	Wv	7.332E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	554.63	°R
Partially Insulated	Wv	7.415E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	531.99	°R
Fully Insulated, unheated	Wv	6.159E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**123.123**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Eq. 40-6 $Zvi = yiMi / MV$ — Eq. 40-5 $yi = Pi / PVA$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.013	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.013	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.013	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.013	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.013	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.013	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.013	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.013	**0.00E+00**
methanol	123.1234	57.213	65.910	32.04	32	1.00E+00	1.35E-02	0.013	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.1519
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.1220
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6547
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2227
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1952
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0064
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.9263

Monthly Calculations - AUGUST

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.56**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**109.80**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**109.80**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Time Period		**August**		Vented Vapor Saturation Factor	Ks	0.98	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**48.56**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.98	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**61.23**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**61.23**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0800**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Not Insulated	P_{VA}	0.012428 78		Average Daily Liquid Surface Temperature	TLA	540.19	°R
Partially Insulated	P_{VA}	0.012597769		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.010454313					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**530.15**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0800**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R	Average Daily Vapor Temperature Range	ΔTv	42.89	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	534.58	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	540.19	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.1	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**42.89**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**40.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**540.19**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**540.63**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**534.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00823**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01713	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00890	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**544.76**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.68**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Fully Insulated; unheated Tv = TB	**Tv**	**534.58**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00795**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01711	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0091640	psia
Not Insulated	Wv	6.812E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.87	°R
Partially Insulated	Wv	6.880E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	530.38	°R
Fully Insulated, unheated	Wv	5.839E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**109.796**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Eq. 40-6 $Zvi = yiMi / MV$ — Eq. 40-5 $yi = Pi / PVA$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	109.7956	48.563	61.233	32.04	32	1.00E+00	1.24E-02	0.012	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.0150
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0480
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6082
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2051
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1796
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0058
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.7172

Monthly Calculations - SEPTEMBER

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**30.73**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**76.27**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**76.27**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Time Period		**September**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**30.73**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.54**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00005	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.73**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.54**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0700**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Not Insulated	P_{VA}	0.009054711		Average Daily Liquid Surface Temperature	TLA	530.01	°R
Partially Insulated	P_{VA}	0.009155981		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.00785475					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0700**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R	Average Daily Vapor Temperature Range	ΔTv	36.91	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	525.56	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	530.01	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**36.91**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**34.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.01**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**530.36**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**525.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00535**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01207	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00672	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.63**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	539.23	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.15**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	520.78	°R
Fully Insulated; unheated Tv = TB	**Tv**	**525.56**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00511**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01202	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0069091	psia
Not Insulated	Wv	5.066E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.10	°R
Partially Insulated	Wv	5.108E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	521.61	°R
Fully Insulated, unheated	Wv	4.462E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**76.269**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	76.2693	30.729	45.540	32.04	32	1.00E+00	9.05E-03	0.009	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.5491
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7974
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4529
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1474
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1288
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0038
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.0210

Monthly Calculations - OCTOBER

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**16.24**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**45.15**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**45.15**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Time Period		**October**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**16.24**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.92**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.92**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0561**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Not Insulated	P_{VA}	0.005576566		Average Daily Liquid Surface Temperature	TLA	515.15	°R
Partially Insulated	P_{VA}	0.005621296		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.005036616					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0561**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R	Average Daily Vapor Temperature Range	ΔTv	28.83	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	512.13	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	515.15	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**28.83**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**26.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.15**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**515.39**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**512.1**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00272**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00708	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00436	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**517.61**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	522.35	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**518.64**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	507.94	°R
Fully Insulated; unheated Tv = TB	**Tv**	**512.13**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00256**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00703	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0044701	psia
Not Insulated	Wv	3.217E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	522.13	°R
Partially Insulated	Wv	3.236E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	508.64	°R
Fully Insulated, unheated	Wv	2.936E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**45.154**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	45.1544	16.239	28.915	32.04	32	1.00E+00	5.58E-03	0.006	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0315
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5226
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2872
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0884
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0019
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2812

Monthly Calculations - NOVEMBER

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**7.67**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**27.25**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**27.25**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Time Period		**November**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**7.67**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.58**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00002	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.73**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.58**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0403**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Not Insulated	P_{VA}	0.003681787		Average Daily Liquid Surface Temperature	TLA	503.07	°R
Partially Insulated	P_{VA}	0.003700512		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.003451775					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0403**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R	Average Daily Vapor Temperature Range	ΔTv	20.25	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	501.24	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	503.07	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	15.2	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.25**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.73**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**503.07**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**503.21**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**501.2**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00132**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00439	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00308	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.56**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	508.13	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.18**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Fully Insulated; unheated Tv = TB	**Tv**	**501.24**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00122**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00436	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.00331337	psia
Not Insulated	Wv	2.179E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	507.90	°R
Partially Insulated	Wv	2.187E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	498.53	°R
Fully Insulated, unheated	Wv	2.056E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr:
Product	biodiesel
Total HAP Emissions =	**27.252**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0	0.000	0.000	114.23	32	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	27.2519	7.667	19.584	32.04	32	1.00E+00

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.004	-
benzene	0.000000	0.004	-
2,2,4 TMP	0.000000	0.004	**0**
toluene	0.000000	0.004	-
ethylbenzene	0.000000	0.004	-
xylenes	0.000000	0.004	-
naphthalene	0.00E+00	0.004	**0.00E+00**
cumene	0.00E+00	0.004	**0.00E+00**
methanol	3.68E-03	0.004	**1.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_i	M_l	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.7252
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3624
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1936
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0567
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0492
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0011
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8647

Monthly Calculations - DECEMBER

Tank No.	29		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.60**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**17.79**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**17.79**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Time Period		**December**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**4.60**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.19**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.19**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0347**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002421037		Average Daily Liquid Surface Temperature	TLA	491.43	°R
Partially Insulated	P_{VA}	0.00243123		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002295179					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0347**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R	Average Daily Vapor Temperature Range	ΔTv	17.05	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.99	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	491.43	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	13.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**17.05**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.70**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**491.43**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**491.55**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**490.0**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00283	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00207	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.61**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	495.69	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.10**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Fully Insulated; unheated Tv = TB	**Tv**	**489.99**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00281	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0021013	psia
Not Insulated	Wv	1.467E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	495.47	°R
Partially Insulated	Wv	1.472E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	487.62	°R
Fully Insulated, unheated	Wv	1.399E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr:
Product	biodiesel
Total HAP Emissions =	**17.792**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0	0.000	0.000	114.23	32	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	17.7923	4.602	13.191	32.04	32	1.00E+00

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	**0**
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.00E+00	0.002	**0.00E+00**
cumene	0.00E+00	0.002	**0.00E+00**
methanol	2.42E-03	0.002	**1.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_i	M_l	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.5061
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2494
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1295
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0360
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0311
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.	64		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**473.24**	lb/year	Vapor Space Volume
				Stock Vapor Density
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5
	Time Period	**Annual**		Vented Vapor Saturation Factor
Nearest US Location		Albany, NY		Constant; Number of Daily Events in a Year
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5
Product Information				Diameter
Product Type		Biodiesel		Vapor Space Outage
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00		
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)
				Working Loss Turnover Factor
Tank design data				Working Loss Product Factor
Shell height	Hs	**45.00**	ft	Stock Vapor Density
Diameter	D	**125.00**	ft	Vent Setting Correction Factor
Throughput	Q	**77,778,331**	gal/yr	
Turnovers	N	**19.70**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB
Roof Type:		Cone		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		Not Insulated		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H
Tank Construction (pick from drop down list)		Riveted		Vapor Pressure at Avg Daily Liq Surface Temp
Tank Shell Color (pick from drop down list)		Gray, light		Vapor Space Outage
Tank Shell Condition (pick from drop down list)		Average		
Tank Interior Condition (pick from drop down list)		Light Rust		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		Average Daily Vapor Temperature Range
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Average Daily Vapor Pressure Range
	PBV	-0.03		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp
Not Insulated	P_{VA}	0.005161549		Average Daily Liquid Surface Temperature
Partially Insulated	P_{VA}	0.005197548		Atmospheric Pressure
Fully Insulated, unheated	P_{VA}	0.004724283		
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA
				Vapor Pressure at Avg Daily Liq Surface Temp
				Vapor Space Outage
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R	Average Daily Vapor Temperature Range
				Average Daily Vapor Pressure Range
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	510.25	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)
				Vapor Pressure at Avg Daily Liq Surface Temp
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**512.85**	°R	**Fully Insulated, not heated**
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR	**TLA**	**513.06**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**510.3**	°R	**Average Daily Vapor Pressure Range (ΔPv)**
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**514.98**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV
Partially Insulated; Eq. **1-34,** Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**515.87**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV
Fully Insulated; unheated Tv = TB	**Tv**	**510.25**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us
Not Insulated	Wv	2.993E-05		Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0
Partially Insulated	Wv	3.008E-05		Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.
Fully Insulated, unheated	Wv	2.764E-05		
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us
				Maximum heated bulk liquid temperature (from process setpoints)
				Minimum heated bulk liquid temperature (from process setpoints)

Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**473.238**

Eq. 40-2 $L_L = Z_L(L_V)$

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_L **(lb/yr)**	M_i	M_V	Z_{VI}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	114.23	32	0	0.000000	0.005	**0**
toluene	0.0000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
methanol	473.2384	32.04	32	1.00E+00	5.16E-03	0.005	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.5971
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.9663
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4883
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2670
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0815
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0708
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0017
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0369
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.1909

Monthly Calculations - JANUARY

Tank No.	64		**Tank type**	**Fixed Roof Tank**			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**3.66**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**13.92**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**13.92**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.034	per day
Time Period		**January**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**3.66**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.034	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**10.26**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,481,528**	gal/month				
Turnovers	N	**19.33**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**10.26**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0019	psia
Tank Shell Color (pick from drop down list)		**Gray, light**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0342**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		Average Daily Vapor Temperature Range	ΔTv	16.60	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0006	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0019	psia
Not Insulated	P_{VA}	0.001928963		Average Daily Liquid Surface Temperature	TLA	485.35	°R
Partially Insulated	P_{VA}	0.001935725		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.001845112					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0019	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**483.25**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0342**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R	Average Daily Vapor Temperature Range	ΔTv	16.60	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0006	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	484.18	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0019	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	485.35	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**16.60**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.11**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**485.35**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**485.44**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**484.2**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00061**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00225	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00165	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**486.30**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	489.50	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**486.71**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.20	°R
Fully Insulated; unheated Tv = TB	**Tv**	**484.18**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00055**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00223	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0016763	psia
Not Insulated	Wv	1.184E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	489.22	°R
Partially Insulated	Wv	1.187E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	481.66	°R
Fully Insulated, unheated	Wv	1.138E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**13.924**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing$_i$ lb/yr**	**Working$_i$ lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0.000	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	13.924	3.664	10.260	32.04	32	1.00E+00	1.93E-03	0.002	**1.00E+00**

Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi — **Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7246
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4158
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2033
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1039
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0281
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0242
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0004
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0117
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4665

Monthly Calculations - FEBRUARY

Tank No.	64		**Tank type**	**Fixed Roof Tank**			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.57**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**16.20**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**16.20**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.042	per day
Time Period		**February**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	28	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 \cdot D^2) * H_{VO} * K_s * W_v$	**Ls**	**4.57**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.042	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	28	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.63**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,481,528**	gal/month				
Turnovers	N	**21.40**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.63**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Tank Shell Color (pick from drop down list)		**Gray, light**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0417**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		Average Daily Vapor Temperature Range	ΔTv	20.35	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Not Insulated	P_{VA}	0.002205041		Average Daily Liquid Surface Temperature	TLA	488.91	°R
Partially Insulated	P_{VA}	0.002216347		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002066212					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**485.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0417**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R	Average Daily Vapor Temperature Range	ΔTv	20.35	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	487.17	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	488.91	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.35**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.75**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**488.91**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**489.05**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**487.2**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00084**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00266	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00182	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**490.33**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.00	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.93**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.82	°R
Fully Insulated; unheated Tv = TB	**Tv**	**487.17**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00078**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00263	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0018581	psia
Not Insulated	Wv	1.343E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	493.74	°R
Partially Insulated	Wv	1.348E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	484.36	°R
Fully Insulated, unheated	Wv	1.266E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**16.198**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing$_i$ lb/yr**	**Working$_i$ lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	16.1977	4.565	11.633	32.04	32	1.00E+00	2.21E-03	0.002	**1.00E+00**

Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi — **Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8076
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4669
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2293
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1183
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0325
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0281
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0137
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5303

Monthly Calculations - MARCH

Tank No.		64		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**			**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
					Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**8.60**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**25.12**	lb/month		Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**25.12**	lb/month		Stock Vapor Density	Wv	0.0000	lb/ft3
					Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.050	per day
Time Period		**March**			Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**			Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day					
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v		**Ls**	**8.60**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.050	per day
Product Information					Diameter	D	125.0000	ft
Product Type		**Biodiesel**			Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole		Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal		Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**			Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**						
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB		**Lw**	**16.52**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
					Working Loss Turnover Factor	KN	1.0000	
Tank design data					Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft		Stock Vapor Density	Wv	0.00002	lb/ft3
Diameter	D	**125.00**	ft		Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,481,528**	gal/month					
Turnovers	N	**19.33**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB		**Lw**	**16.52**	lb/month
Roof Type:		**Cone**			Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft		Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft		Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft		Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft		Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft					
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H		**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**			Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0032	psia
Tank Shell Color (pick from drop down list)		**Gray, light**			Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**						
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**		**KE**	**0.0500**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**			Average Daily Vapor Temperature Range	ΔTv	24.89	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi		Average Daily Vapor Pressure Range	ΔPv	0.0014	psi
	PBV	**-0.03**			Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0032	psia
Not Insulated	P_{VA}	0.003200929			Average Daily Liquid Surface Temperature	TLA	499.12	°R
Partially Insulated	P_{VA}	0.00322282			Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002934849						
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA		**Ks**	**1.00**	
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0032	psia
					Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R					
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**		**KE**	**0.0500**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R		Average Daily Vapor Temperature Range	ΔTv	24.89	°R
					Average Daily Vapor Pressure Range	ΔPv	0.0014	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	496.71	°R		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0032	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R		Average Daily Liquid Surface Temperature	TLA	499.12	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F		Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**				
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R		Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.4	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**24.89**	**°R**
					Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**23.15**	°R
Average Daily Liquid Surface Temperature (TLA)					**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**499.12**	°R		**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**499.31**	°R					
Fully Insulated, unheated: TLA = TB	**TLA**	**496.7**	°R	**Average Daily Vapor Pressure Range (ΔPv)**				
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00143**	psia
					Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00399	psia
Average Vapor Temperature (Tv)					Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00256	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.09**	**°R**		Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	505.35	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.92**	**°R**		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.90	°R
Fully Insulated; unheated Tv = TB	**Tv**	**496.71**	**°R**					
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00134**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00395	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0026144	psia
Not Insulated	Wv	1.907E-05			Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	505.10	°R
Partially Insulated	Wv	1.917E-05			Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	493.52	°R
Fully Insulated, unheated	Wv	1.764E-05						
Fully Insulated, heated	Wv	1.344E-04			**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
					Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
					Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
					Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo		**Vv**	**292,095.51**	ft3
					Tank diameter	D	125.00	ft
					Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)		**Hvo**	**23.80**	ft
					Tank shell height	Hs	45.00	ft
					Liquid Height	HL	22.50	ft
					Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)		**HRO**	**1.30**	ft
					Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
					Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666		**HRO**	**8.57**	ft
					Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
					Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**25.120**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: **M_i**	**M_V**	**Z_{Vi}**	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: **$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.003	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	25.1196	8.596	16.524	32.04	32	1.00E+00	3.20E-03	0.003	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): **A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.0907
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6434
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3200
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1694
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0488
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0423
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0009
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0212
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.7570

Monthly Calculations - APRIL

Tank No.		64		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**			**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
					Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**16.23**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**42.55**	lb/month		Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**42.55**	lb/month		Stock Vapor Density	Wv	0.0000	lb/ft3
					Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Time Period		**April**			Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**			Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day					
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v		**Ls**	**16.23**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Product Information					Diameter	D	125.0000	ft
Product Type		**Biodiesel**			Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole		Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal		Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**			Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**						
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB		**Lw**	**26.31**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
					Working Loss Turnover Factor	KN	1.0000	
Tank design data					Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft		Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft		Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,481,528**	gal/month					
Turnovers	N	**19.98**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB		**Lw**	**26.31**	lb/month
Roof Type:		**Cone**			Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft		Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft		Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft		Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft		Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft					
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H		**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**			Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Tank Shell Color (pick from drop down list)		**Gray, light**			Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**						
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**		**KE**	**0.0614**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**			Average Daily Vapor Temperature Range	ΔTv	31.42	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi		Average Daily Vapor Pressure Range	ΔPv	0.0028	psi
	PBV	**-0.03**			Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Not Insulated	P_{VA}	0.005248947			Average Daily Liquid Surface Temperature	TLA	513.35	°R
Partially Insulated	P_{VA}	0.005295307			Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.004692031						
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA		**Ks**	**0.99**	
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
					Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R					
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**		**KE**	**0.0614**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R		Average Daily Vapor Temperature Range	ΔTv	31.42	°R
					Average Daily Vapor Pressure Range	ΔPv	0.0028	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	510.05	°R		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R		Average Daily Liquid Surface Temperature	TLA	513.35	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F		Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**				
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R		Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	20.1	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**31.42**	**°R**
					Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**29.41**	°R
Average Daily Liquid Surface Temperature (TLA)					**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.35**	°R		**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**513.61**	°R					
Fully Insulated, unheated: TLA = TB	**TLA**	**510.1**	°R	**Average Daily Vapor Pressure Range (ΔPv)**				
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00281**	psia
					Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00682	psia
Average Vapor Temperature (Tv)					Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00401	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**516.04**	**°R**		Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	521.21	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**517.17**	**°R**		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.49	°R
Fully Insulated; unheated Tv = TB	**Tv**	**510.05**	**°R**					
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00265**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00676	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0041162	psia
Not Insulated	Wv	3.037E-05			Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	520.96	°R
Partially Insulated	Wv	3.057E-05			Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	506.26	°R
Fully Insulated, unheated	Wv	2.747E-05						
Fully Insulated, heated	Wv	1.344E-04			**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
					Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
					Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
					Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo		**Vv**	**292,095.51**	ft3
					Tank diameter	D	125.00	ft
					Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)		**Hvo**	**23.80**	ft
					Tank shell height	Hs	45.00	ft
					Liquid Height	HL	22.50	ft
					Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)		**HRO**	**1.30**	ft
					Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
					Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666		**HRO**	**8.57**	ft
					Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
					Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**42.545**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: **M_i**	**M_V**	**Z_{Vi}**	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: **$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.005	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
methanol	42.5455	16.234	26.311	32.04	32	1.00E+00	5.25E-03	0.005	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): **A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.6185
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.9801
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4956
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2713
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0829
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0721
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0376
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2100

Monthly Calculations - MAY

Tank No.	64		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	63.42	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	63.42	lb/month
Time Period		May	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1739.0	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,481,528	gal/month
Turnovers	N	19.33	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.007654065	
Partially Insulated	P_{VA}	0.007729302	
Fully Insulated, unheated	P_{VA}	0.006755472	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	517.90	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	520.93	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	524.76	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	TLA	525.06	°R
Fully Insulated, unheated: TLA = TB	TLA	520.9	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	527.89	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	529.20	°R
Fully Insulated; unheated Tv = TB	Tv	520.93	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	4.329E-05	
Partially Insulated	Wv	4.361E-05	
Fully Insulated, unheated	Wv	3.872E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	25.92	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.067	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	Ls	25.92	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.067	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	37.51	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00004	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	37.51	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0077	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	KE	0.0668	per day
Average Daily Vapor Temperature Range	ΔTv	34.87	°R
Average Daily Vapor Pressure Range	ΔPv	0.0044	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0077	psia
Average Daily Liquid Surface Temperature	TLA	524.76	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0077	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	KE	0.0668	per day
Average Daily Vapor Temperature Range	ΔTv	34.87	°R
Average Daily Vapor Pressure Range	ΔPv	0.0044	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0077	psia
Average Daily Liquid Surface Temperature	TLA	524.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	34.87	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	32.77	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00435	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01010	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00575	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	533.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	516.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00412	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01003	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0059069	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	533.25	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	516.87	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	63.424
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.008	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.008	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.008	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.008	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.008	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.008	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.008	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.008	0.00E+00
methanol	63.4239	25.918	37.506	32.04	32	1.00E+00	7.65E-03	0.008	1.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.1802
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.3462
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.6892
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3870
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1236
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1078
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0030
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0578
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.7262

Monthly Calculations - JUNE

Tank No.	64		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	84.03	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	84.03	lb/month
Time Period		June	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1853.0	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,481,528	gal/month
Turnovers	N	19.98	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.010513185	
Partially Insulated	P_{VA}	0.010619231	
Fully Insulated, unheated	P_{VA}	0.009248362	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	527.45	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	530.67	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	534.76	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	TLA	535.08	°R
Fully Insulated, unheated: TLA = TB	TLA	530.7	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	538.09	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	539.49	°R
Fully Insulated; unheated Tv = TB	Tv	530.67	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.834E-05	
Partially Insulated	Wv	5.877E-05	
Fully Insulated, unheated	Wv	5.203E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	33.49	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	Ls	33.49	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	50.54	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	50.54	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0105	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	KE	0.0664	per day
Average Daily Vapor Temperature Range	ΔTv	35.28	°R
Average Daily Vapor Pressure Range	ΔPv	0.0058	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0105	psia
Average Daily Liquid Surface Temperature	TLA	534.76	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0105	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	KE	0.0664	per day
Average Daily Vapor Temperature Range	ΔTv	35.28	°R
Average Daily Vapor Pressure Range	ΔPv	0.0058	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0105	psia
Average Daily Liquid Surface Temperature	TLA	534.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	35.28	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	33.31	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00583	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01378	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00795	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	543.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	525.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00554	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01371	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0081618	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	543.41	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	526.75	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	84.030
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.011	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.011	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.011	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.011	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.011	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.011	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.011	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.011	0.00E+00
methanol	84.0297	33.490	50.540	32.04	32	1.00E+00	1.05E-02	0.011	1.00E+00

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.7955
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.7540
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.9073
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5206
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1723
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1507
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0046
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0826
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.3241

Monthly Calculations - JULY

Tank No.		64		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
					Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**38.45**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**95.18**	lb/month		Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**95.18**	lb/month		Stock Vapor Density	Wv	0.0001	lb/ft3
					Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Time Period		**July**			Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**			Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day					
Absolute Pressure	P_A	14.55	psi		**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**38.45**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Product Information					Diameter	D	125.0000	ft
Product Type		**Biodiesel**			Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole		Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal		Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**			Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**						
Vapor Pressure Equation Constant A	A	**12.10**			**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**56.73**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
					Working Loss Turnover Factor	KN	1.0000	
Tank design data					Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft		Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft		Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,481,528**	gal/month					
Turnovers	N	**19.33**	per year		**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**56.73**	lb/month
Roof Type:		**Cone**			Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft		Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft		Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft		Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft		Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft					
Tank Insulation (pick from drop down list)		**Not Insulated**			**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**			Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Tank Shell Color (pick from drop down list)		**Gray, light**			Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**						
Tank Interior Condition (pick from drop down list)		**Light Rust**			**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0658**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**			Average Daily Vapor Temperature Range	ΔTv	35.23	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi		Average Daily Vapor Pressure Range	ΔPv	0.0065	psi
	PBV	**-0.03**			Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Not Insulated	P_{VA}	0.011887936			Average Daily Liquid Surface Temperature	TLA	538.73	°R
Partially Insulated	P_{VA}	0.012007295			Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.010463857						
Fully Insulated, heated	P_{VA}	0.025426158			**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
					Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**531.35**	°R					
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R		**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0658**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R		Average Daily Vapor Temperature Range	ΔTv	35.23	°R
					Average Daily Vapor Pressure Range	ΔPv	0.0065	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	534.61	°R		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R		Average Daily Liquid Surface Temperature	TLA	538.73	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F		Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F		**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R		Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**35.23**	**°R**
					Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.30**	°R
Average Daily Liquid Surface Temperature (TLA)					**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.73**	°R		**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**539.06**	°R					
Fully Insulated, unheated: TLA = TB	**TLA**	**534.6**	°R		**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00648**	psia
					Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01551	psia
Average Vapor Temperature (Tv)					Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00903	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**542.10**	**°R**		Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	547.54	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**543.51**	**°R**		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.93	°R
Fully Insulated; unheated Tv = TB	**Tv**	**534.61**	**°R**					
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00617**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01544	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0092662	psia
Not Insulated	Wv	6.548E-05			Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	547.38	°R
Partially Insulated	Wv	6.596E-05			Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	530.74	°R
Fully Insulated, unheated	Wv	5.844E-05						
Fully Insulated, heated	Wv	1.344E-04			**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
					Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
					Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
					Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
					Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
					Tank diameter	D	125.00	ft
					Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
					Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
					Tank shell height	Hs	45.00	ft
					Liquid Height	HL	22.50	ft
					Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
					Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
					Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
					Tank shell radius	Rs	62.50	ft
					Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
					Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
					Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**95.179**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
						Vapor Weight Concentrations		Vapor Mole Fraction	
						Eq. 40-6 ZVi = yiMi / MV		Eq. 40-5 yi = Pi / PVA	
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	95.1789	38.453	56.726	32.04	32	1.00E+00	1.19E-02	0.012	**1.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.0764
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.9422
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0086
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5836
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1958
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1715
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0054
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0948
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.6067

Monthly Calculations - AUGUST

Tank No.		64		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
					Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**33.44**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**86.83**	lb/month		Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**86.83**	lb/month		Stock Vapor Density	Wv	0.0001	lb/ft3
					Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Time Period		**August**			Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**			Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day					
Absolute Pressure	P_A	14.55	psi		**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**33.44**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Product Information					Diameter	D	125.0000	ft
Product Type		**Biodiesel**			Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole		Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal		Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**			Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**						
Vapor Pressure Equation Constant A	A	**12.10**			**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**53.40**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
					Working Loss Turnover Factor	KN	1.0000	
Tank design data					Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft		Stock Vapor Density	Wv	0.00006	lb/ft3
Diameter	D	**125.00**	ft		Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,481,528**	gal/month					
Turnovers	N	**19.33**	per year		**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**53.40**	lb/month
Roof Type:		**Cone**			Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft		Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft		Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft		Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft		Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft					
Tank Insulation (pick from drop down list)		**Not Insulated**			**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**			Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0111	psia
Tank Shell Color (pick from drop down list)		**Gray, light**			Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**						
Tank Interior Condition (pick from drop down list)		**Light Rust**			**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0608**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**			Average Daily Vapor Temperature Range	ΔTv	32.39	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi		Average Daily Vapor Pressure Range	ΔPv	0.0056	psi
	PBV	**-0.03**			Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0111	psia
Not Insulated	P_{VA}	0.011137977			Average Daily Liquid Surface Temperature	TLA	536.62	°R
Partially Insulated	P_{VA}	0.01123667			Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.009952251						
Fully Insulated, heated	P_{VA}	0.025426158			**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0111	psia
					Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**530.15**	°R					
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R		**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0608**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R		Average Daily Vapor Temperature Range	ΔTv	32.39	°R
					Average Daily Vapor Pressure Range	ΔPv	0.0056	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	533.00	°R		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0111	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R		Average Daily Liquid Surface Temperature	TLA	536.62	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F		Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F		**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R		Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.1	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**32.39**	**°R**
					Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.48**	°R
Average Daily Liquid Surface Temperature (TLA)					**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**536.62**	°R		**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**536.90**	°R					
Fully Insulated, unheated: TLA = TB	**TLA**	**533.0**	°R		**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00562**	psia
					Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01426	psia
Average Vapor Temperature (Tv)					Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00864	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**539.57**	**°R**		Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTA	TLX	544.72	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**540.80**	**°R**		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	528.52	°R
Fully Insulated; unheated Tv = TB	**Tv**	**533.00**	**°R**					
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00532**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01417	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0088491	psia
Not Insulated	Wv	6.163E-05			Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	544.52	°R
Partially Insulated	Wv	6.204E-05			Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	529.28	°R
Fully Insulated, unheated	Wv	5.575E-05						
Fully Insulated, heated	Wv	1.344E-04			**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
					Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
					Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
					Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
					Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
					Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
					Tank diameter	D	125.00	ft
					Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
					Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
					Tank shell height	Hs	45.00	ft
					Liquid Height	HL	22.50	ft
					Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
					Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
					Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
					Tank shell radius	Rs	62.50	ft
					Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
					Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
					Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**86.832**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
						Vapor Weight Concentrations		Vapor Mole Fraction	
						Eq. 40-6 ZVi = yiMi / MV		Eq. 40-5 yi = Pi / PVA	
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.011	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.011	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.011	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.011	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.011	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.011	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.011	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.011	**0.00E+00**
methanol	86.8324	33.436	53.397	32.04	32	1.00E+00	1.11E-02	0.011	**1.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.9242
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.8401
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.9536
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5493
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1830
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1602
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0050
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0881
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.4529

Monthly Calculations - SEPTEMBER

Tank No.		64		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**62.47**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**62.47**	lb/month	
	Time Period	**September**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,481,528**	gal/month	
Turnovers	N	**19.98**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Gray, light**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.008273917		
Partially Insulated	P_{VA}	0.008334091		
Fully Insulated, unheated	P_{VA}	0.007544197		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	524.31	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**527.18**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**527.40**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**524.3**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**529.51**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**530.49**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**524.31**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	4.665E-05		
Partially Insulated	Wv	4.691E-05		
Fully Insulated, unheated	Wv	4.296E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**22.05**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.054	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**22.05**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.054	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**40.42**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**40.42**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0083	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0545**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.59	°R
Average Daily Vapor Pressure Range	ΔPv	0.0038	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0083	psia
Average Daily Liquid Surface Temperature	TLA	527.18	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0083	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0545**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.59	°R
Average Daily Vapor Pressure Range	ΔPv	0.0038	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0083	psia
Average Daily Liquid Surface Temperature	TLA	527.18	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00381**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01037	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00656	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	534.32	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.03	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00358**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01029	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0067140	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	534.07	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	520.74	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr*
Product	biodiesel
Total HAP Emissions =	**62.467**

Eq. 40-2 $L_{TI} = Z_{VI}(L_T)$

Individual HAPS	L_{TI} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_I	M_V	Z_{VI}	$P_I = P_{VA}(x_I)$	P_{VA}	y_I
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.008	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.008	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.008	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.008	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.008	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.008	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.008	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.008	**0.00E+00**
methanol	62.4673	22.048	40.419	32.04	32	1.00E+00	8.27E-03	0.008	**1.00E+00**

Vapor Weight Concentrations: Eq. 40-6 ZVI = yIMI / MV

Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{LI}	M_L	M_I	X_I	A	B	C	P_{VAI}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.3177
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.4368
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7374
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4163
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1341
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1171
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0033
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0631
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.8571

Monthly Calculations - OCTOBER

Tank No.		64		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**38.62**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**38.62**	lb/month	
	Time Period	**October**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,481,528**	gal/month	
Turnovers	N	**19.33**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Gray, light**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.00522741		
Partially Insulated	P_{VA}	0.005254601		
Fully Insulated, unheated	P_{VA}	0.004893619		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	511.28	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.23**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**513.38**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**511.3**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**514.81**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**515.48**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**511.28**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	3.032E-05		
Partially Insulated	Wv	3.044E-05		
Fully Insulated, unheated	Wv	2.858E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**12.36**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.045	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**12.36**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.045	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**26.27**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**26.27**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0453**	**per day**
Average Daily Vapor Temperature Range	ΔTv	23.18	°R
Average Daily Vapor Pressure Range	ΔPv	0.0021	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0052	psia
Average Daily Liquid Surface Temperature	TLA	513.23	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**23.18**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**21.33**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00206**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00635	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00429	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.02	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.43	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00190**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00628	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0043797	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	518.71	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	508.05	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr*
Product	biodiesel
Total HAP Emissions =	**38.622**

Eq. 40-2 $L_{TI} = Z_{VI}(L_T)$

Individual HAPS	L_{TI} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_I	M_V	Z_{VI}	$P_I = P_{VA}(x_I)$	P_{VA}	y_I
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.005	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
methanol	38.6224	12.357	26.266	32.04	32	1.00E+00	5.23E-03	0.005	**1.00E+00**

Vapor Weight Concentrations: Eq. 40-6 ZVI = yIMI / MV

Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{LI}	M_L	M_I	X_I	A	B	C	P_{VAI}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.6132
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.9767
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4938
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2702
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0826
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0718
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0374
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2053

Monthly Calculations - NOVEMBER

Tank No.		64		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units		
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**24.33**	lb/month		
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**24.33**	lb/month		
Time Period		**November**			
Nearest US Location		**Albany, NY**			
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day		
Absolute Pressure	P_A	14.55	psi		
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R		
Product Information					
Product Type		**Biodiesel**			
Vapor Molecular weight	Mv	**32**	Lb/lb-mole		
Average organic liquid density	WL	**7.30**	lb/gal		
Average Reid Vapor Pressure	RVP	**0.00**			
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**			
Vapor Pressure Equation Constant A	A	**12.10**			
Vapor Pressure Equation Constant B	B	**8907.0**	°R		
Tank design data					
Shell height	Hs	**45.00**	ft		
Diameter	D	**125.00**	ft		
Throughput	Q	**6,481,528**	gal/month		
Turnovers	N	**19.98**	per year		
Roof Type:		**Cone**			
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft		
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft		
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft		
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft		
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft		
Tank Insulation (pick from drop down list)		**Not Insulated**			
Tank Construction (pick from drop down list)		**Riveted**			
Tank Shell Color (pick from drop down list)		**Gray, light**			
Tank Shell Condition (pick from drop down list)		**Average**			
Tank Interior Condition (pick from drop down list)		**Light Rust**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**			
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi		
	PBV	**-0.03**			
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					
Not Insulated	P_{VA}	0.00353392			
Partially Insulated	P_{VA}	0.003545547			
Fully Insulated, unheated	P_{VA}	0.003389546			
Fully Insulated, heated	P_{VA}	0.025426158			
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R		
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R		
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R		
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	500.73	°R		
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R		
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F		
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F		
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R		
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R		
Average Daily Liquid Surface Temperature (TLA)					
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.91**	°R		
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**502.00**	°R		
Fully Insulated, unheated: TLA = TB	**TLA**	**500.7**	°R		
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R		
Average Vapor Temperature (Tv)					
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**502.87**	**°R**		
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**503.27**	**°R**		
Fully Insulated; unheated Tv = TB	**Tv**	**500.73**	**°R**		
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**		
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					
Not Insulated	Wv	2.098E-05			
Partially Insulated	Wv	2.103E-05			
Fully Insulated, unheated	Wv	2.021E-05			
Fully Insulated, heated	Wv	1.344E-04			

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**6.15**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.034	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**6.15**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.034	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0336**	**per day**
Average Daily Vapor Temperature Range	ΔTv	16.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.91	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00105**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00410	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00304	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	506.11	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	497.70	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00096**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00406	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0030936	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	505.83	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	498.17	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr:
Product	biodiesel
Total HAP Emissions =	**24.331**

Eq. 40-2 $L_T = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0	0.000	0.000	114.23	32	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	24.3314	6.153	18.178	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 $y_i = P_i / PVA$

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.004	-
benzene	0.000000	0.004	-
2,2,4 TMP	0.000000	0.004	**0**
toluene	0.000000	0.004	-
ethylbenzene	0.000000	0.004	-
xylenes	0.000000	0.004	-
naphthalene	0.00E+00	0.004	**0.00E+00**
cumene	0.00E+00	0.004	**0.00E+00**
methanol	3.53E-03	0.004	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1808
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.7003
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3495
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1862
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0543
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0470
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0238
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8317

Monthly Calculations - DECEMBER

Tank No.		64		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units		
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**16.08**	lb/month		
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**16.08**	lb/month		
Time Period		**December**			
Nearest US Location		**Albany, NY**			
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day		
Absolute Pressure	P_A	14.55	psi		
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R		
Product Information					
Product Type		**Biodiesel**			
Vapor Molecular weight	Mv	**32**	Lb/lb-mole		
Average organic liquid density	WL	**7.30**	lb/gal		
Average Reid Vapor Pressure	RVP	**0.00**			
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**			
Vapor Pressure Equation Constant A	A	**12.10**			
Vapor Pressure Equation Constant B	B	**8907.0**	°R		
Tank design data					
Shell height	Hs	**45.00**	ft		
Diameter	D	**125.00**	ft		
Throughput	Q	**6,481,528**	gal/month		
Turnovers	N	**19.33**	per year		
Roof Type:		**Cone**			
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft		
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft		
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft		
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft		
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft		
Tank Insulation (pick from drop down list)		**Not Insulated**			
Tank Construction (pick from drop down list)		**Riveted**			
Tank Shell Color (pick from drop down list)		**Gray, light**			
Tank Shell Condition (pick from drop down list)		**Average**			
Tank Interior Condition (pick from drop down list)		**Light Rust**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**			
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi		
	PBV	**-0.03**			
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))					
Not Insulated	P_{VA}	0.002340269			
Partially Insulated	P_{VA}	0.002346638			
Fully Insulated, unheated	P_{VA}	0.002260914			
Fully Insulated, heated	P_{VA}	0.025426158			
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R		
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R		
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R		
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.58	°R		
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R		
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F		
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F		
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R		
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R		
Average Daily Liquid Surface Temperature (TLA)					
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.51**	°R		
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**490.59**	°R		
Fully Insulated, unheated: TLA = TB	**TLA**	**489.6**	°R		
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R		
Average Vapor Temperature (Tv)					
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**491.27**	**°R**		
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**491.59**	**°R**		
Fully Insulated; unheated Tv = TB	**Tv**	**489.58**	**°R**		
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**		
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)					
Not Insulated	Wv	1.422E-05			
Partially Insulated	Wv	1.425E-05			
Fully Insulated, unheated	Wv	1.379E-05			
Fully Insulated, heated	Wv	1.344E-04			

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**3.76**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.029	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**3.76**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.029	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.32**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.32**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	866,364	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0023	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0293**	**per day**
Average Daily Vapor Temperature Range	ΔTv	14.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0006	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0023	psia
Average Daily Liquid Surface Temperature	TLA	490.51	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0023	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00062**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00267	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00205	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.10	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	486.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00057**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00264	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0020791	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	493.84	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	487.34	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr:
Product	biodiesel
Total HAP Emissions =	**16.083**

Eq. 40-2 $L_T = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0	0.000	0.000	114.23	32	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	16.0833	3.761	12.322	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 $y_i = P_i / PVA$

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	**0**
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.00E+00	0.002	**0.00E+00**
cumene	0.00E+00	0.002	**0.00E+00**
methanol	2.34E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8475
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4915
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2419
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1253
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0347
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0300
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0147
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5614

FRT TANK EMISSION CALCULATION

Tank No.	33		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	
Total Losses, unheaded (Eq.1-1: LT = LS+LW)	**LT**	**571.93**	lb/year
Time Period		**Annual**	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**80,123,668**	gal/yr
Turnovers	N	**20.30**	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		Red, primer	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005628014	
Partially Insulated	P_{VA}	0.005688417	
Fully Insulated, unheated	P_{VA}	0.004910539	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	511.39	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.42**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR	**TLA**	**515.74**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**511.4**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**518.71**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**520.09**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**511.39**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.240E-05	
Partially Insulated	Wv	3.266E-05	
Fully Insulated, unheated	Wv	2.867E-05	
Fully Insulated, heated	Wv	1.344E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**224.99**	lb/yr
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	365	days/year
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**224.99**	lb/yr
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	365	days/year
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**346.95**	lb/yr
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,709,864	ft3/yr
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**346.95**	lb/yr
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,709,864	ft3/yr
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0656**	**per day**
Average Daily Vapor Temperature Range	ΔTv	33.70	°R
Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Average Daily Liquid Surface Temperature	TLA	515.42	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Temperature Range (ΔTv)			
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**33.70**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**31.92**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00321**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00743	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00422	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	523.85	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00306**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00740	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0043363	psia
Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0	TLX	523.72	°R
Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.	TLN	507.76	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**571.933**

Eq. 40-2 $L_V = \Sigma(L_{Vi})$

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Vi} **(lb/yr)**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	571.9330	32.04	32	1.00E+00	5.63E-03	0.006	**1.00E+00**

Liquid Mole Fraction

Eq. 40-4 xi = (ZLiMiL)/Mi

Component Vapor Pressure

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_i	M_L	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7105
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0396
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5269
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2898
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0893
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0777
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0020
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0407
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2923

Monthly Calculations - JANUARY

Tank No.	33		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**15.59**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**15.59**	lb/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002015063	
Partially Insulated	P_{VA}	0.002025981	
Fully Insulated, unheated	P_{VA}	0.001881227	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	484.69	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**486.65**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**484.7**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**484.69**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.233E-05	
Partially Insulated	Wv	1.238E-05	
Fully Insulated, unheated	Wv	1.159E-05	
Fully Insulated, heated	Wv	1.344E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.58**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**4.58**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.00**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.00**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0412**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.51	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0412**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.01**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.52**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00076**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00243	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00167	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00071**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00241	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0016994	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	491.28	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	482.02	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**15.589**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	Standing$_i$ lb/yr	Working$_i$ lb/yr	M_i	M_v	Z_{Vi}
hexane	0.000	0.000	0.000	86.18	32	0.00000
benzene	0.000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0.000	0.000	0.000	114.23	32	0
toluene	0.000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.000	0.000	0.000	106.17	32	0.00000
xylenes	0.000	0.000	0.000	106.17	32	0.00000
naphthalene	0.000	0.000	0.000	128.17	32	0.00E+00
cumene	0.000	0.000	0.000	120.19	32	0.00E+00
methanol	15.589	4.585	11.004	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	**0**
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.00E+00	0.002	**0.00E+00**
cumene	0.00E+00	0.002	**0.00E+00**
methanol	1.00E+00	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4318
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2115
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1084
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0295
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0254
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4865

Monthly Calculations - FEBRUARY

Tank No.	33		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**18.73**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**18.73**	lb/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**22.05**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002350191	
Partially Insulated	P_{VA}	0.002368781	
Fully Insulated, unheated	P_{VA}	0.002125695	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	487.93	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**490.84**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**487.9**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**487.93**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.424E-05	
Partially Insulated	Wv	1.432E-05	
Fully Insulated, unheated	Wv	1.301E-05	
Fully Insulated, heated	Wv	1.344E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**6.02**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**6.02**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.71**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.71**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0519**	**per day**
Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	490.63	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0519**	**per day**
Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Average Daily Liquid Surface Temperature	TLA	490.63	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**25.40**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.80**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00111**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00296	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00185	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00105**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00294	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0018959	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	496.79	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	484.89	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**18.728**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	Standing$_i$ lb/yr	Working$_i$ lb/yr	M_i	M_v	Z_{Vi}
hexane	0.0000	0.000	0.000	86.18	32	0.00000
benzene	0.0000	0.000	0.000	78.11	32	0.00000
2,2,4 TMP	0	0.000	0.000	114.23	32	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000
xylenes	0.0000	0.000	0.000	106.17	32	0.00000
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00
methanol	18.7277	6.020	12.708	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.002	-
benzene	0.000000	0.002	-
2,2,4 TMP	0.000000	0.002	**0**
toluene	0.000000	0.002	-
ethylbenzene	0.000000	0.002	-
xylenes	0.000000	0.002	-
naphthalene	0.00E+00	0.002	**0.00E+00**
cumene	0.00E+00	0.002	**0.00E+00**
methanol	2.35E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4933
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2426
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1258
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0349
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0301
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5637

Monthly Calculations - MARCH

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**11.85**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**30.25**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**30.25**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Time Period		**March**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_v$	**Ls**	**11.85**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.40**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00002	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**19.91**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.40**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0638**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Not Insulated	P_{VA}	0.003484427		Average Daily Liquid Surface Temperature	TLA	501.51	°R
Partially Insulated	P_{VA}	0.003521114		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.003048229					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0638**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R	Average Daily Vapor Temperature Range	ΔTv	31.91	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	497.76	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	501.51	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.4	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**31.91**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.17**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**501.80**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**497.8**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00199**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00460	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00261	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	509.48	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Fully Insulated; unheated Tv = TB	**Tv**	**497.76**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00189**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00458	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0026857	psia
Not Insulated	Wv	2.062E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	509.35	°R
Partially Insulated	Wv	2.078E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	494.26	°R
Fully Insulated, unheated	Wv	1.828E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**30.254**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.003	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	30.2544	11.852	18.402	32.04	32	1.00E+00	3.48E-03	0.003	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6919
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3451
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1837
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0535
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0463
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8206

Monthly Calculations - APRIL

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**23.26**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**53.22**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**53.22**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Time Period		**April**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_v$	**Ls**	**23.26**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**29.96**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**20.58**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**29.96**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0796**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Not Insulated	P_{VA}	0.005855374		Average Daily Liquid Surface Temperature	TLA	516.61	°R
Partially Insulated	P_{VA}	0.00593478		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.004927826					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0796**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R	Average Daily Vapor Temperature Range	ΔTv	41.00	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	511.49	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	516.61	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	20.1	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**41.00**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**38.99**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**516.61**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**517.01**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**511.5**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00406**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00819	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00413	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**520.78**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	526.86	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.53**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Fully Insulated; unheated Tv = TB	**Tv**	**511.49**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00390**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00816	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0042622	psia
Not Insulated	Wv	3.357E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	526.76	°R
Partially Insulated	Wv	3.391E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.26	°R
Fully Insulated, unheated	Wv	2.877E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**53.217**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	53.2168	23.256	29.961	32.04	32	1.00E+00	5.86E-03	0.006	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0749
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5455
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3008
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0931
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0811
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0021
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.3415

Monthly Calculations - MAY

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**37.91**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**81.09**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**81.09**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Time Period		**May**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**37.91**	lb/month
Ideal Gas Constant	R	10.73	plai ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.18**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00005	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**19.91**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.18**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0875**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Not Insulated	P_{VA}	0.008643068		Average Daily Liquid Surface Temperature	TLA	528.54	°R
Partially Insulated	P_{VA}	0.008773316		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.007134727					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**517.90**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0875**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R	Average Daily Vapor Temperature Range	ΔTv	46.00	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	522.60	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	528.54	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**46.00**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**43.90**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**528.54**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**529.01**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**522.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00643**	psia
				Vapor pressure at ave, daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01237	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00594	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.39**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	540.04	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.43**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Fully Insulated; unheated Tv = TB	**Tv**	**522.60**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00621**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01235	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0061410	psia
Not Insulated	Wv	4.838E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.99	°R
Partially Insulated	Wv	4.892E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	518.04	°R
Fully Insulated, unheated	WV	4.076E-05					
Fully Insulated, heated	WV	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**81.089**

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
							Vapor Weight Concentrations		Vapor Mole Fraction
							Eq. 40-6 ZVi = yiMi / MV		Eq. 40-5 yi = Pi / PVA
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	81.0886	37.909	43.179	32.04	32	1.00E+00	8.64E-03	0.009	**1.00E+00**

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.4901
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7659
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4337
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1404
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1226
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0035
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.9347

Monthly Calculations - JUNE

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**49.72**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**108.06**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**108.06**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Time Period		**June**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**49.72**	lb/month
Ideal Gas Constant	R	10.73	plai ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**58.34**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00007	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**20.58**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**58.34**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0881**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Not Insulated	P_{VA}	0.011908818		Average Daily Liquid Surface Temperature	TLA	538.79	°R
Partially Insulated	P_{VA}	0.012092866		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.009781779					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**527.45**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0881**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R	Average Daily Vapor Temperature Range	ΔTv	47.14	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	532.45	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	538.79	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**47.14**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.17**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.79**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**539.29**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**532.5**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00874**	psia
				Vapor pressure at ave, daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01697	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00823	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**543.96**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	550.58	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.13**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Fully Insulated; unheated Tv = TB	**Tv**	**532.45**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00848**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01697	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0084939	psia
Not Insulated	Wv	6.537E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.58	°R
Partially Insulated	Wv	6.611E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	528.00	°R
Fully Insulated, unheated	WV	5.485E-05					
Fully Insulated, heated	WV	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**108.055**

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
							Vapor Weight Concentrations		Vapor Mole Fraction
							Eq. 40-6 ZVi = yiMi / MV		Eq. 40-5 yi = Pi / PVA
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	108.0555	49.717	58.339	32.04	32	1.00E+00	1.19E-02	0.012	**1.00E+00**

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.9450
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0102
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5845
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1962
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1718
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0055
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.6110

Monthly Calculations - JULY

Tank No.		33		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**122.65**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**122.65**	lb/month	
	Time Period	**July**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,676,972**	gal/month	
Turnovers	N	**19.91**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.013458315		
Partially Insulated	P_{VA}	0.013665337		
Fully Insulated, unheated	P_{VA}	0.011064547		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**531.35**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	536.40	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**542.81**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**543.31**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**536.4**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**548.03**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**550.22**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**536.40**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	7.332E-05		
Partially Insulated	Wv	7.415E-05		
Fully Insulated, unheated	Wv	6.159E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**57.21**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**57.21**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.98	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.44**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00007	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.44**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0876**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Average Daily Liquid Surface Temperature	TLA	542.81	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00974**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01908	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00935	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00945**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01910	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0096413	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	554.63	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	531.99	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**122.653**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Eq. 40-6 ZVi = yiMi / MV — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.013	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.013	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.013	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.013	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.013	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.013	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.013	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.013	**0.00E+00**
methanol	122.6532	57.213	65.440	32.04	32	1.00E+00	1.35E-02	0.013	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.1519
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.1220
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6547
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2227
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1952
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0064
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.9263

Monthly Calculations - AUGUST

Tank No.		33		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**109.36**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**109.36**	lb/month	
	Time Period	**August**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,676,972**	gal/month	
Turnovers	N	**19.91**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.01242878		
Partially Insulated	P_{VA}	0.012597769		
Fully Insulated, unheated	P_{VA}	0.010454313		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**530.15**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	534.58	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**540.19**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**540.63**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**534.6**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**544.76**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.68**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**534.58**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	6.812E-05		
Partially Insulated	Wv	6.880E-05		
Fully Insulated, unheated	Wv	5.839E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.56**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**48.56**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.98	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**60.80**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00007	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**60.80**	lb/month
Roof Type:			
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892.489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0800**	**per day**
Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Average Daily Liquid Surface Temperature	TLA	540.19	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00823**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01713	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00890	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00795**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01711	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0091640	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.87	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	530.38	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**109.359**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Eq. 40-6 ZVi = yiMi / MV — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	109.3588	48.563	60.796	32.04	32	1.00E+00	1.24E-02	0.012	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.0150
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0480
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6082
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2051
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1796
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0058
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.7172

Monthly Calculations - SEPTEMBER

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**30.73**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**75.94**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**75.94**	lb/month	Stock Vapor Density	Wv	0.0001	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Time Period		**September**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**30.73**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.22**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00005	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**20.58**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.22**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0700**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Not Insulated	P_{VA}	0.009054711		Average Daily Liquid Surface Temperature	TLA	530.01	°R
Partially Insulated	P_{VA}	0.009155981		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.00785475					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0700**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R	Average Daily Vapor Temperature Range	ΔTv	36.91	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	525.56	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	530.01	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**36.91**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**34.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.01**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**530.36**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**525.6**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00535**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01207	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00672	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.63**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	539.23	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.15**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	520.78	°R
Fully Insulated; unheated Tv = TB	**Tv**	**525.56**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00511**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01202	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0069091	psia
Not Insulated	Wv	5.066E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.10	°R
Partially Insulated	Wv	5.108E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	521.61	°R
Fully Insulated, unheated	Wv	4.462E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**75.944**

Eq. 40-2 $L_{TI} = Z_{VI}(L_T)$

Individual HAPS	L_{TI} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_I	M_V	Z_{VI}	$P_I = P_{VA}(x_I)$	P_{VA}	y_I
				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	75.9445	30.729	45.215	32.04	32	1.00E+00	9.05E-03	0.009	**1.00E+00**

Individual HAPS	Z_{LI}	M_L	M_I	X_I	A	B	C	P_{VAI}
	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.5491
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7974
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4529
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1474
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1288
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0038
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.0210

Monthly Calculations - OCTOBER

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**16.24**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**44.95**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**44.95**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Time Period		**October**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_s * W_v$	**Ls**	**16.24**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.71**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**19.91**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.71**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0561**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Not Insulated	P_{VA}	0.005576566		Average Daily Liquid Surface Temperature	TLA	515.15	°R
Partially Insulated	P_{VA}	0.005621296		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.005036616					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0561**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R	Average Daily Vapor Temperature Range	ΔTv	28.83	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	512.13	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	515.15	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**28.83**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**26.98**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.15**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**515.39**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**512.1**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00272**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00708	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00436	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**517.61**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	522.35	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**518.64**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	507.94	°R
Fully Insulated; unheated Tv = TB	**Tv**	**512.13**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00256**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00703	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0044701	psia
Not Insulated	Wv	3.217E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	522.13	°R
Partially Insulated	Wv	3.236E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	508.64	°R
Fully Insulated, unheated	Wv	2.936E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**44.948**

Eq. 40-2 $L_{TI} = Z_{VI}(L_T)$

Individual HAPS	L_{TI} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	M_I	M_V	Z_{VI}	$P_I = P_{VA}(x_I)$	P_{VA}	y_I
				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	44.9481	16.239	28.709	32.04	32	1.00E+00	5.58E-03	0.006	**1.00E+00**

Individual HAPS	Z_{LI}	M_L	M_I	X_I	A	B	C	P_{VAI}
	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0315
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5226
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2872
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0884
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0019
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2812

Monthly Calculations - NOVEMBER

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**7.67**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**27.11**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**27.11**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Time Period		**November**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_v$	**Ls**	**7.67**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.44**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00002	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**20.58**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.44**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0403**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Not Insulated	P_{VA}	0.003681787		Average Daily Liquid Surface Temperature	TLA	503.07	°R
Partially Insulated	P_{VA}	0.003700512		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.003451775					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0403**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R	Average Daily Vapor Temperature Range	ΔTv	20.25	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	501.24	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	503.07	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	15.2	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.25**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.73**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**503.07**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**503.21**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**501.2**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00132**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00439	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00308	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.56**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	508.13	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.18**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Fully Insulated; unheated Tv = TB	**Tv**	**501.24**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00122**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00436	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.00331337	psia
Not Insulated	Wv	2.179E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	507.90	°R
Partially Insulated	Wv	2.187E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	498.53	°R
Fully Insulated, unheated	Wv	2.056E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr:**
Product	biodiesel
Total HAP Emissions =	**27.112**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.004	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.004	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.004	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.004	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.004	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.004	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
methanol	27.1122	7.667	19.445	32.04	32	1.00E+00	3.68E-03	0.004	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.7252
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3624
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1936
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0567
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0492
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0011
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8647

Monthly Calculations - DECEMBER

Tank No.	33		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.60**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**17.70**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**17.70**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Time Period		**December**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_v$	**Ls**	**4.60**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.10**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,676,972**	gal/month				
Turnovers	N	**19.91**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.10**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0347**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002421037		Average Daily Liquid Surface Temperature	TLA	491.43	°R
Partially Insulated	P_{VA}	0.00243123		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002295179					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0347**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R	Average Daily Vapor Temperature Range	ΔTv	17.05	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.99	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	491.43	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	13.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**17.05**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.70**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**491.43**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**491.55**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**490.0**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00283	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00207	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.61**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	495.69	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.10**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Fully Insulated; unheated Tv = TB	**Tv**	**489.99**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00281	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0021013	psia
Not Insulated	Wv	1.467E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	495.47	°R
Partially Insulated	Wv	1.472E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	487.62	°R
Fully Insulated, unheated	Wv	1.399E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr:**
Product	biodiesel
Total HAP Emissions =	**17.698**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV: M_i	M_V	Z_{Vi}	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	17.6982	4.602	13.096	32.04	32	1.00E+00	2.42E-03	0.002	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiML)/Mi: Z_{Li}	M_L	M_i	X_i	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))): A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.5061
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2494
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1295
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0360
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0311
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.	33		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**285.09**	lb/year	Vapor Space Volume
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**2,198.32**	lb/year	Stock Vapor Density
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5
	Time Period	**Annual**		Vented Vapor Saturation Factor
Nearest US Location		Albany, NY		Constant; Number of Daily Events in a Year
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day	
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5
Product Information				Diameter
Product Type		Biodiesel		Vapor Space Outage
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00		
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)
				Working Loss Turnover Factor
Tank design data				Working Loss Product Factor
Shell height	Hs	**45.00**	ft	Stock Vapor Density
Diameter	D	**125.00**	ft	Vent Setting Correction Factor
Throughput	Q	**80,123,668**	gal/yr	
Turnovers	N	**20.30**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB
Roof Type:		Cone		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		Fully Insulated		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H
Tank Construction (pick from drop down list)		Riveted		Vapor Pressure at Avg Daily Liq Surface Temp
Tank Shell Color (pick from drop down list)		White		Vapor Space Outage
Tank Shell Condition (pick from drop down list)		Average		
Tank Interior Condition (pick from drop down list)		Light Rust		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**		Average Daily Vapor Temperature Range
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Average Daily Vapor Pressure Range
	PBV	-0.03		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp
Not Insulated	P_{VA}	0.00471666		Average Daily Liquid Surface Temperature
Partially Insulated	P_{VA}	0.004730962		Atmospheric Pressure
Fully Insulated, unheated	P_{VA}	0.004538785		
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA
				Vapor Pressure at Avg Daily Liq Surface Temp
				Vapor Space Outage
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R	Average Daily Vapor Temperature Range
				Average Daily Vapor Pressure Range
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	509.09	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)
				Vapor Pressure at Avg Daily Liq Surface Temp
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**510.21**	°R	**Fully Insulated, not heated**
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR	**TLA**	**510.29**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**509.1**	°R	**Average Daily Vapor Pressure Range (ΔPv)**
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**511.12**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**511.50**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV
Fully Insulated; unheated Tv = TB	**Tv**	**509.09**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us
Not Insulated	Wv	2.755E-05		Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0
Partially Insulated	Wv	2.762E-05		Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.
Fully Insulated, unheated	Wv	2.662E-05		
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us
				Maximum heated bulk liquid temperature (from process setpoints)
				Minimum heated bulk liquid temperature (from process setpoints)
				Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo
				Tank diameter
				Vapor Space Outage; see Equation 1-16
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)
				Tank shell height
				Liquid Height
				Roof Outage (for a Cone Roof vs Dome Roof)
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)
				Tank cone roof slope (If unknown, use 0.0625)
				Tank shell radius
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))
				Tank shell radius

Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/yr
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year		365	days/year
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**758.53**	lb/yr
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year		365	days/year
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**285.09**	lb/yr
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,709.864	ft3/yr
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1,439.79**	lb/yr
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,709.864	ft3/yr
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.8	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**18.36**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**16.58**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00149**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00551	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00403	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	514.80	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.62	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00134**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00545	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0041008	psia
Average daily maximum liquid surface temperature, deq R (TLX = TLA + 0	TLX	514.44	°R
Average daily minimum liquid surface temperature, deq R (TLN = TLA - 0.	TLN	506.15	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)^(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**285.092**
Eq. 40-2 $L_T = \Sigma_i(L_{Ti})$	

Individual HAPS	**L_{Ti} (lb/yr)**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV **M_i**	**M_v**	**Z_{Vi}**	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA **$P_i = P_{VA}(X_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	114.23	32	0	0.000000	0.005	**0**
toluene	0.0000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
methanol	285.0923	32.04	32	1.00E+00	4.54E-03	0.005	**1.00E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiMLi/Mi **Z_{Li}**	**M_L**	**M_i**	**X_i**	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))) **A**	**B**	**C**	**P_{VAi}**
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.4419
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.8666
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4361
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2363
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0710
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0617
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0015
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0318
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.0545

Speciation, Heated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**2198.323**
Eq. 40-2 $L_T = \Sigma_i(L_{Ti})$	

Individual HAPS	**L_{Ti} (lb/yr)**	**Vapor Weight Concentrations** Eq. 40-6 ZVi = yiMi / MV **M_i**	**M_v**	**Z_{Vi}**	**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA **$P_i = P_{VA}(X_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	**0**
methanol	2198.3227	32.04	32	1.00E+00	2.54E-02	0.025	**1.0E+00**

Individual HAPS	**Liquid Mole Fraction** Eq. 40-4 xi = (ZLiMLi/Mi **Z_{Li}**	**M_L**	**M_i**	**X_i**	**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C))) **A**	**B**	**C**	**P_{VAi}**
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - JANUARY

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**9.96**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**184.41**	lb/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.001843621	
Partially Insulated	P_{VA}	0.001846418	
Fully Insulated, unheated	P_{VA}	0.001808517	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	483.65	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**484.15**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**484.19**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**483.6**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**484.57**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**484.74**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**483.65**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.136E-05	
Partially Insulated	Wv	1.137E-05	
Fully Insulated, unheated	Wv	1.116E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**9.96**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0018	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0018	psia
Average Daily Liquid Surface Temperature	TLA	483.65	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**13.09**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**11.60**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00046**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00209	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00163	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	487.43	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	480.88	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00041**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00206	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0016527	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	487.09	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	481.29	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	9.964
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0.000	0.000	0.000	114.23	32	0	0.000000	0.002	0
toluene	0.000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	9.964	0.000	9.964	32.04	32	1.00E+00	1.81E-03	0.002	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.6875
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.3932
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.1918
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.0976
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0262
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0226
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0004
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0108
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4385

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	184.406
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - FEBRUARY

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**10.99**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**178.17**	lb/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**22.05**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002063766	
Partially Insulated	P_{VA}	0.002068355	
Fully Insulated, unheated	P_{VA}	0.002006428	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	486.39	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**487.14**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**487.20**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**486.4**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.75**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.01**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**486.39**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.263E-05	
Partially Insulated	Wv	1.265E-05	
Fully Insulated, unheated	Wv	1.232E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**58.19**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**10.99**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.39	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**15.15**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**13.55**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00059**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00238	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00179	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	490.93	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00053**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0018199	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	490.59	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	483.81	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	10.992
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.002	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	10.9924	0.000	10.992	32.04	32	1.00E+00	2.01E-03	0.002	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7481
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4302
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2107
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1080
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0293
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0253
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4845

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	178.171
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	178.1713	58.189	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - MARCH

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**15.17**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**184.41**	lb/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002930207	
Partially Insulated	P_{VA}	0.002938916	
Fully Insulated, unheated	P_{VA}	0.002821865	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	495.62	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**496.66**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**496.75**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**495.6**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**497.51**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**497.87**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**495.62**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.759E-05	
Partially Insulated	Wv	1.762E-05	
Fully Insulated, unheated	Wv	1.700E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**15.17**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0028	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0028	psia
Average Daily Liquid Surface Temperature	TLA	495.62	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**17.66**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.92**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00094**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00343	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00249	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	501.08	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.25	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00085**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00339	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0025427	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	500.73	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	492.77	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**15.172**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.003	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	15.1719	0.000	15.172	32.04	32	1.00E+00	2.82E-03	0.003	**1.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.9856
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.5775
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2860
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1501
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0426
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0368
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0007
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0183
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.6713

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**184.406**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - APRIL

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**23.37**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**182.33**	lb/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**20.58**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.004682427	
Partially Insulated	P_{VA}	0.004700449	
Fully Insulated, unheated	P_{VA}	0.004459385	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	508.57	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**509.99**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**510.11**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**508.6**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**511.15**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**511.64**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**508.57**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.735E-05	
Partially Insulated	Wv	2.743E-05	
Fully Insulated, unheated	Wv	2.618E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**23.37**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
Average Daily Liquid Surface Temperature	TLA	508.57	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**21.55**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**19.54**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00173**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00562	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00389	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	515.38	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	504.61	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00158**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00555	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0039702	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	514.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	505.22	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**23.366**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.004	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.004	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.004	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.004	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.004	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.004	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
methanol	23.3656	0.000	23.366	32.04	32	1.00E+00	4.46E-03	0.004	**1.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.4218
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.8537
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4293
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2324
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0697
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0605
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0014
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0312
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.0371

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**182.328**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations			Vapor Mole Fraction		
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	182.3277	62.345	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - MAY

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	32.76	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	184.41	lb/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.006740064	
Partially Insulated	P_{VA}	0.00676898	
Fully Insulated, unheated	P_{VA}	0.006383119	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	519.20	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**520.86**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**520.99**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**519.2**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**522.20**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.77**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**519.20**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.854E-05	
Partially Insulated	Wv	3.866E-05	
Fully Insulated, unheated	Wv	3.671E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**32.76**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00004	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0064	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0064	psia
Average Daily Liquid Surface Temperature	TLA	519.20	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**23.40**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**21.30**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00260**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00815	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00555	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.71	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	515.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00237**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00805	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0056737	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	526.31	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	515.66	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**32.760**

Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	32.7604	0.000	32.760	32.04	32	1.00E+00	6.38E-03	0.006	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.8895
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.1559
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5882
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3263
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1021
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0889
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0023
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0470
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.4552

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**184.406**

Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - JUNE

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	43.97	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	182.33	lb/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**20.58**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009226703	
Partially Insulated	P_{VA}	0.00926735	
Fully Insulated, unheated	P_{VA}	0.008725276	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	528.84	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.60**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**530.74**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**528.8**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**532.04**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**532.64**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**528.84**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.178E-05	
Partially Insulated	Wv	5.195E-05	
Fully Insulated, unheated	Wv	4.926E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.97**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0087	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0087	psia
Average Daily Liquid Surface Temperature	TLA	528.84	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**23.05**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**21.09**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00338**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01105	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00767	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	536.36	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	524.84	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00310**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01093	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0078314	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	536.01	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	525.47	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**43.965**

Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	43.9653	0.000	43.965	32.04	32	1.00E+00	8.73E-03	0.009	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.4163
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.5019
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7722
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4375
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1418
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1238
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0036
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0670
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.9520

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**182.328**

Eq. 40-2 $L_{Ti}=Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	182.3277	62.345	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - JULY

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**49.39**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**184.41**	lb/month
Time Period		**July**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.010439464	
Partially Insulated	P_{VA}	0.010485243	
Fully Insulated, unheated	P_{VA}	0.009874636	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**531.35**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	532.75	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**534.53**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**534.67**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**532.8**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**535.98**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**536.59**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**532.75**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.815E-05	
Partially Insulated	Wv	5.834E-05	
Fully Insulated, unheated	Wv	5.534E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**49.39**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0099	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0099	psia
Average Daily Liquid Surface Temperature	TLA	532.75	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**22.87**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**20.94**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00373**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01245	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00872	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.25	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	528.81	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00343**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01232	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0088929	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.91	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	529.44	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**49.391**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.010	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.010	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.010	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.010	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.010	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.010	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.010	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.010	**0.00E+00**
methanol	49.3912	0.000	49.391	32.04	32	1.00E+00	9.87E-03	0.010	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.6620
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.6650
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.8595
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4911
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1614
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1411
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0042
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0770
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.1918

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**184.406**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - AUGUST

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**47.42**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**184.41**	lb/month
Time Period		**August**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0099318	
Partially Insulated	P_{VA}	0.009970175	
Fully Insulated, unheated	P_{VA}	0.00945685	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**530.15**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	531.38	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**532.94**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**533.06**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**531.4**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**534.21**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**534.74**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**531.38**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.551E-05	
Partially Insulated	Wv	5.567E-05	
Fully Insulated, unheated	Wv	5.314E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**47.42**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0095	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0095	psia
Average Daily Liquid Surface Temperature	TLA	531.38	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**21.57**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**19.66**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00337**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01174	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00837	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	538.33	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.55	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00308**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01161	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0085344	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	537.98	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	528.15	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**47.424**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	47.4238	0.000	47.424	32.04	32	1.00E+00	9.46E-03	0.009	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.5735
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.6062
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.8280
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4717
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1543
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1348
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0040
naphthalene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0734
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.1049

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**184.406**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - SEPTEMBER

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	36.86	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	182.33	lb/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**20.58**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.007531496	
Partially Insulated	P_{VA}	0.007555326	
Fully Insulated, unheated	P_{VA}	0.007235334	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	523.03	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**524.26**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**524.36**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**523.0**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**525.27**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**525.69**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**523.03**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	4.281E-05	
Partially Insulated	Wv	4.291E-05	
Fully Insulated, unheated	Wv	4.130E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**36.86**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00004	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0072	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0072	psia
Average Daily Liquid Surface Temperature	TLA	523.03	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.01**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.08**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00245**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00884	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00639	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	529.26	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	519.26	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00222**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00874	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0065179	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	528.88	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	519.84	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**36.863**

Eq. 40-2 L_{Ti} = $Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.007	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.007	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.007	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.007	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.007	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.007	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.007	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.007	**0.00E+00**
methanol	36.8630	0.000	36.863	32.04	32	1.00E+00	7.24E-03	0.007	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.0858
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.2842
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.6562
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3671
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1165
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1016
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0028
naphthalene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0542
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.6373

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**182.328**

Eq. 40-2 L_{Ti} = $Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	182.3277	62.345	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - OCTOBER

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	24.80	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	184.41	lb/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.00488774	
Partially Insulated	P_{VA}	0.004898769	
Fully Insulated, unheated	P_{VA}	0.004749929	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	510.41	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**511.25**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**511.32**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**510.4**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**511.93**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**512.22**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**510.41**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.851E-05	
Partially Insulated	Wv	2.856E-05	
Fully Insulated, unheated	Wv	2.779E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**24.80**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0047	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0047	psia
Average Daily Liquid Surface Temperature	TLA	510.41	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**17.36**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.51**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00145**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00566	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00421	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	515.59	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.91	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00130**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00559	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0042882	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	515.19	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.44	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**24.798**

Eq. 40-2 L_{Ti} = $Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.005	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
methanol	24.7983	0.000	24.798	32.04	32	1.00E+00	4.75E-03	0.005	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.4950
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.9006
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4539
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2468
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0745
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0648
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0016
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0335
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.1009

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**184.406**

Eq. 40-2 L_{Ti} = $Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - NOVEMBER

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**17.72**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**182.33**	lb/month
Time Period		**November**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**20.58**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.003386975	
Partially Insulated	P_{VA}	0.003391797	
Fully Insulated, unheated	P_{VA}	0.003326417	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	500.20	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**500.71**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**500.75**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**500.2**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.12**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.30**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**500.20**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.018E-05	
Partially Insulated	Wv	2.020E-05	
Fully Insulated, unheated	Wv	1.986E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**17.72**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0033	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0033	psia
Average Daily Liquid Surface Temperature	TLA	500.20	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**13.31**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**11.79**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00080**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00381	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00301	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔT\	TLX	504.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	497.38	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00071**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00376	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0030527	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	503.70	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	497.80	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**17.721**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.003	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	17.7210	0.000	17.721	32.04	32	1.00E+00	3.33E-03	0.003	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1249
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6650
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3312
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1757
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0509
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0441
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0009
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0222
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.7852

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**182.328**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	182.3277	62.345	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - DECEMBER

Tank No.	33		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**12.13**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**184.41**	lb/month
Time Period		**December**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,676,972**	gal/month
Turnovers	N	**19.91**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002259496	
Partially Insulated	P_{VA}	0.002262155	
Fully Insulated, unheated	P_{VA}	0.002226056	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.17	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**489.57**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	**TLA**	**489.60**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**489.2**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**489.89**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.03**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**489.17**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.377E-05	
Partially Insulated	Wv	1.378E-05	
Fully Insulated, unheated	Wv	1.359E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.13**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**119.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	892,489	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0022	psia
Average Daily Liquid Surface Temperature	TLA	489.17	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**11.56**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**10.21**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00049**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00251	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00203	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔT\	TLX	492.46	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	486.68	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00043**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00249	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0020564	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	492.15	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	487.05	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**12.126**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0.000	0.000	114.23	32	0	0.000000	0.002	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	12.1265	0.000	12.126	32.04	32	1.00E+00	2.23E-03	0.002	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8138
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4707
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2313
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1194
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0329
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0284
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0139
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5352

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**184.406**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.000	0.000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.000	0.000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.000	0.000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.000	0.000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.000	0.000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.000	0.000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.000	0.000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	184.4058	64.423	119.983	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

FRT TANK EMISSION CALCULATION

Tank No.	30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**224.99**	lb/yr
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**574.43**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
				Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
	Time Period	**Annual**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		Albany, NY		Constant; Number of Daily Events in a Year	365	365	days/year
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**224.99**	lb/yr
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.066	per day
Product Information				Diameter	D	125.0000	ft
Product Type		Biodiesel		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.99	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	365	days/year
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**349.44**	lb/yr
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**80,699,334**	gal/yr				
Turnovers	N	**20.44**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**349.44**	lb/yr
Roof Type:		Cone		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		Not Insulated		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Tank Construction (pick from drop down list)		Riveted		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Tank Shell Color (pick from drop down list)		Red, primer		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(**	**KE**	**0.0656**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	33.70	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
	PBV	-0.03		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Not Insulated	P_{VA}	0.005628014		Average Daily Liquid Surface Temperature	TLA	515.42	°R
Partially Insulated	P_{VA}	0.005688417		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.004910539					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB/(**	**KE**	**0.0656**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R	Average Daily Vapor Temperature Range	ΔTv	33.70	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0032	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	511.39	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	515.42	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.8	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**33.70**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**31.92**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.42**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**515.74**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**511.4**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00321**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00743	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00422	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**518.71**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	523.85	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**520.09**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.00	°R
Fully Insulated; unheated Tv = TB	**Tv**	**511.39**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00306**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00740	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0043363	psia
Not Insulated	Wv	3.240E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	523.72	°R
Partially Insulated	Wv	3.266E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.76	°R
Fully Insulated, unheated	Wv	2.867E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R

Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**574.426**
Eq. 40-2 $L_T = \sum_{i=1}^{n} L_{Ti}$	

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Individual HAPS	**L_{Ti} (lb/yr)**	**M_i**	**M_v**	**Z_{Vi}**
hexane	0.0000	86.18	32	0.00000
benzene	0.0000	78.11	32	0.00000
2,2,4 TMP	0	114.23	32	0
toluene	0.0000	92.14	32	0.00000
ethylbenzene	0.0000	106.17	32	0.00000
xylenes	0.0000	106.17	32	0.00000
naphthalene	0.0000	128.17	32	0.00E+00
cumene	0.0000	120.19	32	0.00E+00
methanol	574.4257	32.04	32	1.00E+00

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Individual HAPS	**$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.000000	0.006	-
benzene	0.000000	0.006	-
2,2,4 TMP	0.000000	0.006	0
toluene	0.000000	0.006	-
ethylbenzene	0.000000	0.006	-
xylenes	0.000000	0.006	-
naphthalene	0.00E+00	0.006	**0.00E+00**
cumene	0.00E+00	0.006	**0.00E+00**
methanol	5.63E-03	0.006	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**
hexane	0.0000000	277.4	86.18	0.00000
benzene	0.0000000	277.4	78.11	0.00000
2,2,4 TMP	0.0000000	277.4	114.23	0.00000
toluene	0.0000000	277.4	92.14	0.00000
ethylbenzene	0.0000000	277.4	106.17	0.00000
xylenes	0.0000000	277.4	106.17	0.00000
naphthalene	0.0000000	277.4	128.17	0.00000
cumene	0.0000000	277.4	120.19	0.00000
methanol	0.0020000	277.4	32.04	0.01732

Component Vapor Pressure — PVAi=(0.01937)10^(A-(B/(TLA+C)))

Individual HAPS	**A**	**B**	**C**	**P_{VAi}**
hexane	6.878	1171.5	224.37	1.7105
benzene	6.906	1211	220.79	1.0396
2,2,4 TMP	6.812	1257.8	220.74	0.5269
toluene	7.017	1377.6	222.64	0.2898
ethylbenzene	6.95	1419.3	212.61	0.0893
xylenes	7.009	1462.3	215.11	0.0777
naphthalene	7.146	1831.6	211.82	0.0020
cumene	6.929	1455.8	207.2	0.0407
methanol	8.079	1581.3	239.65	1.2923

Monthly Calculations - JANUARY

Tank No.	30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.58**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**15.67**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**15.67**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Time Period		**January**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft²-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_V$	**Ls**	**4.58**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.08**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**11.08**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0412**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.01	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Not Insulated	P_{VA}	0.002015063		Average Daily Liquid Surface Temperature	TLA	486.51	°R
Partially Insulated	P_{VA}	0.002025981		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.001881227					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**483.25**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB/**	**KE**	**0.0412**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R	Average Daily Vapor Temperature Range	ΔTv	20.01	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	484.69	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	486.51	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.01**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.52**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**486.51**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**486.65**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**484.7**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00243	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00167	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**487.99**	°R	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	491.51	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**488.61**	°R	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.50	°R
Fully Insulated; unheated Tv = TB	**Tv**	**484.69**	°R				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00241	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0016994	psia
Not Insulated	Wv	1.233E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	491.28	°R
Partially Insulated	Wv	1.238E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	482.02	°R
Fully Insulated, unheated	Wv	1.159E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**15.668**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Vapor Weight Concentrations — Eq. 40-6 $Zvi = yiMi / MV$

Vapor Mole Fraction — Eq. 40-5 $yi = Pi / PVA$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	15.6676	4.5850	11.0826	32.04	32	1.00E+00	2.02E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 $xi = (ZLiML)/Mi$

Component Vapor Pressure — $PVAi=(0.019337)10^{(A-(B/(TLA+C)))}$

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7507
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4318
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2115
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1084
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0295
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0254
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4865

Monthly Calculations - FEBRUARY

Tank No.	30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**6.02**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**18.82**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**18.82**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Time Period		**February**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	28	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft²-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 $365 * K_E * (\pi/4 * D^2) * H_{VO} * K_S * W_V$	**Ls**	**6.02**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.052	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	28	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.80**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**22.21**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.80**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0519**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	25.40	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002350191		Average Daily Liquid Surface Temperature	TLA	490.63	°R
Partially Insulated	P_{VA}	0.002368781		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002125695					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**485.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB/**	**KE**	**0.0519**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R	Average Daily Vapor Temperature Range	ΔTv	25.40	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0011	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	487.93	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	490.63	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**25.40**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.80**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.63**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**490.84**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**487.9**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00111**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00296	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00185	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.83**	°R	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	496.98	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.75**	°R	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	484.28	°R
Fully Insulated; unheated Tv = TB	**Tv**	**487.93**	°R				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00105**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00294	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0018959	psia
Not Insulated	Wv	1.424E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	496.79	°R
Partially Insulated	Wv	1.432E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	484.89	°R
Fully Insulated, unheated	Wv	1.301E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**18.819**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Vapor Weight Concentrations — Eq. 40-6 $Zvi = yiMi / MV$

Vapor Mole Fraction — Eq. 40-5 $yi = Pi / PVA$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	18.8190	6.0202	12.7988	32.04	32	1.00E+00	2.35E-03	0.002	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 $xi = (ZLiML)/Mi$

Component Vapor Pressure — $PVAi=(0.019337)10^{(A-(B/(TLA+C)))}$

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8504
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4933
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2428
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1258
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0349
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0301
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0148
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5637

Monthly Calculations - MARCH

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**30.39**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**30.39**	lb/month	
Time Period		**March**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.06**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.003484427		
Partially Insulated	P_{VA}	0.003521114		
Fully Insulated, unheated	P_{VA}	0.003048229		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	497.76	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.51**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**501.80**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**497.8**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.57**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.85**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**497.76**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	2.062E-05		
Partially Insulated	Wv	2.078E-05		
Fully Insulated, unheated	Wv	1.828E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**11.85**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**11.85**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.064	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	1.00	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**18.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0638**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0020	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0035	psia
Average Daily Liquid Surface Temperature	TLA	501.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00199**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00460	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00261	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	509.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	493.53	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.17**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00189**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00458	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0026857	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.	TLX	509.35	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	494.26	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**30.387**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	Vapor Weight Concentrations: M_i	M_v	Z_{vi}	Vapor Mole Fraction: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.003	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	30.3866	11.8523	18.5344	32.04	32	1.00E+00	3.48E-03	0.003	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

Individual HAPS	Liquid Mole Fraction: Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C))) A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1675
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6919
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3451
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1837
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0535
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0463
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0234
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8206

Monthly Calculations - APRIL

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**53.43**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**53.43**	lb/month	
Time Period		**April**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.73**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.005855374		
Partially Insulated	P_{VA}	0.00593478		
Fully Insulated, unheated	P_{VA}	0.004927826		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 as	TB	511.49	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**516.61**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**517.01**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**511.5**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**520.78**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**522.53**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**511.49**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	3.357E-05		
Partially Insulated	Wv	3.391E-05		
Fully Insulated, unheated	Wv	2.877E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**23.26**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**23.26**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**30.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**30.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	**KE**	**0.0796**	**per day**
Average Daily Vapor Temperature Range	ΔTv	41.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0041	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0059	psia
Average Daily Liquid Surface Temperature	TLA	516.61	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**41.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**38.99**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00406**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00819	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00413	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.86	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00390**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00816	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0042622	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.	TLX	526.76	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.26	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**53.432**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	Vapor Weight Concentrations: M_i	M_v	Z_{vi}	Vapor Mole Fraction: $P_i = P_{VA}(x_i)$	P_{VA}	y_i
				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	53.4320	23.2558	30.1762	32.04	32	1.00E+00	5.86E-03	0.006	**1.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

Individual HAPS	Liquid Mole Fraction: Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C))) A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.7649
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0749
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5455
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3008
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0931
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0811
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0021
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0426
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.3415

Monthly Calculations - MAY

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**81.40**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**81.40**	lb/month	
Time Period		**May**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.06**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.008643068		
Partially Insulated	P_{VA}	0.008773316		
Fully Insulated, unheated	P_{VA}	0.007134727		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**517.90**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	522.60	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**528.54**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**529.01**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**522.6**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.39**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.43**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**522.60**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	4.838E-05		
Partially Insulated	Wv	4.892E-05		
Fully Insulated, unheated	Wv	4.076E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**37.91**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**37.91**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.087	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.49**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**43.49**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0875**	**per day**
Average Daily Vapor Temperature Range	ΔTv	46.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0064	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0086	psia
Average Daily Liquid Surface Temperature	TLA	528.54	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**46.00**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**43.90**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00643**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01237	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00594	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.04	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	517.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00621**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0061410	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	518.04	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**81.399**

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VAi}(X_i)$	P_{VA}	y_i
						Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV		Vapor Mole Fraction Eq. 40-5 yi ~ Pi / PVA	
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$									
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	81.3988	37.9094	43.4894	32.04	32	1.00E+00	8.64E-03	0.009	**1.00E+00**

Individual HAPS	Liquid Mole Fraction Eq. 40-4 xi ~ (ZLiML)/Mi Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C))) A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.3984
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.4901
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7659
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4337
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1404
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1226
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0035
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0663
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.9347

Monthly Calculations - JUNE

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**108.47**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**108.47**	lb/month	
Time Period		**June**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.73**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.011908818		
Partially Insulated	P_{VA}	0.012092866		
Fully Insulated, unheated	P_{VA}	0.009781779		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**527.45**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	532.45	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.79**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**539.29**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**532.5**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**543.96**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.13**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**532.45**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	6.537E-05		
Partially Insulated	Wv	6.611E-05		
Fully Insulated, unheated	Wv	5.485E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**49.72**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**49.72**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**58.76**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00007	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**58.76**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0000	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0881**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.14	°R
Average Daily Vapor Pressure Range	ΔPv	0.0087	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0119	psia
Average Daily Liquid Surface Temperature	TLA	538.79	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**47.14**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.17**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00874**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01697	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00823	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.00	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00848**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01697	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0084939	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.58	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	528.00	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**108.475**

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VAi}(X_i)$	P_{VA}	y_i
						Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV		Vapor Mole Fraction Eq. 40-5 yi ~ Pi / PVA	
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$									
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.012	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.012	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.012	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.012	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.012	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.012	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.012	**0.00E+00**
methanol	108.4746	49.7168	58.7578	32.04	32	1.00E+00	1.19E-02	0.012	**1.00E+00**

Individual HAPS	Liquid Mole Fraction Eq. 40-4 xi ~ (ZLiML)/Mi Z_{Li}	M_L	M_i	X_i	Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C))) A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.0806
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.9450
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0102
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.5845
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1962
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1718
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0055
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0949
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.6110

Monthly Calculations - JULY

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**123.12**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**123.12**	lb/month	
	Time Period	**July**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.06**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.013458315		
Partially Insulated	P_{VA}	0.013665337		
Fully Insulated, unheated	P_{VA}	0.011064547		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**531.35**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	536.40	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**542.81**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**543.31**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**536.4**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**548.03**	°R	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**550.22**	°R	
Fully Insulated; unheated Tv = TB	**Tv**	**536.40**	°R	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	7.332E-05		
Partially Insulated	Wv	7.415E-05		
Fully Insulated, unheated	Wv	6.159E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**57.21**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**57.21**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.088	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.98	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.91**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00007	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**65.91**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0876**	**per day**
Average Daily Vapor Temperature Range	ΔTv	47.21	°R
Average Daily Vapor Pressure Range	ΔPv	0.0097	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Average Daily Liquid Surface Temperature	TLA	542.81	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0135	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**47.21**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**45.28**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00974**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01908	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00935	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	554.61	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	531.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00945**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01910	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0096413	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	554.63	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	531.99	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**123.123**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000
2,2,4 TMP	0	0	0	114.23	32	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00
methanol	123.1234	57.2135	65.9099	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi ~ Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.013	-
benzene	0.000000	0.013	-
2,2,4 TMP	0.000000	0.013	**0**
toluene	0.000000	0.013	-
ethylbenzene	0.000000	0.013	-
xylenes	0.000000	0.013	-
naphthalene	0.00E+00	0.013	**0.00E+00**
cumene	0.00E+00	0.013	**0.00E+00**
methanol	1.00E+00	0.013	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi ~ (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.3877
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.1519
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.1220
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6547
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2227
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1952
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0064
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.1088
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.9263

Monthly Calculations - AUGUST

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**109.80**	lb/month	
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**109.80**	lb/month	
	Time Period	**August**		
Nearest US Location		**Albany, NY**		
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft²-day	
Absolute Pressure	P_A	14.55	psi	
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	
Product Information				
Product Type		**Biodiesel**		
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	
Average organic liquid density	WL	**7.30**	lb/gal	
Average Reid Vapor Pressure	RVP	**0.00**		
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**		
Vapor Pressure Equation Constant A	A	**12.10**		
Vapor Pressure Equation Constant B	B	**8907.0**	°R	
Tank design data				
Shell height	Hs	**45.00**	ft	
Diameter	D	**125.00**	ft	
Throughput	Q	**6,724,944**	gal/month	
Turnovers	N	**20.06**	per year	
Roof Type:		**Cone**		
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft	
Tank Insulation (pick from drop down list)		**Not Insulated**		
Tank Construction (pick from drop down list)		**Riveted**		
Tank Shell Color (pick from drop down list)		**Red, primer**		
Tank Shell Condition (pick from drop down list)		**Average**		
Tank Interior Condition (pick from drop down list)		**Light Rust**		
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	
	PBV	**-0.03**		
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				
Not Insulated	P_{VA}	0.01242878		
Partially Insulated	P_{VA}	0.012597769		
Fully Insulated, unheated	P_{VA}	0.010454313		
Fully Insulated, heated	P_{VA}	0.025426158		
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**530.15**	°R	
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R	
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R	
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	534.58	°R	
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	
Average Daily Liquid Surface Temperature (TLA)				
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**540.19**	°R	
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**540.63**	°R	
Fully Insulated, unheated: TLA = TB	**TLA**	**534.6**	°R	
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	
Average Vapor Temperature (Tv)				
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**544.76**	**°R**	
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**546.68**	**°R**	
Fully Insulated; unheated Tv = TB	**Tv**	**534.58**	**°R**	
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				
Not Insulated	Wv	6.812E-05		
Partially Insulated	Wv	6.880E-05		
Fully Insulated, unheated	Wv	5.839E-05		
Fully Insulated, heated	Wv	1.344E-04		

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**48.56**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Vented Vapor Saturation Factor	Ks	0.98	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**48.56**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.080	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.98	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**61.23**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00007	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**61.23**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0800**	**per day**
Average Daily Vapor Temperature Range	ΔTv	42.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0082	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Average Daily Liquid Surface Temperature	TLA	540.19	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.98**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0124	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**42.89**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**40.98**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00823**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01713	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00890	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	550.91	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.46	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00795**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01711	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0091640	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	550.87	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	530.38	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**109.796**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{vi}
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000
2,2,4 TMP	0	0	0	114.23	32	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00
methanol	109.7956	48.5626	61.2330	32.04	32	1.00E+00

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi ~ Pi / PVA

Individual HAPS	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.000000	0.012	-
benzene	0.000000	0.012	-
2,2,4 TMP	0.000000	0.012	**0**
toluene	0.000000	0.012	-
ethylbenzene	0.000000	0.012	-
xylenes	0.000000	0.012	-
naphthalene	0.00E+00	0.012	**0.00E+00**
cumene	0.00E+00	0.012	**0.00E+00**
methanol	1.24E-02	0.012	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi ~ (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	3.1847
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	2.0150
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.0480
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.6082
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.2051
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1796
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0058
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0996
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.7172

Monthly Calculations - SEPTEMBER

Tank No.	30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**76.27**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**76.27**	lb/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009054711	
Partially Insulated	P_{VA}	0.009155981	
Fully Insulated, unheated	P_{VA}	0.00785475	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	525.56	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**530.01**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**530.36**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**525.6**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**533.63**	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**535.15**	°R
Fully Insulated; unheated Tv = TB	**Tv**	**525.56**	°R
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.066E-05	
Partially Insulated	Wv	5.108E-05	
Fully Insulated, unheated	Wv	4.462E-05	
Fully Insulated, heated	Wv	1.344E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**30.73**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**30.73**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.070	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.54**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**45.54**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0700**	**per day**
Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Average Daily Liquid Surface Temperature	TLA	530.01	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0700**	**per day**
Average Daily Vapor Temperature Range	ΔTv	36.91	°R
Average Daily Vapor Pressure Range	ΔPv	0.0053	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0091	psia
Average Daily Liquid Surface Temperature	TLA	530.01	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**36.91**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**34.98**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00535**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01207	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00672	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	539.23	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.78	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00511**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01202	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0069091	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.	TLX	539.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	521.61	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**76.269**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$ — Eq. 40-6 ZVi = yiMi / MV — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** M_i	M_v	Z_{vi}	**Vapor Mole Fraction** $P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.009	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.009	**0.00E+00**
methanol	76.2693	30.7290	45.5403	32.04	32	1.00E+00	9.05E-03	0.009	**1.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.4874
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.5491
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7974
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4529
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1474
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1288
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0038
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0699
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.0210

Monthly Calculations - OCTOBER

Tank No.	30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**45.15**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**45.15**	lb/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**Red, primer**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.005576566	
Partially Insulated	P_{VA}	0.005621296	
Fully Insulated, unheated	P_{VA}	0.005036616	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	512.13	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**515.15**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**515.39**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**512.1**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**517.61**	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**518.64**	°R
Fully Insulated; unheated Tv = TB	**Tv**	**512.13**	°R
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.217E-05	
Partially Insulated	Wv	3.236E-05	
Fully Insulated, unheated	Wv	2.936E-05	
Fully Insulated, heated	Wv	1.344E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**16.24**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**16.24**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.99	NA
Stock Vapor Density	Wv	0.0000	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.92**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**28.92**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0561**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Average Daily Liquid Surface Temperature	TLA	515.15	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	**KE**	**0.0561**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0027	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0056	psia
Average Daily Liquid Surface Temperature	TLA	515.15	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**28.83**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**26.98**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00272**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00708	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00436	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	522.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00256**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00703	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0044701	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.	TLX	522.13	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	508.64	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((PI / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	**lb/yr**
Product	biodiesel
Total HAP Emissions =	**45.154**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$ — Eq. 40-6 ZVi = yiMi / MV — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} **(lb/yr)**	**Standing, lb/yr**	**Working, lb/yr**	**Vapor Weight Concentrations** M_i	M_v	Z_{vi}	**Vapor Mole Fraction** $P_i = P_{VA}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.006	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.006	**0.00E+00**
methanol	45.1544	16.2390	28.9154	32.04	32	1.00E+00	5.58E-03	0.006	**1.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	**A**	**B**	**C**	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.6981
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.0315
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5226
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2872
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0884
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0019
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0403
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.2812

Monthly Calculations - NOVEMBER

Tank No.	30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**7.67**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**27.25**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**27.25**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Time Period		**November**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	30	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft²-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_S * W_V	**Ls**	**7.67**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.040	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	30	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.58**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00002	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.73**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**19.58**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0403**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	20.25	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Not Insulated	P_{VA}	0.003681787		Average Daily Liquid Surface Temperature	TLA	503.07	°R
Partially Insulated	P_{VA}	0.003700512		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.003451775					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB/**	**KE**	**0.0403**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R	Average Daily Vapor Temperature Range	ΔTv	20.25	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0013	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	501.24	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0037	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	503.07	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	15.2	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**20.25**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**18.73**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**503.07**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**503.21**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**501.2**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00132**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00439	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00308	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**504.56**	°R	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	508.13	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**505.18**	°R	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	498.01	°R
Fully Insulated; unheated Tv = TB	**Tv**	**501.24**	°R				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00122**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00436	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0031337	psia
Not Insulated	Wv	2.179E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	507.90	°R
Partially Insulated	Wv	2.187E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	498.53	°R
Fully Insulated, unheated	Wv	2.056E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**27.252**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$ | Eq. 40-6 ZVI = yiMi / MV | Eq. 40-5 yi ~ Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	Vapor Weight Concentrations M_i	M_v	Z_{vi}	Vapor Mole Fraction $P_i = P_{VAi}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.004	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.004	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.004	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.004	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.004	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.004	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
methanol	27.2519	7.6674	19.5845	32.04	32	1.00E+00	3.68E-03	0.004	**1.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi | Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.2202
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.7252
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3624
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1936
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0567
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0492
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0011
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0250
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.8647

Monthly Calculations - DECEMBER

Tank No.	30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.60**	lb/month
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**17.79**	lb/month	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**17.79**	lb/month	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Time Period		**December**		Vented Vapor Saturation Factor	Ks	1.00	NA
Nearest US Location		**Albany, NY**		Constant; Number of Daily Events in a Year	365	31	days/month
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft²-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_S * W_V	**Ls**	**4.60**	lb/month
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.035	per day
Product Information				Diameter	D	125.0000	ft
Product Type		**Biodiesel**		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	1.00	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0000	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	31	days/month
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.19**	lb/month
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00001	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**6,724,944**	gal/month				
Turnovers	N	**20.06**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**13.19**	lb/month
Roof Type:		**Cone**		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0000	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		**Not Insulated**		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**1.00**	
Tank Construction (pick from drop down list)		**Riveted**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Tank Shell Color (pick from drop down list)		**Red, primer**		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/**	**KE**	**0.0347**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.9**		Average Daily Vapor Temperature Range	ΔTv	17.05	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
	PBV	**-0.03**		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Not Insulated	P_{VA}	0.002421037		Average Daily Liquid Surface Temperature	TLA	491.43	°R
Partially Insulated	P_{VA}	0.00243123		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.002295179					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB/**	**KE**	**0.0347**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R	Average Daily Vapor Temperature Range	ΔTv	17.05	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0008	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.99	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0024	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	491.43	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	13.5	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α l)**	**ΔTv**	**17.05**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR l)	**ΔTv**	**15.70**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**491.43**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**491.55**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**490.0**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00076**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00283	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00207	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**492.61**	°R	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	495.69	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**493.10**	°R	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	487.17	°R
Fully Insulated; unheated Tv = TB	**Tv**	**489.99**	°R				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00071**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00281	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0021013	psia
Not Insulated	Wv	1.467E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	495.47	°R
Partially Insulated	Wv	1.472E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	487.62	°R
Fully Insulated, unheated	Wv	1.399E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
				Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
				Tank diameter	D	125.00	ft
				Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
				Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
				Tank shell height	Hs	45.00	ft
				Liquid Height	HL	22.50	ft
				Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
				Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
				Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
				Tank shell radius	Rs	62.50	ft
				Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
				Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
				Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**17.792**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$ | Eq. 40-6 ZVI = yiMi / MV | Eq. 40-5 yi ~ Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	Vapor Weight Concentrations M_i	M_v	Z_{vi}	Vapor Mole Fraction $P_i = P_{VAi}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	17.7923	4.6018	13.1905	32.04	32	1.00E+00	2.42E-03	0.002	**1.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi | Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8710
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.5061
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2494
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1295
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0360
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0311
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0153
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5799

FRT TANK EMISSION CALCULATION

Tank No.	30		Tank type	Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**	**ROUTINE EMISSIONS CALCULATIONS**	**Symbol**		**Units**
				Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/yr
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**287.14**	lb/year	Vapor Space Volume	Vv	292095.5	ft3
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**2,208.67**	lb/year	Stock Vapor Density	Wv	0.0000	lb/ft3
				Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
	Time Period	**Annual**		Vented Vapor Saturation Factor	Ks	0.99	NA
Nearest US Location		Albany, NY		Constant; Number of Daily Events in a Year	365	365	days/year
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft^2-day				
Absolute Pressure	P_A	14.55	psi	**Standing Losses, Heated:** Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**758.53**	lb/yr
Ideal Gas Constant	R	10.73	psia ft3/lb-mole R	Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Product Information				Diameter	D	125.0000	ft
Product Type		Biodiesel		Vapor Space Outage	Hvo	23.802	ft
Vapor Molecular weight	Mv	**32**	Lb/lb-mole	Vented Vapor Saturation Factor	Ks	0.97	NA
Average organic liquid density	WL	**7.30**	lb/gal	Stock Vapor Density	Wv	0.0001	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Constant; Number of Daily Events in a Year	365	365	days/year
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**12.10**		**Working Losses; Unheated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**287.14**	lb/yr
Vapor Pressure Equation Constant B	B	**8907.0**	°R	Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
				Working Loss Turnover Factor	KN	1.0000	
Tank design data				Working Loss Product Factor	Kp	1.00	
Shell height	Hs	**45.00**	ft	Stock Vapor Density	Wv	0.00003	lb/ft3
Diameter	D	**125.00**	ft	Vent Setting Correction Factor	KB	1.00	
Throughput	Q	**80,699,334**	gal/yr				
Turnovers	N	**20.44**	per year	**Working Losses; Heated,** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1,450.13**	lb/yr
Roof Type:		Cone		Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	10,786,811	ft3/yr
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Working Loss Turnover Factor	KN	1.0000	
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Working Loss Product Factor	Kp	1.00	
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft	Stock Vapor Density	Wv	0.0001	lb/ft3
Minimum Filling Height (use 1 if unknown)	HLN	**1.00**	ft	Vent Setting Correction Factor	KB	1.00	
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft				
Tank Insulation (pick from drop down list)		Fully Insulated		**Vented Vapor Saturation Factor; Heated,** Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Tank Construction (pick from drop down list)		Riveted		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Tank Shell Color (pick from drop down list)		White		Vapor Space Outage	Hvo	23.80	ft
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I**	**KE**	**0.0546**	**per day**
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**		Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
	PBV	-0.03		Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Not Insulated	P_{VA}	0.00471666		Average Daily Liquid Surface Temperature	TLA	564.70	°R
Partially Insulated	P_{VA}	0.004730962		Atmospheric Pressure	P_A	14.55	psia
Fully Insulated, unheated	P_{VA}	0.004538785					
Fully Insulated, heated	P_{VA}	0.025426158		**Vented Vapor Saturation Factor; Unheated,** Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
				Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**508.20**	°R				
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.10	°R	**Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB**	**KE**	**0.0000**	**per day**
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	499.30	°R	Average Daily Vapor Temperature Range	ΔTv	0.00	°R
				Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	509.09	°R	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R	Average Daily Liquid Surface Temperature	TLA	509.09	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F	Atmospheric Pressure	P_A	14.55	psia
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F	**Average Daily Vapor Temperature Range (ΔTv)**			
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.8	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R	**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**18.36**	**°R**
				Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**16.58**	°R
Average Daily Liquid Surface Temperature (TLA)				**Fully Insulated, heated**	**ΔTv**	**30.00**	°R
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**510.21**	°R	**Fully Insulated, not heated**	**ΔTv**	**0.00**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**510.29**	°R				
Fully Insulated, unheated: TLA = TB	**TLA**	**509.1**	°R	**Average Daily Vapor Pressure Range (ΔPv)**			
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R	**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00149**	psia
				Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00551	psia
Average Vapor Temperature (Tv)				Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00403	psia
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**511.12**	**°R**	Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	514.80	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**511.50**	**°R**	Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.62	°R
Fully Insulated; unheated Tv = TB	**Tv**	**509.09**	**°R**				
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**	**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00134**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00545	psia
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0041008	psia
Not Insulated	Wv	2.755E-05		Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	514.44	°R
Partially Insulated	Wv	2.762E-05		Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	506.15	°R
Fully Insulated, unheated	Wv	2.662E-05					
Fully Insulated, heated	Wv	1.344E-04		**Fully Insulated, unheated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
				Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
				Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 us	PVN	0.0165332	psia
				Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
				Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R

Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**287.141**
Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$	

Vapor Weight Concentrations — Eq. 40-6 Zvi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	114.23	32	0	0.000000	0.005	0
toluene	0.0000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.005	**0.00E+00**
methanol	287.1407	32.04	32	1.00E+00	4.54E-03	0.005	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.4419
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.8666
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4361
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2363
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0710
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0617
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0015
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0318
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.0545

Speciation, Heated 0

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**2208.667**
Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$	

Vapor Weight Concentrations — Eq. 40-6 Zvi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	M_i	M_v	Z_{vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	114.23	32	0	0.000000	0.025	0
toluene	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	2208.6672	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - JANUARY

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	10.04	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	185.27	lb/month
Time Period		January	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	532.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Fully Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.001843621	
Partially Insulated	P_{VA}	0.001846418	
Fully Insulated, unheated	P_{VA}	0.001808517	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	483.25	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	475.80	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	483.65	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	484.15	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	TLA	484.19	°R
Fully Insulated, unheated: TLA = TB	TLA	483.6	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	484.57	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	484.74	°R
Fully Insulated; unheated Tv = TB	Tv	483.65	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.136E-05	
Partially Insulated	Wv	1.137E-05	
Fully Insulated, unheated	Wv	1.116E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	0.00	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	Ls	64.42	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	10.04	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	120.84	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.97	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	KE	0.0546	per day
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0018	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔP	KE	0.0000	per day
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0018	psia
Average Daily Liquid Surface Temperature	TLA	483.65	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	13.09	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	11.60	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00046	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00209	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00163	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	487.43	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	480.88	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00041	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00206	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0016527	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	487.09	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	481.29	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	10.036

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.002	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.002	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.002	0.00E+00
methanol	10.0359	0.0000	10.0359	32.04	32	1.00E+00	1.81E-03	0.002	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.6875
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.3932
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.1918
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.0976
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0262
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0226
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0004
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0108
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4385

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	185.268

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	185.2679	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - FEBRUARY

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	11.07	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	179.03	lb/month
Time Period		February	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	789.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	22.21	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Fully Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002063766	
Partially Insulated	P_{VA}	0.002068355	
Fully Insulated, unheated	P_{VA}	0.002006428	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	485.80	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	477.80	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	486.39	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	487.14	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	TLA	487.20	°R
Fully Insulated, unheated: TLA = TB	TLA	486.4	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	487.75	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	488.01	°R
Fully Insulated; unheated Tv = TB	Tv	486.39	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.263E-05	
Partially Insulated	Wv	1.265E-05	
Fully Insulated, unheated	Wv	1.232E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	0.00	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	Ls	58.19	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	11.07	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	120.84	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.97	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	KE	0.0546	per day
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔP	KE	0.0000	per day
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0020	psia
Average Daily Liquid Surface Temperature	TLA	486.39	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	15.15	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	13.55	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00059	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00238	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00179	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	490.93	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.36	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00053	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00235	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0018199	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	490.59	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	483.81	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	11.071

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.002	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.002	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.002	0.00E+00
methanol	11.0714	0.0000	11.0714	32.04	32	1.00E+00	2.01E-03	0.002	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.7481
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4302
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2107
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1080
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0293
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0253
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0123
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.4845

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	179.033

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	179.0334	58.1888	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - MARCH

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**15.28**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**185.27**	lb/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.002930207	
Partially Insulated	P_{VA}	0.002938916	
Fully Insulated, unheated	P_{VA}	0.002821865	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	486.10	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	495.62	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**496.66**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**496.75**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**495.6**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**497.51**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**497.87**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**495.62**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.759E-05	
Partially Insulated	Wv	1.762E-05	
Fully Insulated, unheated	Wv	1.700E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**15.28**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**120.84**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0028	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔP	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0028	psia
Average Daily Liquid Surface Temperature	TLA	495.62	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**17.66**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.92**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00094**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00343	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00249	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	501.08	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.25	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00085**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00339	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0025427	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	500.73	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	492.77	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**15.281**

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.003	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	15.2809	0.0000	15.2809	32.04	32	1.00E+00	2.82E-03	0.003	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.9856
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.5775
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2860
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1501
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0426
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0368
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0007
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0183
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.6713

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**185.268**

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	185.2679	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - APRIL

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**23.53**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**183.19**	lb/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.004682427	
Partially Insulated	P_{VA}	0.004700449	
Fully Insulated, unheated	P_{VA}	0.004459385	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	497.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	508.57	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**509.99**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**510.11**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**508.6**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**511.15**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**511.64**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**508.57**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.735E-05	
Partially Insulated	Wv	2.743E-05	
Fully Insulated, unheated	Wv	2.618E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**23.53**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**120.84**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔP	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0045	psia
Average Daily Liquid Surface Temperature	TLA	508.57	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**21.55**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**19.54**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00173**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00562	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00389	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	515.38	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	504.61	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00158**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00555	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0039702	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	514.99	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	505.22	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**23.534**

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.004	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.004	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.004	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.004	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.004	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.004	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.004	**0.00E+00**
methanol	23.5335	0.0000	23.5335	32.04	32	1.00E+00	4.46E-03	0.004	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.4218
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.8537
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4293
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2324
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0697
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0605
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0014
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0312
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.0371

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**183.190**

Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	183.1897	62.3451	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - MAY

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	33.00	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	185.27	lb/month
Time Period		May	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1739.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Fully Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.006740064	
Partially Insulated	P_{VA}	0.00676898	
Fully Insulated, unheated	P_{VA}	0.006383119	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	517.90	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	507.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	519.20	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	520.86	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	TLA	520.99	°R
Fully Insulated, unheated: TLA = TB	TLA	519.2	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	522.20	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	522.77	°R
Fully Insulated; unheated Tv = TB	Tv	519.20	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.854E-05	
Partially Insulated	Wv	3.866E-05	
Fully Insulated, unheated	Wv	3.671E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	0.00	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	Ls	64.42	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	33.00	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00004	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	120.84	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.97	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	KE	0.0546	per day
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0064	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	KE	0.0000	per day
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0064	psia
Average Daily Liquid Surface Temperature	TLA	519.20	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	23.40	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	21.30	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00260	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00815	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00555	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	526.71	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	515.01	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00237	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00805	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0056737	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	526.31	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	515.66	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	32.996

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.006	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.006	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.006	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.006	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.006	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.006	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.006	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.006	0.00E+00
methanol	32.9958	0.0000	32.9958	32.04	32	1.00E+00	6.38E-03	0.006	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.8895
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.1559
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.5882
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3263
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1021
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0889
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0023
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0470
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.4552

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	185.268

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	185.2679	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - JUNE

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	44.28	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	183.19	lb/month
Time Period		June	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1853.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.73	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Fully Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.009226703	
Partially Insulated	P_{VA}	0.00926735	
Fully Insulated, unheated	P_{VA}	0.008725276	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	527.45	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	517.60	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	528.84	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	530.60	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	TLA	530.74	°R
Fully Insulated, unheated: TLA = TB	TLA	528.8	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	532.04	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	532.64	°R
Fully Insulated; unheated Tv = TB	Tv	528.84	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.178E-05	
Partially Insulated	Wv	5.195E-05	
Fully Insulated, unheated	Wv	4.926E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	0.00	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	Ls	62.35	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	44.28	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	120.84	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.97	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	KE	0.0546	per day
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0087	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB	KE	0.0000	per day
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0087	psia
Average Daily Liquid Surface Temperature	TLA	528.84	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	23.05	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	21.09	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00338	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01105	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00767	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	536.36	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	524.84	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00310	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01093	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0078314	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	536.01	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	525.47	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	44.281

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.009	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.009	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.009	0.00E+00
methanol	44.2812	0.0000	44.2812	32.04	32	1.00E+00	8.73E-03	0.009	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.4163
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.5019
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.7722
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4375
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1418
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1238
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0036
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0670
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.9520

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	183.190

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	183.1897	62.3451	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - JULY

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	49.75	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	185.27	lb/month
Time Period		July	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1872.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Fully Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.010439464	
Partially Insulated	P_{VA}	0.010485243	
Fully Insulated, unheated	P_{VA}	0.009874636	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	531.35	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	521.70	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	532.75	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	534.53	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	TLA	534.67	°R
Fully Insulated, unheated: TLA = TB	TLA	532.8	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	535.98	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	536.59	°R
Fully Insulated; unheated Tv = TB	Tv	532.75	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.815E-05	
Partially Insulated	Wv	5.834E-05	
Fully Insulated, unheated	Wv	5.534E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	0.00	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	Ls	64.42	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	49.75	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	120.84	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.97	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	KE	0.0546	per day
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0099	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	KE	0.0000	per day
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0099	psia
Average Daily Liquid Surface Temperature	TLA	532.75	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	22.87	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	20.94	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00373	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01245	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00872	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	540.25	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	528.81	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00343	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01232	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0088929	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	539.91	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	529.44	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	49.746

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.010	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.010	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.010	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.010	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.010	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.010	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.010	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.010	0.00E+00
methanol	49.7460	0.0000	49.7460	32.04	32	1.00E+00	9.87E-03	0.010	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.6620
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.6650
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.8595
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4911
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1614
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1411
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0042
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0770
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.1918

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	185.268

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	185.2679	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - AUGUST

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses, unheated (Eq.1-1: LT = LS+LW)	LT	47.76	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	LT	185.27	lb/month
Time Period		August	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1640.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Biodiesel	
Vapor Molecular weight	Mv	32	Lb/lb-mole
Average organic liquid density	WL	7.30	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	12.10	
Vapor Pressure Equation Constant B	B	8907.0	°R
Tank design data			
Shell height	Hs	45.00	ft
Diameter	D	125.00	ft
Throughput	Q	6,724,944	gal/month
Turnovers	N	20.06	per year
Roof Type:		Cone	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	44.00	ft
Minimum Filling Height (use 1 if unknown)	HLN	22.50	ft
Liquid height (assume 1/2 Hs)	HL	22.50	ft
Tank Insulation (pick from drop down list)		Fully Insulated	
Tank Construction (pick from drop down list)		Riveted	
Tank Shell Color (pick from drop down list)		White	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
	PBV	-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0099318	
Partially Insulated	P_{VA}	0.009970175	
Fully Insulated, unheated	P_{VA}	0.00945685	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	TAA	530.15	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	520.60	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	531.38	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	532.94	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR'	TLA	533.06	°R
Fully Insulated, unheated: TLA = TB	TLA	531.4	°R
Fully Insulated: TLA = TB	TLA	564.7	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	534.21	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	534.74	°R
Fully Insulated; unheated Tv = TB	Tv	531.38	°R
Fully Insulated; heated Tv = TB	Tv	564.7	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.551E-05	
Partially Insulated	Wv	5.567E-05	
Fully Insulated, unheated	Wv	5.314E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	0.00	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0001	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 · D^2) * H_{VO} * K_s * W_v	Ls	64.42	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	47.76	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	120.84	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	Ks	0.97	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/	KE	0.0546	per day
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	Ks	0.99	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0095	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPI	KE	0.0000	per day
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0095	psia
Average Daily Liquid Surface Temperature	TLA	531.38	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	21.57	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	19.66	°R
Fully Insulated, heated	ΔTv	30.00	°R
Fully Insulated, not heated	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00337	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.01174	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00837	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	538.33	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	527.55	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00308	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.01161	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0085344	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	537.98	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	528.15	°R
Fully Insulated, unheated (ΔPv = 0)	ΔPv	0.00	psia
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.02	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	292,095.51	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	Hvo	23.80	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	HRO	1.30	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	HRO	8.57	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	47.765

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.009	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.009	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.009	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.009	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.009	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.009	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.009	0.00E+00
methanol	47.7645	0.0000	47.7645	32.04	32	1.00E+00	9.46E-03	0.009	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.5735
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.6062
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.8280
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.4717
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1543
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1348
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0040
naphthalene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0734
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	2.1049

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	185.268

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	185.2679	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - SEPTEMBER

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**37.13**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**183.19**	lb/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.73**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.007531496	
Partially Insulated	P_{VA}	0.007555326	
Fully Insulated, unheated	P_{VA}	0.007235334	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	512.40	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	523.03	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**524.26**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**524.36**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**523.0**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**525.27**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**525.69**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**523.03**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	4.281E-05	
Partially Insulated	Wv	4.291E-05	
Fully Insulated, unheated	Wv	4.130E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**37.13**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00004	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**120.84**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0072	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔP	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0072	psia
Average Daily Liquid Surface Temperature	TLA	523.03	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.01**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.08**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00245**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00884	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00639	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	529.26	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	519.26	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00222**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00874	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0065179	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	528.88	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	519.84	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	37.128

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.007	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.007	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.007	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.007	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.007	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.007	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.007	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.007	0.00E+00
methanol	37.1279	0.0000	37.1279	32.04	32	1.00E+00	7.24E-03	0.007	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	2.0858
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	1.2842
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.6562
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.3671
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.1165
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.1016
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0028
naphthalene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0542
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.6373

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	183.190

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	183.1897	62.3451	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - OCTOBER

Tank No.	30		Tank type
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses, unheated (Eq.1-1: LT = LS+LW)	**LT**	**24.98**	lb/month
Total Losses, heated (Eq.1-1: LT = LS+LW)	**LT**	**185.27**	lb/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Biodiesel**	
Vapor Molecular weight	Mv	**32**	Lb/lb-mole
Average organic liquid density	WL	**7.30**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**12.10**	
Vapor Pressure Equation Constant B	B	**8907.0**	°R
Tank design data			
Shell height	Hs	**45.00**	ft
Diameter	D	**125.00**	ft
Throughput	Q	**6,724,944**	gal/month
Turnovers	N	**20.06**	per year
Roof Type:		**Cone**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height (use Hs-1 if unknown)	HLX	**44.00**	ft
Minimum Filling Height (use 1 if unknown)	HLN	**22.50**	ft
Liquid height (assume 1/2 Hs)	HL	**22.50**	ft
Tank Insulation (pick from drop down list)		**Fully Insulated**	
Tank Construction (pick from drop down list)		**Riveted**	
Tank Shell Color (pick from drop down list)		**White**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.25**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.00488774	
Partially Insulated	P_{VA}	0.004898769	
Fully Insulated, unheated	P_{VA}	0.004749929	
Fully Insulated, heated	P_{VA}	0.025426158	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+T	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	500.50	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	510.41	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**511.25**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**511.32**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**510.4**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**511.93**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**512.22**	**°R**
Fully Insulated; unheated Tv = TB	**Tv**	**510.41**	**°R**
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.851E-05	
Partially Insulated	Wv	2.856E-05	
Fully Insulated, unheated	Wv	2.779E-05	
Fully Insulated, heated	Wv	1.344E-04	

Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	0.99	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_s * W_v	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**24.98**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00003	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**120.84**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Average Daily Liquid Surface Temperature	TLA	564.70	°R
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**0.99**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0047	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Unheated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔP	**KE**	**0.0000**	**per day**
Average Daily Vapor Temperature Range	ΔTv	0.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0047	psia
Average Daily Liquid Surface Temperature	TLA	510.41	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**17.36**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.51**	°R
Fully Insulated, heated	**ΔTv**	**30.00**	°R
Fully Insulated, not heated	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00145**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp	PVX	0.00566	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp	PVN	0.00421	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	515.59	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.91	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00130**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.00559	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0042882	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0	TLX	515.19	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.	TLN	507.44	°R
Fully Insulated, unheated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Fully Insulated, heated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.02**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 us	PVX	0.03824	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usi	PVN	0.0165332	psia
Maximum heated bulk liquid temperature (from process setpoints)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process setpoints)	TBN	549.70	°R
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	24.976

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.005	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.005	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.005	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.005	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.005	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.005	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.005	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.005	0.00E+00
methanol	24.9765	0.0000	24.9765	32.04	32	1.00E+00	4.75E-03	0.005	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.4950
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.9006
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.4539
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.2468
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0745
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0648
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0016
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0335
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	1.1009

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	185.268

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$; Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV; Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	0
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	0.00E+00
methanol	185.2679	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	1.00E+00

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi; Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - NOVEMBER

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_S * W_V	**Ls**	**62.35**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**17.85**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00002	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**120.84**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0033	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	492.20	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	500.20	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**500.71**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**500.75**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**500.2**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.12**	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.30**	°R
Fully Insulated; unheated Tv = TB	**Tv**	**500.20**	°R
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.018E-05	
Partially Insulated	Wv	2.020E-05	
Fully Insulated, unheated	Wv	1.986E-05	
Fully Insulated, heated	Wv	1.344E-04	
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Tank Insulation (pick from drop down list)		Fully Insulated
Tank Construction (pick from drop down list)		Riveted
Tank Shell Color (pick from drop down list)		White
Tank Shell Condition (pick from drop down list)		Average
Tank Interior Condition (pick from drop down list)		Light Rust
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03 psi
	PBV	-0.03
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))		
Not Insulated	P_{VA}	0.003386975
Partially Insulated	P_{VA}	0.003391797
Fully Insulated, unheated	P_{VA}	0.003326417
Fully Insulated, heated	P_{VA}	0.025426158

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**17.848**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VAi}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.003	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.003	-
2,2,4 TMP	0	0	0	114.23	32	0	0.000000	0.003	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.003	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.003	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.003	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.003	**0.00E+00**
methanol	17.8483	0.0000	17.8483	32.04	32	1.00E+00	3.33E-03	0.003	**1.00E+00**

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	1.1249
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.6650
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.3312
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1757
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0509
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0441
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0009
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0222
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.7852

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**183.190**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VAi}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	183.1897	62.3451	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

Monthly Calculations - DECEMBER

Tank No.		30		Tank type	Fixed Roof Tank
ROUTINE EMISSIONS CALCULATIONS	Symbol			Units	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses, Unheated; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.00**	lb/month
Vapor Space Volume	Vv	292095.5	ft3
Stock Vapor Density	Wv	0.0000	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.000	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Standing Losses, Heated: Eq 1-4 365 * K_E * (π/4 * D^2) * H_{VO} * K_S * W_V	**Ls**	**64.42**	lb/month
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.055	per day
Diameter	D	125.0000	ft
Vapor Space Outage	Hvo	23.802	ft
Vented Vapor Saturation Factor	Ks	0.97	NA
Stock Vapor Density	Wv	0.0001	lb/ft3
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Unheated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**12.21**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.00001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Working Losses; Heated, Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**120.84**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	898,901	ft3/month
Working Loss Turnover Factor	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0001	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Heated, Eq. 1-21, Ks = 1/(1+0.053*PvA*H	**Ks**	**0.97**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Vapor Space Outage	Hvo	23.80	ft
Vapor Space Expansion Factor, Heated (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/I	**KE**	**0.0546**	**per day**
Average Daily Vapor Temperature Range	ΔTv	30.00	°R
Average Daily Vapor Pressure Range	ΔPv	0.0217	psi
Breather Vent Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0000	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0254	psia
Atmospheric Pressure	P_A	14.55	psia
Vented Vapor Saturation Factor; Unheated, Eq. 1-21, Ks = 1/(1+0.053*PvA	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0033	psia
Vapor Space Outage	Hvo	23.80	ft
Average Daily Ambient Temperature (TAA): Eq. 1-30 TAA = ((TAX+T	**TAA**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7, unheated	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7, unheated	TAN	482.10	°R
Liquid Bulk Temperature; unheated, Eq 1-31: TB = TAA + 0.003 αs	TB	489.17	°R
Liquid Bulk Temperature; temperature of heated product	TB	564.70	°R
Maximum heated bulk liquid temperature (from process knowledge)		120.00	°F
Minimum heated bulk liquid temperature (from process knowledge)		90.00	°F
Maximum heated bulk liquid temperature (from process knowledge)	TBX	579.70	°R
Minimum heated bulk liquid temperature (from process knowledge)	TBN	549.70	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**489.57**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*	**TLA**	**489.60**	°R
Fully Insulated, unheated: TLA = TB	**TLA**	**489.2**	°R
Fully Insulated: TLA = TB	**TLA**	**564.7**	°R
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**489.89**	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.03**	°R
Fully Insulated; unheated Tv = TB	**Tv**	**489.17**	°R
Fully Insulated; heated Tv = TB	**Tv**	**564.7**	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.377E-05	
Partially Insulated	Wv	1.378E-05	
Fully Insulated, unheated	Wv	1.359E-05	
Fully Insulated, heated	Wv	1.344E-04	
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**292,095.51**	ft3
Tank diameter	D	125.00	ft
Vapor Space Outage; see Equation 1-16	Hvo	23.80	ft
Vapor Space Outage (Eq. 1-16: Hvo=Hs-HL+HRO)	**Hvo**	**23.80**	ft
Tank shell height	Hs	45.00	ft
Liquid Height	HL	22.50	ft
Roof Outage (for a Cone Roof vs Dome Roof)	HRO	1.30	ft
Roof Outage - Cone Roof (Eq. 1-17 & 1-18: HRO=(1/3)SR*Rs)	**HRO**	**1.30**	ft
Tank cone roof slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Tank shell radius	Rs	62.50	ft
Roof Outage - Dome Roof (Eq. 1-19 & 1-20: HRO=(RR-(RR^2-Rs^2)^0.5)*(0.5+0.1666	**HRO**	**8.57**	ft
Tank dome roof radius (If unknown, use tank diameter (D) or (2Rs))	RR	125.00	ft
Tank shell radius	Rs	62.50	ft

Tank Insulation (pick from drop down list)		Fully Insulated
Tank Construction (pick from drop down list)		Riveted
Tank Shell Color (pick from drop down list)		White
Tank Shell Condition (pick from drop down list)		Average
Tank Interior Condition (pick from drop down list)		Light Rust
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.25
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03 psi
	PBV	-0.03
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))		
Not Insulated	P_{VA}	0.002259496
Partially Insulated	P_{VA}	0.002262155
Fully Insulated, unheated	P_{VA}	0.002226056
Fully Insulated, heated	P_{VA}	0.025426158

Speciation, Unheated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**12.214**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VAi}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.002	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.002	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.002	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.002	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.002	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.002	**0.00E+00**
methanol	12.2136	0.0000	12.2136	32.04	32	1.00E+00	2.23E-03	0.002	**1.00E+00**

Vapor Weight Concentrations — Eq. 40-6 ZVi = yiMi / MV

Vapor Mole Fraction — Eq. 40-5 yi = Pi / PVA

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	0.8138
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	0.4707
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	0.2313
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	0.1194
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.0329
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.0284
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.0139
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	0.5352

Speciation, Heated

HAPS Speciation	lb/yr
Product	biodiesel
Total HAP Emissions =	**12.214**

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Individual HAPS	L_{Ti} (lb/yr)	Standing, lb/yr	Working, lb/yr	M_i	M_v	Z_{Vi}	$P_i = P_{VAi}(X_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	32	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	32	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0	0	114.23	32	0	0.000000	0.025	**0**
toluene	0.0000	0.0000	0.0000	92.14	32	0.00000	0.000000	0.025	-
ethylbenzene	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
xylenes	0.0000	0.0000	0.0000	106.17	32	0.00000	0.000000	0.025	-
naphthalene	0.0000	0.0000	0.0000	128.17	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	32	0.00E+00	0.00E+00	0.025	**0.00E+00**
methanol	12.2136	64.4233	120.8446	32.04	32	1.00E+00	2.54E-02	0.025	**1.00E+00**

Liquid Mole Fraction — Eq. 40-4 xi = (ZLiML)/Mi

Component Vapor Pressure — PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	277.4	86.18	0.00000	6.878	1171.5	224.37	5.5293
benzene	0.0000000	277.4	78.11	0.00000	6.906	1211	220.79	3.6222
2,2,4 TMP	0.0000000	277.4	114.23	0.00000	6.812	1257.8	220.74	1.9275
toluene	0.0000000	277.4	92.14	0.00000	7.017	1377.6	222.64	1.1738
ethylbenzene	0.0000000	277.4	106.17	0.00000	6.95	1419.3	212.61	0.4271
xylenes	0.0000000	277.4	106.17	0.00000	7.009	1462.3	215.11	0.3769
naphthalene	0.0000000	277.4	128.17	0.00000	7.146	1831.6	211.82	0.0150
cumene	0.0000000	277.4	120.19	0.00000	6.929	1455.8	207.2	0.2187
methanol	0.0020000	277.4	32.04	0.01732	8.079	1581.3	239.65	5.2768

HT TANK EMISSION CALCULATION

Tank No.		A-1		Tank type	Horizontal Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS		Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
					Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**19.27**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)		**LT**	**43.66**	lb/year	Vapor Space Volume	Vv	801.0	ft3
			0.02	ton/year	Stock Vapor Density	Wv	0.0014	lb/ft3
	Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.047	per day
Nearest US Location			Albany, NY		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7		I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure		P_A	14.55	psi				
Ideal Gas Constant		R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**24.38**	lb/yr
Product Information					Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	17,323	ft3/yr
Product Type			Gasoline Additive		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight		Mv	**106**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density		WL	**7.24**	lb/gal	Stock Vapor Density	Wv	0.0014	lb/ft3
Average Reid Vapor Pressure		RVP	**0.00**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00					
Vapor Pressure Equation Constant A		A	**0.00**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B		B	**0.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0733	psia
					Vapor Space Outage	Hvo	0.00	ft
Tank design data								
Effective Height H_E = (Pi)D/4		H_E	**8.25**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0468**	**per day**
Effective Diameter D_E = SQRT(LD/(Pi/4))		D_E	**15.73**	ft	Average Daily Vapor Temperature Range	ΔTv	26.15	°R
Throughput		Q	**129,600**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Turnovers		N	**10.81**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0733	psia
Tank Cone Roof Slope (If unknown, use 0.0625)		SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	512.85	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))		RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height -use (Pi/4)D if unknown		HLX	**8.25**	ft				
Minimum Filling Height (use 0 if unknown)		HLN	**0.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 H_E)		HL	**4.12**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)			Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**26.15**	**°R**
Tank Construction (pick from drop down list)			Welded		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**24.37**	°R
Tank Shell Color (pick from drop down list)			Gray, light		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)			Average					
Tank Interior Condition (pick from drop down list)			Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00000**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)		PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
		PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
True Vapor Pressure; Sum of Components, PVAi=(0.019337)10^(A-(B/(TLA+C)))					Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.39	°R
Not Insulated		P_{VA}	0.07325926		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.32	°R
Partially Insulated		P_{VA}	0.07380657					
Fully Insulated		P_{VA}	0.06662447		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00000**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN		**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum ambient temperature, Table 7.1-7		TAX	517.10	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	519.15	°R
Average daily minimum ambient temperature, Table 7.1-7		TAN	499.30	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	506.97	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I		TB	510.25	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)					**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**800.96**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I		**TLA**	**512.85**	°R	Effective Tank diameter	D_E	15.73	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I		**TLA**	**513.06**	°R	Effective Tank Height	H_E	8.25	ft
Fully Insulated: TLA = TB		**TLA**	**510.3**		Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft
Average Vapor Temperature (Tv)								
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I		**Tv**	**514.98**	**°R**				
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I		**Tv**	**515.87**	**°R**				
Fully Insulated; Tv = TB		**Tv**	**510.25**	**°R**				
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)								
Not Insulated		Wv	1.407E-03					
Partially Insulated		Wv	1.416E-03					
Fully Insulated		Wv	1.292E-03					

HAPS Speciation	lb/yr
Product	additive
Total HAP Emissions =	**43.655**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

	Vapor Weight Concentrations				Vapor Mole Fraction		
	Eq. 40-6 ZVi = yiMi / MV				Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/yr)**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VA}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	86.18	106	0.00000	0.000000	0.073	-
benzene	0.0000	78.11	106	0.00000	0.000000	0.073	-
2,2,4 TMP	0.0000	114.23	106	0.00000	0.000000	0.073	-
toluene	0.0000	92.14	106	0.00000	0.000000	0.073	-
ethylbenzene	11.1643	106.17	106	0.25574	0.018735	0.073	**0.25574**
xylenes	32.4912	106.17	106	0.74426	0.054524	0.073	**0.74426**
naphthalene	0.0000	128.17	106	0.00E+00	0.00E+00	0.073	**0.00E+00**
cumene	0.0000	120.19	106	0.00E+00	0.00E+00	0.073	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.0000000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.5971
benzene	0.0000000	106.17	78.11	0.00000	6.906	1211	220.79	0.9663
2,2,4 TMP	0.0000000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4913
toluene	0.0000000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2670
ethylbenzene	0.2300000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0815
xylenes	0.7700000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0708
naphthalene	0.0000000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0017
cumene	0.0000000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0372

Monthly Calculations - JANUARY

Tank No.	A-1						
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	**ROUTINE EMISSIONS CALCULATIONS**	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.38**	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**1.12**	lb/month	Vapor Space Volume	Vv	801.0	ft3
		5.60E-04	ton/month	Stock Vapor Density	Wv	0.0005	lb/ft3
Time Period		**January**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.030	per day
Nearest US Location		**Albany, NY**		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	31	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.74**	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Product Type		**Gasoline Additive**		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.24**	lb/gal	Stock Vapor Density	Wv	0.0005	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**0.00**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0251	psia
				Vapor Space Outage	Hvo	0.00	ft
Tank design data							
Shell height	Hs	**8.25**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0301**	**per day**
Diameter	D	**15.73**	ft	Average Daily Vapor Temperature Range	ΔTv	16.60	°R
Throughput	Q	**10,800**	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Turnovers	N	**10.61**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Roof Type:		**0.00**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0251	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	485.35	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft				
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Tank Insulation (pick from drop down list)		**Not Insulated**		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**16.60**	**°R**
Tank Construction (pick from drop down list)		**Welded**		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**15.11**	°R
Tank Shell Color (pick from drop down list)		**Gray, light**		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00000**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
	PBV	**-0.03**		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	489.50	°R
Not Insulated	P_{VA}	0.02513171		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.20	°R
Partially Insulated	P_{VA}	0.02522891					
Fully Insulated	P_{VA}	0.02392845		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00000**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	489.22	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	481.66	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.18	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**800.96**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**485.35**	°R	Effective Tank diameter	D_E	15.73	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**485.44**	°R	Effective Tank Height	H_E	8.25	ft
Fully Insulated: TLA = TB	**TLA**	**484.2**		Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft
Average Vapor Temperature (Tv)							
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**486.30**	**°R**				
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**486.71**	**°R**				
Fully Insulated; Tv = TB	**Tv**	**484.18**	**°R**				
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)							
Not Insulated	Wv	5.113E-04					
Partially Insulated	Wv	5.129E-04					
Fully Insulated	Wv	4.890E-04					

HAPS Speciation	**lb/month**								
Product	additive								
Total HAP Emissions =	**1.120**			**Vapor Weight Concentrations**			**Vapor Mole Fraction**		
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.025	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.025	-
ethylbenzene	0.2880	0.0982	0.1898	106.17	106	0.25714	0.006462	0.025	**0.25714**
xylenes	0.8319	0.2836	0.5483	106.17	106	0.74286	0.018669	0.025	**0.74286**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.025	**0.00E+00**

	Liquid Mole Fraction				**Component Vapor Pressure**			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.7246
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4158
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2040
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1039
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0281
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0242
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0004
naphthalene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0117

Monthly Calculations (continued) **FEBRUARY**

Tank No.	A-1						
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	**ROUTINE EMISSIONS CALCULATIONS**	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.49**	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**1.34**	lb/month	Vapor Space Volume	Vv	801.0	ft3
		6.71E-04	ton/month	Stock Vapor Density	Wv	0.0006	lb/ft3
Time Period		**February**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.037	per day
Nearest US Location		**Albany, NY**		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	28	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.85**	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Product Type		**Gasoline Additive**		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.24**	lb/gal	Stock Vapor Density	Wv	0.0006	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**0.00**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0291	psia
				Vapor Space Outage	Hvo	0.00	ft
Tank design data							
Shell height	Hs	**8.25**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0375**	**per day**
Diameter	D	**15.73**	ft	Average Daily Vapor Temperature Range	ΔTv	20.35	°R
Throughput	Q	**10,800**	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Turnovers	N	**11.75**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Roof Type:		**0.00**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0291	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	488.91	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft				
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Tank Insulation (pick from drop down list)		**Not Insulated**		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**20.35**	**°R**
Tank Construction (pick from drop down list)		**Welded**		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**18.75**	°R
Tank Shell Color (pick from drop down list)		**Gray, light**		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00000**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.00	°R
Not Insulated	P_{VA}	0.02911926		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.82	°R
Partially Insulated	P_{VA}	0.02928334					
Fully Insulated	P_{VA}	0.02710937		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00000**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.74	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	484.36	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.17	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**800.96**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**488.91**	°R	Effective Tank diameter	D_E	15.73	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**489.05**	°R	Effective Tank Height	H_E	8.25	ft
Fully Insulated: TLA = TB	**TLA**	**487.2**		Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft
Average Vapor Temperature (Tv)							
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**490.33**	**°R**				
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.93**	**°R**				
Fully Insulated; Tv = TB	**Tv**	**487.17**	**°R**				
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)							
Not Insulated	Wv	5.876E-04					
Partially Insulated	Wv	5.902E-04					
Fully Insulated	Wv	5.506E-04					

HAPS Speciation	**lb/month**								
Product	additive								
Total HAP Emissions =	**1.342**			**Vapor Weight Concentrations**			**Vapor Mole Fraction**		
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.029	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.029	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.029	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.029	-
ethylbenzene	0.3449	0.1270	0.2180	106.17	106	0.25696	0.007483	0.029	**0.25696**
xylenes	0.9974	0.3671	0.6302	106.17	106	0.74304	0.021637	0.029	**0.74304**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.029	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.029	**0.00E+00**

	Liquid Mole Fraction				**Component Vapor Pressure**			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.8076
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4669
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2304
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1183
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0325
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0281
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0138

Monthly Calculations (continued) **MARCH**

Tank No.	A-1						
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	**ROUTINE EMISSIONS CALCULATIONS**	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.98**	lb/month
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**2.23**	lb/month	Vapor Space Volume	Vv	801.0	ft3
		1.11E-03	ton/month	Stock Vapor Density	Wv	0.0009	lb/ft3
Time Period		**March**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.046	per day
Nearest US Location		**Albany, NY**		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	31	days/month
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1.25**	lb/month
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Product Type		**Gasoline Additive**		Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**7.24**	lb/gal	Stock Vapor Density	Wv	0.0009	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**					
Vapor Pressure Equation Constant A	A	**0.00**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0438	psia
				Vapor Space Outage	Hvo	0.00	ft
Tank design data							
Shell height	Hs	**8.25**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0457**	**per day**
Diameter	D	**15.73**	ft	Average Daily Vapor Temperature Range	ΔTv	24.89	°R
Throughput	Q	**10,800**	gal/month	Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Turnovers	N	**10.61**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Roof Type:		**0.00**		Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0438	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	499.12	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft				
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Tank Insulation (pick from drop down list)		**Not Insulated**		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**24.89**	**°R**
Tank Construction (pick from drop down list)		**Welded**		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**23.15**	°R
Tank Shell Color (pick from drop down list)		**Gray, light**		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		**Average**					
Tank Interior Condition (pick from drop down list)		**Light Rust**		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00000**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
		-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	505.35	°R
Not Insulated	P_{VA}	0.04375479		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.90	°R
Partially Insulated	P_{VA}	0.04407997					
Fully Insulated	P_{VA}	0.03981282		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00000**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.10	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	493.52	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	496.71	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**800.96**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**499.12**	°R	Effective Tank diameter	D_E	15.73	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**499.31**	°R	Effective Tank Height	H_E	8.25	ft
Fully Insulated: TLA = TB	**TLA**	**496.7**		Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft
Average Vapor Temperature (Tv)							
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.09**	**°R**				
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.92**	**°R**				
Fully Insulated; Tv = TB	**Tv**	**496.71**	**°R**				
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)							
Not Insulated	Wv	8.639E-04					
Partially Insulated	Wv	8.689E-04					
Fully Insulated	Wv	7.930E-04					

HAPS Speciation	**lb/month**								
Product	additive								
Total HAP Emissions =	**2.228**			**Vapor Weight Concentrations**			**Vapor Mole Fraction**		
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$				Eq. 40-6 ZVi = yiMi / MV			Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.044	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.044	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.044	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.044	-
ethylbenzene	0.5714	0.2516	0.3198	106.17	106	0.25645	0.011221	0.044	**0.25645**
xylenes	1.6568	0.7295	0.9273	106.17	106	0.74355	0.032534	0.044	**0.74355**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.044	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.044	**0.00E+00**

	Liquid Mole Fraction				**Component Vapor Pressure**			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.0907
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.6434
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.3220
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1694
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0488
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0423
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0009
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0214

Monthly Calculations (continued) APRIL

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**4.03**	lb/month
		2.01E-03	ton/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Gasoline Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**7.24**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**8.25**	ft
Diameter	D	**15.73**	ft
Throughput	Q	**10,800**	gal/month
Turnovers	N	**10.96**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.07458828	
Partially Insulated	P_{VA}	0.07529363	
Fully Insulated	P_{VA}	0.06613611	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	510.05	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.61**	°R
Fully Insulated: TLA = TB	**TLA**	**510.1**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**516.04**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**517.17**	**°R**
Fully Insulated; Tv = TB	**Tv**	**510.05**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.430E-03	
Partially Insulated	Wv	1.440E-03	
Fully Insulated	Wv	1.283E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**1.96**	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0014	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.057	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.06**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0014	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0746	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0571**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.42	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0746	psia
Average Daily Liquid Surface Temperature	TLA	513.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.42**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**29.41**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	521.21	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.49	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	520.96	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	506.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**800.96**	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	4.025
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.075	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.075	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.075	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.075	-
ethylbenzene	1.0293	0.5014	0.5279	106.17	106	0.25571	0.019073	0.075	**0.25571**
xylenes	2.9961	1.4595	1.5365	106.17	106	0.74429	0.055515	0.075	**0.74429**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.075	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.075	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.6185
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.9801
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4994
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2713
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0829
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0721
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0380

Monthly Calculations (continued) MAY

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**6.25**	lb/month
		3.12E-03	ton/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Gasoline Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**7.24**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**8.25**	ft
Diameter	D	**15.73**	ft
Throughput	Q	**10,800**	gal/month
Turnovers	N	**10.61**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.11144355	
Partially Insulated	P_{VA}	0.11260328	
Fully Insulated	P_{VA}	0.0976197	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	520.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**524.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**525.06**	°R
Fully Insulated: TLA = TB	**TLA**	**520.9**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**527.89**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**529.20**	**°R**
Fully Insulated; Tv = TB	**Tv**	**520.93**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.089E-03	
Partially Insulated	Wv	2.105E-03	
Fully Insulated	Wv	1.854E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**3.23**	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0021	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.062	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**3.02**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0021	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1114	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0623**	**per day**
Average Daily Vapor Temperature Range	ΔTv	34.87	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1114	psia
Average Daily Liquid Surface Temperature	TLA	524.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**34.87**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**32.77**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	533.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	516.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	533.25	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	516.87	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**800.96**	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	6.246
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.111	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.111	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.111	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.111	-
ethylbenzene	1.5934	0.8242	0.7692	106.17	106	0.25510	0.028429	0.111	**0.25510**
xylenes	4.6528	2.4067	2.2461	106.17	106	0.74490	0.083014	0.111	**0.74490**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.111	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.111	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.1802
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.3462
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.6951
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.3870
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1236
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1078
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0030
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0584

Monthly Calculations (continued) JUNE

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**8.38**	lb/month
		4.19E-03	ton/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Gasoline Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**7.24**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**8.25**	ft
Diameter	D	**15.73**	ft
Throughput	Q	**10,800**	gal/month
Turnovers	N	**10.96**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.1556972	
Partially Insulated	P_{VA}	0.15734425	
Fully Insulated	P_{VA}	0.13607975	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	530.67	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**534.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**535.08**	°R
Fully Insulated: TLA = TB	**TLA**	**530.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**538.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**539.49**	**°R**
Fully Insulated; Tv = TB	**Tv**	**530.67**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.863E-03	
Partially Insulated	Wv	2.886E-03	
Fully Insulated	Wv	2.537E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**4.25**	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0029	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.062	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**4.13**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0029	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1557	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0618**	**per day**
Average Daily Vapor Temperature Range	ΔTv	35.28	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1557	psia
Average Daily Liquid Surface Temperature	TLA	534.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**35.28**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.31**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	543.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	525.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	543.41	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	526.75	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**800.96**	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	8.385
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.156	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.156	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.156	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.156	-
ethylbenzene	2.1344	1.0824	1.0520	106.17	106	0.25456	0.039634	0.156	**0.25456**
xylenes	6.2504	3.1697	3.0807	106.17	106	0.74544	0.116064	0.156	**0.74544**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.156	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.156	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.7955
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.7540
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.9152
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5206
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1723
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1507
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0046
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0835

Monthly Calculations (continued) JULY

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	9.58	lb/month
		4.79E-03	ton/month
Time Period		July	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1872.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Gasoline Additive	
Vapor Molecular weight	Mv	106	Lb/lb-mole
Average organic liquid density	WL	7.24	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	0.00	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	0.0	°R
Tank design data			
Shell height	Hs	8.25	ft
Diameter	D	15.73	ft
Throughput	Q	10,800	gal/month
Turnovers	N	10.61	per year
Roof Type:		0.00	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	7.25	ft
Minimum Filling Height (use 0 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 H_E)	HL	4.12	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Welded	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.1770708	
Partially Insulated	P_{VA}	0.17892849	
Fully Insulated	P_{VA}	0.15493119	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	531.35	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.61	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	538.73	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	539.06	°R
Fully Insulated: TLA = TB	TLA	534.6	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	542.10	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	543.51	°R
Fully Insulated; Tv = TB	Tv	534.61	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.232E-03	
Partially Insulated	Wv	3.257E-03	
Fully Insulated	Wv	2.867E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	4.91	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0032	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	4.67	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0032	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1771	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0612	per day
Average Daily Vapor Temperature Range	ΔTv	35.23	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1771	psia
Average Daily Liquid Surface Temperature	TLA	538.73	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	35.23	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	33.30	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00000	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	547.54	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00000	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	547.38	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	530.74	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	800.96	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	9.577
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations (Eq. 40-6 ZVi = yiMi / MV)			Vapor Mole Fraction (Eq. 40-5 yi = Pi / PVA)		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.177	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.177	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.177	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.177	-
ethylbenzene	2.4358	1.2492	1.1866	106.17	106	0.25434	0.045036	0.177	0.25434
xylenes	7.1412	3.6624	3.4787	106.17	106	0.74566	0.132035	0.177	0.74566
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.177	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.177	0.00E+00

	Liquid Mole Fraction (Eq. 40-4 xi = (ZLiML)/Mi)				Component Vapor Pressure (PVAi=(0.019337)10^(A-(B/(TLA+C))))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	3.0764
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.9422
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	1.0173
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5836
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1958
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1715
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0054
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0958

Monthly Calculations (continued) AUGUST

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	8.61	lb/month
		4.31E-03	ton/month
Time Period		August	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1640.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Gasoline Additive	
Vapor Molecular weight	Mv	106	Lb/lb-mole
Average organic liquid density	WL	7.24	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	0.00	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	0.0	°R
Tank design data			
Shell height	Hs	8.25	ft
Diameter	D	15.73	ft
Throughput	Q	10,800	gal/month
Turnovers	N	10.61	per year
Roof Type:		0.00	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	7.25	ft
Minimum Filling Height (use 0 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 H_E)	HL	4.12	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Welded	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.16540538	
Partially Insulated	P_{VA}	0.16693979	
Fully Insulated	P_{VA}	0.14699061	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	530.15	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	533.00	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	536.62	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	536.90	°R
Fully Insulated: TLA = TB	TLA	533.0	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	539.57	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	540.80	°R
Fully Insulated; Tv = TB	Tv	533.00	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.033E-03	
Partially Insulated	Wv	3.054E-03	
Fully Insulated	Wv	2.728E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	4.23	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0030	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	4.38	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0030	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1654	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0562	per day
Average Daily Vapor Temperature Range	ΔTv	32.39	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1654	psia
Average Daily Liquid Surface Temperature	TLA	536.62	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	32.39	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	30.48	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00000	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	544.72	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	528.52	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00000	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	544.52	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	529.28	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	800.96	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	8.610
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations (Eq. 40-6 ZVi = yiMi / MV)			Vapor Mole Fraction (Eq. 40-5 yi = Pi / PVA)		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.165	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.165	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.165	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.165	-
ethylbenzene	2.1909	1.0768	1.1141	106.17	106	0.25445	0.042088	0.165	0.25445
xylenes	6.4194	3.1551	3.2643	106.17	106	0.74555	0.123317	0.165	0.74555
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.165	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.165	0.00E+00

	Liquid Mole Fraction (Eq. 40-4 xi = (ZLiML)/Mi)				Component Vapor Pressure (PVAi=(0.019337)10^(A-(B/(TLA+C))))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.9242
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.8401
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.9609
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5493
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1830
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1602
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0050
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0890

Monthly Calculations (continued) SEPTEMBER

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	LT	5.98	lb/month
		2.99E-03	ton/month
Time Period		September	
Nearest US Location		Albany, NY	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	1300.0	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		Gasoline Additive	
Vapor Molecular weight	Mv	106	Lb/lb-mole
Average organic liquid density	WL	7.24	lb/gal
Average Reid Vapor Pressure	RVP	0.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00	
Vapor Pressure Equation Constant A	A	0.00	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	0.0	°R
Tank design data			
Shell height	Hs	8.25	ft
Diameter	D	15.73	ft
Throughput	Q	10,800	gal/month
Turnovers	N	10.96	per year
Roof Type:		0.00	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	0.0625	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	NA	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	7.25	ft
Minimum Filling Height (use 0 if unknown)	HLN	1.00	ft
Liquid height (assume 1/2 H_E)	HL	4.12	ft
Tank Insulation (pick from drop down list)		Not Insulated	
Tank Construction (pick from drop down list)		Welded	
Tank Shell Color (pick from drop down list)		Gray, light	
Tank Shell Condition (pick from drop down list)		Average	
Tank Interior Condition (pick from drop down list)		Light Rust	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	0.58	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.12100742	
Partially Insulated	P_{VA}	0.12193693	
Fully Insulated	P_{VA}	0.10975059	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	TAA	522.05	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	524.31	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	TLA	527.18	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	TLA	527.40	°R
Fully Insulated: TLA = TB	TLA	524.3	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	Tv	529.51	°R
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	Tv	530.49	°R
Fully Insulated; Tv = TB	Tv	524.31	°R
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.261E-03	
Partially Insulated	Wv	2.274E-03	
Fully Insulated	Wv	2.071E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	Ls	2.72	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0023	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.050	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	Lw	3.26	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0023	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	Ks	1.00	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1210	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	KE	0.0501	per day
Average Daily Vapor Temperature Range	ΔTv	28.59	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1210	psia
Average Daily Liquid Surface Temperature	TLA	527.18	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	ΔTv	28.59	°R
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	ΔTv	26.66	°R
Fully Insulated, constant temperature	ΔTv	0.00	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00000	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	534.32	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.03	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	0.00000	psia
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	534.07	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	520.74	°R
Fully Insulated (ΔPv = 0)	ΔPv	0.00	psia
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	Vv	800.96	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	5.984
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

				Vapor Weight Concentrations (Eq. 40-6 ZVi = yiMi / MV)			Vapor Mole Fraction (Eq. 40-5 yi = Pi / PVA)		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.121	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.121	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.121	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.121	-
ethylbenzene	1.5258	0.6936	0.8322	106.17	106	0.25497	0.030853	0.121	0.25497
xylenes	4.4586	2.0268	2.4317	106.17	106	0.74503	0.090154	0.121	0.74503
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.121	0.00E+00
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.121	0.00E+00

	Liquid Mole Fraction (Eq. 40-4 xi = (ZLiML)/Mi)				Component Vapor Pressure (PVAi=(0.019337)10^(A-(B/(TLA+C))))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.3177
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.4368
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.7421
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.4163
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1341
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1171
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0033
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0636

Monthly Calculations (continued) **OCTOBER**

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**3.51**	lb/month
		1.76E-03	ton/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Gasoline Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**7.24**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**8.25**	ft
Diameter	D	**15.73**	ft
Throughput	Q	**10,800**	gal/month
Turnovers	N	**10.61**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0742607	
Partially Insulated	P_{VA}	0.07467428	
Fully Insulated	P_{VA}	0.06919088	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.28	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.23**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.38**	°R
Fully Insulated: TLA = TB	**TLA**	**511.3**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**514.81**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**515.48**	**°R**
Fully Insulated; Tv = TB	**Tv**	**511.28**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.427E-03	
Partially Insulated	Wv	1.433E-03	
Fully Insulated	Wv	1.339E-03	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**1.45**	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0014	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.06**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0014	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0743	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0410**	**per day**
Average Daily Vapor Temperature Range	ΔTv	23.18	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0743	psia
Average Daily Liquid Surface Temperature	TLA	513.23	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**23.18**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**21.33**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.02	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.43	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	518.71	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	508.05	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**800.96**	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**3.514**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.074	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.074	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.074	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.074	-
ethylbenzene	0.8986	0.3717	0.5268	106.17	106	0.25572	0.018990	0.074	**0.25572**
xylenes	2.6153	1.0819	1.5334	106.17	106	0.74428	0.055271	0.074	**0.74428**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.074	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.074	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.6132
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.9767
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4960
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2702
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0826
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0718
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0377

Monthly Calculations (continued) **NOVEMBER**

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**2.06**	lb/month
		1.03E-03	ton/month
Time Period		**November**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Gasoline Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**7.24**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**8.25**	ft
Diameter	D	**15.73**	ft
Throughput	Q	**10,800**	gal/month
Turnovers	N	**10.96**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.04871392	
Partially Insulated	P_{VA}	0.04888755	
Fully Insulated	P_{VA}	0.04656051	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	500.73	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.91**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**502.00**	°R
Fully Insulated: TLA = TB	**TLA**	**500.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**502.87**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**503.27**	**°R**
Fully Insulated; Tv = TB	**Tv**	**500.73**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	9.584E-04	
Partially Insulated	Wv	9.611E-04	
Fully Insulated	Wv	9.200E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.68**	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0010	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.029	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1.38**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0010	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0487	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0294**	**per day**
Average Daily Vapor Temperature Range	ΔTv	16.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0487	psia
Average Daily Liquid Surface Temperature	TLA	501.91	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**16.83**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.31**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	506.11	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	497.70	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.83	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	498.17	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**800.96**	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**2.061**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.049	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.049	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.049	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.049	-
ethylbenzene	0.5282	0.1736	0.3546	106.17	106	0.25631	0.012486	0.049	**0.25631**
xylenes	1.5326	0.5036	1.0290	106.17	106	0.74369	0.036228	0.049	**0.74369**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.049	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.049	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.1808
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.7003
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.3505
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1862
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0543
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0470
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0239

Monthly Calculations (continued) **DECEMBER**

Tank No.	A-1		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**1.29**	lb/month
		6.47E-04	ton/month
Time Period		**December**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Gasoline Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**7.24**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**8.25**	ft
Diameter	D	**15.73**	ft
Throughput	Q	**10,800**	gal/month
Turnovers	N	**10.61**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**7.25**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**4.12**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.03108539	
Partially Insulated	P_{VA}	0.03117819	
Fully Insulated	P_{VA}	0.02993067	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**490.59**	°R
Fully Insulated: TLA = TB	**TLA**	**489.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**491.27**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**491.59**	**°R**
Fully Insulated; Tv = TB	**Tv**	**489.58**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	6.260E-04	
Partially Insulated	Wv	6.275E-04	
Fully Insulated	Wv	6.049E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.39**	lb/month
Vapor Space Volume	Vv	801.0	ft3
Stock Vapor Density	Wv	0.0006	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.025	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.90**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0311	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0251**	**per day**
Average Daily Vapor Temperature Range	ΔTv	14.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0311	psia
Average Daily Liquid Surface Temperature	TLA	490.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**14.35**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**13.00**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.10	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	486.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.84	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	487.34	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**800.96**	ft3
Effective Tank diameter	D_E	15.73	ft
Effective Tank Height	H_E	8.25	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	4.12	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**1.294**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.031	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.031	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.031	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.031	-
ethylbenzene	0.3324	0.1003	0.2322	106.17	106	0.25688	0.007985	0.031	**0.25688**
xylenes	0.9617	0.2901	0.6716	106.17	106	0.74312	0.023100	0.031	**0.74312**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.031	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.031	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.8475
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4915
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2425
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1253
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0347
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0300
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0148

HT TANK EMISSION CALCULATION

Tank No.		A-4		Tank type	Horizontal Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
				Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**12.90**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**29.16**	lb/year	Vapor Space Volume	Vv	536.2	ft3
		0.01	ton/year	Stock Vapor Density	Wv	0.0014	lb/ft3
Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.047	per day
Nearest US Location		Albany, NY		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1180.0**	Btu/ft²-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure	P_A	14.55	psi				
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**16.25**	lb/yr
Product Information				Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	11,549	ft3/yr
Product Type		Diesel Additive		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density	WL	**6.10**	lb/gal	Stock Vapor Density	Wv	0.0014	lb/ft3
Average Reid Vapor Pressure	RVP	**0.00**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	1.00					
Vapor Pressure Equation Constant A	A	**0.00**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B	B	**0.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0733	psia
				Vapor Space Outage	Hvo	0.00	ft
Tank design data							
Effective Height H_E = (Pi)D/4	H_E	**6.28**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0468**	**per day**
Effective Diameter D_E = SQRT(LD/(Pi/4))	D_E	**14.74**	ft	Average Daily Vapor Temperature Range	ΔTv	26.15	°R
Throughput	Q	**86,400**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Turnovers	N	**10.77**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
				Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0733	psia
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	512.85	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**6.28**	ft				
Minimum Filling Height (use 0 if unknown)	HLN	**0.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)		Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**26.15**	**°R**
Tank Construction (pick from drop down list)		Welded		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**24.37**	°R
Tank Shell Color (pick from drop down list)		Gray, light		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)		Average					
Tank Interior Condition (pick from drop down list)		Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00000**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
	PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
True Vapor Pressure; Sum of Components, PVAi=(0.019337)10^(A-(B/(TLA+C)))				Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.39	°R
Not Insulated	P_{VA}	0.07325926		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	506.32	°R
Partially Insulated	P_{VA}	0.07380657					
Fully Insulated	P_{VA}	0.06662447		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00000**	**psia**
				Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.10	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	519.15	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	499.30	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	506.97	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	510.25	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)				**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**536.17**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**512.85**	°R	Effective Tank diameter	D_E	14.74	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.06**	°R	Effective Tank Height	H_E	6.28	ft
Fully Insulated: TLA = TB	**TLA**	**510.3**		Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft
Average Vapor Temperature (Tv)							
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**514.98**	**°R**				
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**515.87**	**°R**				
Fully Insulated; Tv = TB	**Tv**	**510.25**	**°R**				
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)							
Not Insulated	Wv	1.407E-03					
Partially Insulated	Wv	1.416E-03					
Fully Insulated	Wv	1.292E-03					

HAPS Speciation	lb/yr
Product	additive
Total HAP Emissions =	**29.156**
Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$	

Individual HAPS	L_{Ti} (lb/yr)	M_i	M_v	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	106	0.00000	0.000000	0.073	-
benzene	0.0000	78.11	106	0.00000	0.000000	0.073	-
2,2,4 TMP	0.0000	114.23	106	0.00000	0.000000	0.073	-
toluene	0.0000	92.14	106	0.00000	0.000000	0.073	-
ethylbenzene	7.4563	106.17	106	0.25574	0.018735	0.073	**0.25574**
xylenes	21.7001	106.17	106	0.74426	0.054524	0.073	**0.74426**
naphthalene	0.0000	128.17	106	0.00E+00	0.00E+00	0.073	**0.00E+00**
cumene	0.0000	120.19	106	0.00E+00	0.00E+00	0.073	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.5971
benzene	0.0000000	106.17	78.11	0.00000	6.906	1211	220.79	0.9663
2,2,4 TMP	0.0000000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4913
toluene	0.0000000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2670
ethylbenzene	0.2300000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0815
xylenes	0.7700000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0708
naphthalene	0.0000000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0017
cumene	0.0000000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0372

Monthly Calculations - JANUARY

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Tank No.	A-4		
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.75**	lb/month
		3.74E-04	ton/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_{ES})	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.02513171	
Partially Insulated	P_{VA}	0.02522891	
Fully Insulated	P_{VA}	0.02392845	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.18	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**485.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**485.44**	°R
Fully Insulated: TLA = TB	**TLA**	**484.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**486.30**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**486.71**	**°R**
Fully Insulated; Tv = TB	**Tv**	**484.18**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.113E-04	
Partially Insulated	Wv	5.129E-04	
Fully Insulated	Wv	4.890E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.26**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0005	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.030	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.49**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0251	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0301**	**per day**
Average Daily Vapor Temperature Range	ΔTv	16.60	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0251	psia
Average Daily Liquid Surface Temperature	TLA	485.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTv = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**16.60**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.11**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	489.50	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.20	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usin	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	489.22	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	481.66	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	0.748

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.025	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.025	-
ethylbenzene	0.1922	0.0657	0.1265	106.17	106	0.25714	0.006462	0.025	**0.25714**
xylenes	0.5554	0.1899	0.3655	106.17	106	0.74286	0.018669	0.025	**0.74286**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.025	**0.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.7246
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4158
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2040
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1039
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0281
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0242
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0004
naphthalene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0117

Monthly Calculations (continued) — FEBRUARY

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Tank No.	A-4		
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.90**	lb/month
		4.48E-04	ton/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**11.70**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_{ES})	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.02911926	
Partially Insulated	P_{VA}	0.02928334	
Fully Insulated	P_{VA}	0.02710937	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.17	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**488.91**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**489.05**	°R
Fully Insulated: TLA = TB	**TLA**	**487.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**490.33**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.93**	**°R**
Fully Insulated; Tv = TB	**Tv**	**487.17**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.876E-04	
Partially Insulated	Wv	5.902E-04	
Fully Insulated	Wv	5.506E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.33**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0006	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.037	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.57**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0291	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0375**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0291	psia
Average Daily Liquid Surface Temperature	TLA	488.91	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTv = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.35**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.75**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.00	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.82	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usin	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.74	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.36	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	0.896

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.029	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.029	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.029	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.029	-
ethylbenzene	0.2303	0.0850	0.1453	106.17	106	0.25696	0.007483	0.029	**0.25696**
xylenes	0.6659	0.2458	0.4202	106.17	106	0.74304	0.021637	0.029	**0.74304**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.029	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.029	**0.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.8076
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4669
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2304
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1183
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0325
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0281
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0138

Monthly Calculations (continued) — MARCH

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Tank No.	A-4		
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**1.49**	lb/month
		7.44E-04	ton/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_{ES})	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.04375479	
Partially Insulated	P_{VA}	0.04407997	
Fully Insulated	P_{VA}	0.03981282	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	496.71	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**499.12**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**499.31**	°R
Fully Insulated: TLA = TB	**TLA**	**496.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.92**	**°R**
Fully Insulated; Tv = TB	**Tv**	**496.71**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.639E-04	
Partially Insulated	Wv	8.689E-04	
Fully Insulated	Wv	7.930E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.66**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0009	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.046	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.83**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0009	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0438	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0457**	**per day**
Average Daily Vapor Temperature Range	ΔTv	24.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0438	psia
Average Daily Liquid Surface Temperature	TLA	499.12	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTv = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**24.89**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.15**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	505.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.90	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 usin	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	493.52	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	1.488

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$

Eq. 40-6 ZVi = yiMi / MV

Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.044	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.044	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.044	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.044	-
ethylbenzene	0.3816	0.1684	0.2132	106.17	106	0.25645	0.011221	0.044	**0.25645**
xylenes	1.1065	0.4883	0.6182	106.17	106	0.74355	0.032534	0.044	**0.74355**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.044	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.044	**0.00E+00**

Eq. 40-4 xi = (ZLiML)/Mi

PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.0907
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.6434
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.3220
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1694
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0488
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0423
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0009
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0214

Monthly Calculations (continued) APRIL

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**2.69**	lb/month
		1.34E-03	ton/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.92**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.07458828	
Partially Insulated	P_{VA}	0.07529363	
Fully Insulated	P_{VA}	0.06613611	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	510.05	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.61**	°R
Fully Insulated: TLA = TB	**TLA**	**510.1**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**516.04**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**517.17**	**°R**
Fully Insulated; Tv = TB	**Tv**	**510.05**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.430E-03	
Partially Insulated	Wv	1.440E-03	
Fully Insulated	Wv	1.283E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**1.31**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0014	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.057	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1.38**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0014	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0746	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0571**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.42	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0746	psia
Average Daily Liquid Surface Temperature	TLA	513.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.42**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**29.41**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	521.21	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.49	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	520.96	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	506.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	2.689
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.075	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.075	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.075	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.075	-
ethylbenzene	0.6876	0.3357	0.3519	106.17	106	0.25571	0.019073	0.075	**0.25571**
xylenes	2.0014	0.9770	1.0243	106.17	106	0.74429	0.055515	0.075	**0.74429**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.075	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.075	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.6185
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.9801
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4994
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2713
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0829
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0721
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0380

Monthly Calculations (continued) MAY

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**4.17**	lb/month
		2.09E-03	ton/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.11144355	
Partially Insulated	P_{VA}	0.11260328	
Fully Insulated	P_{VA}	0.0976197	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	520.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**524.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**525.06**	°R
Fully Insulated: TLA = TB	**TLA**	**520.9**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**527.89**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**529.20**	**°R**
Fully Insulated; Tv = TB	**Tv**	**520.93**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.089E-03	
Partially Insulated	Wv	2.105E-03	
Fully Insulated	Wv	1.854E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**2.16**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0021	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.062	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.01**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0021	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1114	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0623**	**per day**
Average Daily Vapor Temperature Range	ΔTv	34.87	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1114	psia
Average Daily Liquid Surface Temperature	TLA	524.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**34.87**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**32.77**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	533.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	516.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	533.25	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	516.87	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	4.173
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.111	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.111	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.111	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.111	-
ethylbenzene	1.0645	0.5517	0.5128	106.17	106	0.25510	0.028429	0.111	**0.25510**
xylenes	3.1084	1.6111	1.4974	106.17	106	0.74490	0.083014	0.111	**0.74490**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.111	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.111	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.1802
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.3462
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.6951
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.3870
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1236
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1078
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0030
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0584

Monthly Calculations (continued) JUNE

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**5.60**	lb/month
		2.80E-03	ton/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.92**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.1556972	
Partially Insulated	P_{VA}	0.15734425	
Fully Insulated	P_{VA}	0.13607975	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	530.67	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**534.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**535.08**	°R
Fully Insulated: TLA = TB	**TLA**	**530.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**538.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**539.49**	**°R**
Fully Insulated; Tv = TB	**Tv**	**530.67**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.863E-03	
Partially Insulated	Wv	2.886E-03	
Fully Insulated	Wv	2.537E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**2.85**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0029	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.062	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.76**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0029	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1557	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0618**	**per day**
Average Daily Vapor Temperature Range	ΔTv	35.28	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1557	psia
Average Daily Liquid Surface Temperature	TLA	534.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**35.28**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.31**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	543.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	525.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	543.41	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	526.75	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	5.602
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	P_i = P_{VAi}(x_i)	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.156	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.156	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.156	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.156	-
ethylbenzene	1.4259	0.7246	0.7013	106.17	106	0.25456	0.039634	0.156	**0.25456**
xylenes	4.1756	2.1218	2.0538	106.17	106	0.74544	0.116064	0.156	**0.74544**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.156	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.156	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.7955
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.7540
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.9152
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5206
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1723
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1507
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0046
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0835

Monthly Calculations (continued) JULY

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**6.40**	lb/month
		3.20E-03	ton/month
Time Period		**July**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1872.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.1770708	
Partially Insulated	P_{VA}	0.17892849	
Fully Insulated	P_{VA}	0.15493119	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**531.35**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	541.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	521.70	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	534.61	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**538.73**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**539.06**	°R
Fully Insulated: TLA = TB	**TLA**	**534.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**542.10**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**543.51**	**°R**
Fully Insulated; Tv = TB	**Tv**	**534.61**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.232E-03	
Partially Insulated	Wv	3.257E-03	
Fully Insulated	Wv	2.867E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**3.29**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0032	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.061	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**3.11**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0032	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1771	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0612**	**per day**
Average Daily Vapor Temperature Range	ΔTv	35.23	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1771	psia
Average Daily Liquid Surface Temperature	TLA	538.73	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**35.23**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.30**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	547.54	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	529.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	547.38	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	530.74	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	6.398
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**P_i = P_{VAi}(x_i)**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.177	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.177	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.177	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.177	-
ethylbenzene	1.6273	0.8362	0.7910	106.17	106	0.25434	0.045036	0.177	**0.25434**
xylenes	4.7708	2.4517	2.3191	106.17	106	0.74566	0.132035	0.177	**0.74566**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.177	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.177	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	3.0764
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.9422
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	1.0173
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5836
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1958
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1715
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0054
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0958

Monthly Calculations (continued) AUGUST

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**5.75**	lb/month
		2.88E-03	ton/month
Time Period		**August**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1640.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.16540538	
Partially Insulated	P_{VA}	0.16693979	
Fully Insulated	P_{VA}	0.14699061	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**530.15**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	539.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	520.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	533.00	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**536.62**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**536.90**	°R
Fully Insulated: TLA = TB	**TLA**	**533.0**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**539.57**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**540.80**	**°R**
Fully Insulated; Tv = TB	**Tv**	**533.00**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	3.033E-03	
Partially Insulated	Wv	3.054E-03	
Fully Insulated	Wv	2.728E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**2.83**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0030	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.056	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.92**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0030	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1654	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0562**	**per day**
Average Daily Vapor Temperature Range	ΔTv	32.39	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1654	psia
Average Daily Liquid Surface Temperature	TLA	536.62	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**32.39**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**30.48**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	544.72	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	528.52	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	544.52	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	529.28	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	5.752
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**P_i = P_{VAi}(x_i)**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.165	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.165	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.165	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.165	-
ethylbenzene	1.4636	0.7208	0.7427	106.17	106	0.25445	0.042088	0.165	**0.25445**
xylenes	4.2882	2.1121	2.1762	106.17	106	0.74555	0.123317	0.165	**0.74555**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.165	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.165	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.9242
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.8401
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.9609
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5493
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1830
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1602
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0050
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0890

Monthly Calculations (continued) SEPTEMBER

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**4.00**	lb/month
		2.00E-03	ton/month
Time Period		**September**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1300.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.92**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.12100742	
Partially Insulated	P_{VA}	0.12193693	
Fully Insulated	P_{VA}	0.10975059	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**522.05**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	531.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	512.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	524.31	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**527.18**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**527.40**	°R
Fully Insulated: TLA = TB	**TLA**	**524.3**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**529.51**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**530.49**	**°R**
Fully Insulated; Tv = TB	**Tv**	**524.31**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.261E-03	
Partially Insulated	Wv	2.274E-03	
Fully Insulated	Wv	2.071E-03	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**1.82**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0023	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.050	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.18**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0023	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1210	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0501**	**per day**
Average Daily Vapor Temperature Range	ΔTv	28.59	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1210	psia
Average Daily Liquid Surface Temperature	TLA	527.18	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.3	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**28.59**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**26.66**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	534.32	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	520.03	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	534.07	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	520.74	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	3.997
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			Vapor Mole Fraction Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**P_i = P_{VAi}(x_i)**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.121	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.121	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.121	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.121	-
ethylbenzene	1.0191	0.4643	0.5548	106.17	106	0.25497	0.030853	0.121	**0.25497**
xylenes	2.9779	1.3568	1.6212	106.17	106	0.74503	0.090154	0.121	**0.74503**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.121	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.121	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				Component Vapor Pressure PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.3177
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.4368
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.7421
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.4163
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1341
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1171
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0033
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0636

Monthly Calculations (continued) — OCTOBER

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**2.35**	lb/month
		1.17E-03	ton/month
Time Period		**October**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**882.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0742607	
Partially Insulated	P_{VA}	0.07467428	
Fully Insulated	P_{VA}	0.06919088	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**509.75**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	519.00	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	500.50	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	511.28	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.23**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.38**	°R
Fully Insulated: TLA = TB	**TLA**	**511.3**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**514.81**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**515.48**	**°R**
Fully Insulated; Tv = TB	**Tv**	**511.28**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.427E-03	
Partially Insulated	Wv	1.433E-03	
Fully Insulated	Wv	1.339E-03	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.97**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0014	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.041	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**1.37**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0014	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0743	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0410**	**per day**
Average Daily Vapor Temperature Range	ΔTv	23.18	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0743	psia
Average Daily Liquid Surface Temperature	TLA	513.23	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	18.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**23.18**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**21.33**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	519.02	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	507.43	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	518.71	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	508.05	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**2.347**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**P_i = P_{VAi}(x_i)**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.074	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.074	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.074	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.074	-
ethylbenzene	0.6001	0.2488	0.3512	106.17	106	0.25572	0.018990	0.074	**0.25572**
xylenes	1.7465	0.7243	1.0223	106.17	106	0.74428	0.055271	0.074	**0.74428**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.074	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.074	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.6132
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.9767
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4960
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2702
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0826
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0718
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0377

Monthly Calculations (continued) — NOVEMBER

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**1.38**	lb/month
		6.88E-04	ton/month
Time Period		**November**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**534.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.92**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.04871392	
Partially Insulated	P_{VA}	0.04888755	
Fully Insulated	P_{VA}	0.04656051	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**499.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	507.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	492.20	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	500.73	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**501.91**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**502.00**	°R
Fully Insulated: TLA = TB	**TLA**	**500.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**502.87**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**503.27**	**°R**
Fully Insulated; Tv = TB	**Tv**	**500.73**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	9.584E-04	
Partially Insulated	Wv	9.611E-04	
Fully Insulated	Wv	9.200E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.45**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0010	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.029	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.92**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0010	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0487	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0294**	**per day**
Average Daily Vapor Temperature Range	ΔTv	16.83	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0487	psia
Average Daily Liquid Surface Temperature	TLA	501.91	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	15.2	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**16.83**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.31**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	506.11	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	497.70	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.83	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	498.17	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**1.376**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**P_i = P_{VAi}(x_i)**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.049	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.049	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.049	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.049	-
ethylbenzene	0.3526	0.1162	0.2364	106.17	106	0.25631	0.012486	0.049	**0.25631**
xylenes	1.0231	0.3371	0.6860	106.17	106	0.74369	0.036228	0.049	**0.74369**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.049	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.049	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.1808
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.7003
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.3505
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1862
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0543
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0470
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0010
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0239

Monthly Calculations (continued) — DECEMBER

Tank No.	A-4		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.86**	lb/month
		4.32E-04	ton/month
Time Period		**December**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**422.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**6.28**	ft
Diameter	D	**14.74**	ft
Throughput	Q	**7,200**	gal/month
Turnovers	N	**10.57**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**5.28**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**3.14**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.03108539	
Partially Insulated	P_{VA}	0.03117819	
Fully Insulated	P_{VA}	0.02993067	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**488.85**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	495.60	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	482.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	489.58	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**490.51**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**490.59**	°R
Fully Insulated: TLA = TB	**TLA**	**489.6**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**491.27**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**491.59**	**°R**
Fully Insulated; Tv = TB	**Tv**	**489.58**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	6.260E-04	
Partially Insulated	Wv	6.275E-04	
Fully Insulated	Wv	6.049E-04	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.26**	lb/month
Vapor Space Volume	Vv	536.2	ft3
Stock Vapor Density	Wv	0.0006	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.025	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.60**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	962	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0311	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0251**	**per day**
Average Daily Vapor Temperature Range	ΔTv	14.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0311	psia
Average Daily Liquid Surface Temperature	TLA	490.51	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	13.5	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**14.35**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**13.00**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.10	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	486.93	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 usin	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.84	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.2	TLN	487.34	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**536.17**	ft3
Effective Tank diameter	D_E	14.74	ft
Effective Tank Height	H_E	6.28	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	3.14	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**0.864**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**P_i = P_{VAi}(x_i)**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.031	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.031	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.031	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.031	-
ethylbenzene	0.2219	0.0671	0.1548	106.17	106	0.25688	0.007985	0.031	**0.25688**
xylenes	0.6419	0.1942	0.4477	106.17	106	0.74312	0.023100	0.031	**0.74312**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.031	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.031	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.8475
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4915
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2425
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1253
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0347
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0300
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0006
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0148

HT TANK EMISSION CALCULATION

Tank No.		A-5		Tank type	Horizontal Fixed Roof Tank			
ROUTINE EMISSIONS CALCULATIONS		Symbol		Units	ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
					Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**1.63**	lb/yr
Total Losses (Eq.1-1: LT = LS+LW)		**LT**	**3.66**	lb/year	Vapor Space Volume	Vv	67.5	ft3
			0.00	ton/year	Stock Vapor Density	Wv	0.0014	lb/ft3
	Time Period		**Annual**		Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.047	per day
Nearest US Location			Albany, NY		Vented Vapor Saturation Factor	Ks	1.00	NA
Daily total solar insolation on a horizontal surface; Table 7.1-7		I	**1180.0**	Btu/ft^2-day	Constant; Number of Daily Events in a Year	365	365	days/year
Absolute Pressure		P_A	14.55	psi				
Ideal Gas Constant		R	10.73	psia ft3/lb-mole R	**Working Losses;** Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**2.03**	lb/yr
Product Information					Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	1,444	ft3/yr
Product Type			Diesel Additive		Working Loss Turnover Factor	KN	1.0000	
Vapor Molecular weight		Mv	**106**	Lb/lb-mole	Working Loss Product Factor	Kp	1.00	
Average organic liquid density		WL	**6.10**	lb/gal	Stock Vapor Density	Wv	0.0014	lb/ft3
Average Reid Vapor Pressure		RVP	**0.00**		Vent Setting Correction Factor	KB	1.00	
Product factor; 0.4 for crude oils or 1 for other organic liquids		Kc	1.00					
Vapor Pressure Equation Constant A		A	**0.00**		**Vented Vapor Saturation Factor;** Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure Equation Constant B		B	**0.0**	°R	Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0733	psia
					Vapor Space Outage	Hvo	0.00	ft
Tank design data								
Effective Height H_E = (Pi)D/4		H_E	**3.14**	ft	**Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]**	**KE**	**0.0468**	**per day**
Effective Diameter D_E = SQRT(LD/(Pi/4))		D_E	**7.40**	ft	Average Daily Vapor Temperature Range	ΔTv	26.15	°R
Throughput		Q	**10,800**	gal/yr	Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Turnovers		N	**10.69**	per year	Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
					Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0733	psia
Tank Cone Roof Slope (If unknown, use 0.0625)		SR	**0.0625**	ft/ft	Average Daily Liquid Surface Temperature	TLA	512.85	°R
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))		RR	**NA**	ft	Atmospheric Pressure	P_A	14.55	psia
Maximum Filling Height -use (Pi/4)D if unknown		HLX	**3.14**	ft				
Minimum Filling Height (use 0 if unknown)		HLN	**0.00**	ft	**Average Daily Vapor Temperature Range (ΔTv)**			
Liquid height (assume 1/2 H_E)		HL	**1.57**	ft	Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.8	°R
Tank Insulation (pick from drop down list)			Not Insulated		**Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)**	**ΔTv**	**26.15**	**°R**
Tank Construction (pick from drop down list)			Welded		**Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)**	**ΔTv**	**24.37**	°R
Tank Shell Color (pick from drop down list)			Gray, light		**Fully Insulated, constant temperature**	**ΔTv**	**0.00**	°R
Tank Shell Condition (pick from drop down list)			Average					
Tank Interior Condition (pick from drop down list)			Light Rust		**Average Daily Vapor Pressure Range (ΔPv)**			
Tank paint solar absorptance, dimensionless, Table 7.1-6		α	**0.58**		**Not Insulated - Equation 1-9: ΔPV = PVX - PVN**	ΔPv	**0.00000**	psia
Breather Vent Setting Range (Default Assumption: +/- 0.03)		PBP	0.03	psi	Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
		PBV	-0.03		Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
True Vapor Pressure; Sum of Components, PVAi=(0.019337)10^(A-(B/(TLA+C)))					Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTv	TLX	519.39	°R
Not Insulated		P_{VA}	0.0732593		Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTv	TLN	506.32	°R
Partially Insulated		P_{VA}	0.0738066					
Fully Insulated		P_{VA}	0.0666245		**Partially Insulated - Equation 1-9: ΔPV = PVX - PVN**	**ΔPv**	**0.00000**	**psia**
					Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN		**TAA**	**508.20**	°R	Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum ambient temperature, Table 7.1-7		TAX	517.10	°R	Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	519.15	°R
Average daily minimum ambient temperature, Table 7.1-7		TAN	499.30	°R	Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	506.97	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I		TB	510.25	°R	**Fully Insulated (ΔPv = 0)**	**ΔPv**	**0.00**	**psia**
Average Daily Liquid Surface Temperature (TLA)					**Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo**	**Vv**	**67.54**	ft3
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I		**TLA**	**512.85**	°R	Effective Tank diameter	D_E	7.40	ft
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I		**TLA**	**513.06**	°R	Effective Tank Height	H_E	3.14	ft
Fully Insulated: TLA = TB		**TLA**	**510.3**		Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft
Average Vapor Temperature (Tv)								
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I		**Tv**	**514.98**	**°R**				
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I		**Tv**	**515.87**	**°R**				
Fully Insulated; Tv = TB		**Tv**	**510.25**	**°R**				
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)								
Not Insulated		Wv	1.407E-03					
Partially Insulated		Wv	1.416E-03					
Fully Insulated		Wv	1.292E-03					

HAPS Speciation	lb/yr
Product	additive
Total HAP Emissions =	**3.657**

Eq. 40-2 $L_{Ti} = Z_{vi}(L_T)$ | Eq. 40-6 ZVi = yiMi / MV | Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/yr)	M_i	M_V	Z_{Vi}	$P_i = P_{VA}(x_i)$	P_{VA}	y_i
hexane	0.0000	86.18	106	0.00000	0.000000	0.073	-
benzene	0.0000	78.11	106	0.00000	0.000000	0.073	-
2,2,4 TMP	0.0000	114.23	106	0.00000	0.000000	0.073	-
toluene	0.0000	92.14	106	0.00000	0.000000	0.073	-
ethylbenzene	0.9353	106.17	106	0.25574	0.018735	0.073	**0.25574**
xylenes	2.7219	106.17	106	0.74426	0.054524	0.073	**0.74426**
naphthalene	0.0000	128.17	106	0.00E+00	0.00E+00	0.073	**0.00E+00**
cumene	0.0000	120.19	106	0.00E+00	0.00E+00	0.073	**0.00E+00**

	Liquid Mole Fraction				Component Vapor Pressure			
	Eq. 40-4 xi = (ZLiML)/Mi				PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.0000000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.5971
benzene	0.0000000	106.17	78.11	0.00000	6.906	1211	220.79	0.9663
2,2,4 TMP	0.0000000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4913
toluene	0.0000000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2670
ethylbenzene	0.2300000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0815
xylenes	0.7700000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0708
naphthalene	0.0000000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0017
cumene	0.0000000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0372

Monthly Calculations - JANUARY

Tank No.	A-5		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.09**	lb/month
		4.69E-05	ton/month
Time Period		**January**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**532.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**3.14**	ft
Diameter	D	**7.40**	ft
Throughput	Q	**900**	gal/month
Turnovers	N	**10.49**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**2.14**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**1.57**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
	PBV	**-0.03**	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0251317	
Partially Insulated	P_{VA}	0.0252289	
Fully Insulated	P_{VA}	0.0239284	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**483.25**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	490.70	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	475.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	484.18	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**485.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**485.44**	°R
Fully Insulated: TLA = TB	**TLA**	**484.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**486.30**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**486.71**	**°R**
Fully Insulated; Tv = TB	**Tv**	**484.18**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.113E-04	
Partially Insulated	Wv	5.129E-04	
Fully Insulated	Wv	4.890E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.03**	lb/month
Vapor Space Volume	Vv	67.5	ft3
Stock Vapor Density	Wv	0.0005	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.030	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.06**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	120	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0005	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0251	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0301**	**per day**
Average Daily Vapor Temperature Range	ΔTv	16.60	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0251	psia
Average Daily Liquid Surface Temperature	TLA	485.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	14.9	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**16.60**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**15.11**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	489.50	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	481.20	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	489.22	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	481.66	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**67.54**	ft3
Effective Tank diameter	D_E	7.40	ft
Effective Tank Height	H_E	3.14	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	0.094

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.025	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.025	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.025	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.025	-
ethylbenzene	0.0241	0.0083	0.0158	106.17	106	0.25714	0.006462	0.025	**0.25714**
xylenes	0.0696	0.0239	0.0457	106.17	106	0.74286	0.018669	0.025	**0.74286**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.025	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.025	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.7246
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4158
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2040
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1039
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0281
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0242
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0004
naphthalene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0117

Monthly Calculations (continued) FEBRUARY

Tank No.	A-5		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.11**	lb/month
		5.62E-05	ton/month
Time Period		**February**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**789.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**3.14**	ft
Diameter	D	**7.40**	ft
Throughput	Q	**900**	gal/month
Turnovers	N	**11.61**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**2.14**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**1.57**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0291193	
Partially Insulated	P_{VA}	0.0292833	
Fully Insulated	P_{VA}	0.0271094	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**485.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	493.80	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	477.80	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	487.17	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**488.91**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**489.05**	°R
Fully Insulated: TLA = TB	**TLA**	**487.2**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**490.33**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**490.93**	**°R**
Fully Insulated; Tv = TB	**Tv**	**487.17**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	5.876E-04	
Partially Insulated	Wv	5.902E-04	
Fully Insulated	Wv	5.506E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.04**	lb/month
Vapor Space Volume	Vv	67.5	ft3
Stock Vapor Density	Wv	0.0006	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.037	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	28	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.07**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	120	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0006	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0291	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0375**	**per day**
Average Daily Vapor Temperature Range	ΔTv	20.35	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0291	psia
Average Daily Liquid Surface Temperature	TLA	488.91	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	16.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**20.35**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**18.75**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	494.00	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	483.82	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	493.74	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	484.36	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**67.54**	ft3
Effective Tank diameter	D_E	7.40	ft
Effective Tank Height	H_E	3.14	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	0.112

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.029	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.029	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.029	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.029	-
ethylbenzene	0.0289	0.0107	0.0182	106.17	106	0.25696	0.007483	0.029	**0.25696**
xylenes	0.0835	0.0310	0.0525	106.17	106	0.74304	0.021637	0.029	**0.74304**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.029	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.029	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	0.8076
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.4669
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.2304
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1183
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0325
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0281
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0005
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0138

Monthly Calculations (continued) MARCH

Tank No.	A-5		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.19**	lb/month
		9.33E-05	ton/month
Time Period		**March**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1096.0**	Btu/ft²-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**3.14**	ft
Diameter	D	**7.40**	ft
Throughput	Q	**900**	gal/month
Turnovers	N	**10.49**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**2.14**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 H_E)	HL	**1.57**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0437548	
Partially Insulated	P_{VA}	0.04408	
Fully Insulated	P_{VA}	0.0398128	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**494.80**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	503.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	486.10	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	496.71	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**499.12**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**499.31**	°R
Fully Insulated: TLA = TB	**TLA**	**496.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**501.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**501.92**	**°R**
Fully Insulated; Tv = TB	**Tv**	**496.71**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	8.639E-04	
Partially Insulated	Wv	8.689E-04	
Fully Insulated	Wv	7.930E-04	

ROUTINE EMISSIONS CALCULATIONS	Symbol		Units
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.08**	lb/month
Vapor Space Volume	Vv	67.5	ft3
Stock Vapor Density	Wv	0.0009	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.046	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.10**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	120	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0009	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0438	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0457**	**per day**
Average Daily Vapor Temperature Range	ΔTv	24.89	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0438	psia
Average Daily Liquid Surface Temperature	TLA	499.12	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	17.4	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**24.89**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**23.15**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	505.35	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	492.90	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	505.10	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	493.52	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**67.54**	ft3
Effective Tank diameter	D_E	7.40	ft
Effective Tank Height	H_E	3.14	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft

HAPS Speciation	lb/month
Product	additive
Total HAP Emissions =	0.187

Eq. 40-2 $L_{Ti} = Z_{Vi}(L_T)$ — Vapor Weight Concentrations: Eq. 40-6 ZVi = yiMi / MV — Vapor Mole Fraction: Eq. 40-5 yi = Pi / PVA

Individual HAPS	L_{Ti} (lb/month)	Standing, lb/yr	Working, lb/yr	M_i	M_V	Z_{Vi}	$P_i = P_{VAi}(x_i)$	P_{VA}	y_i
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.044	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.044	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.044	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.044	-
ethylbenzene	0.0479	0.0212	0.0267	106.17	106	0.25645	0.011221	0.044	**0.25645**
xylenes	0.1388	0.0615	0.0773	106.17	106	0.74355	0.032534	0.044	**0.74355**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.044	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.044	**0.00E+00**

Liquid Mole Fraction: Eq. 40-4 xi = (ZLiML)/Mi — Component Vapor Pressure: PVAi=(0.019337)10^(A-(B/(TLA+C)))

Individual HAPS	Z_{Li}	M_L	M_i	X_i	A	B	C	P_{VAi}
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.0907
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.6434
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.3220
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.1694
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0488
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0423
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0009
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0214

Monthly Calculations (continued) — APRIL

Tank No.	A-5		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.34**	lb/month
		1.69E-04	ton/month
Time Period		**April**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1496.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**3.14**	ft
Diameter	D	**7.40**	ft
Throughput	Q	**900**	gal/month
Turnovers	N	**10.83**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**2.14**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 $H_{E)}$	HL	**1.57**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.0745883	
Partially Insulated	P_{VA}	0.0752936	
Fully Insulated	P_{VA}	0.0661361	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**507.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	517.50	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	497.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	510.05	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**513.35**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**513.61**	°R
Fully Insulated: TLA = TB	**TLA**	**510.1**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**516.04**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**517.17**	**°R**
Fully Insulated; Tv = TB	**Tv**	**510.05**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	1.430E-03	
Partially Insulated	Wv	1.440E-03	
Fully Insulated	Wv	1.283E-03	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.17**	lb/month
Vapor Space Volume	Vv	67.5	ft3
Stock Vapor Density	Wv	0.0014	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.057	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.17**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	120	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0014	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0746	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0571**	**per day**
Average Daily Vapor Temperature Range	ΔTv	31.42	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.0746	psia
Average Daily Liquid Surface Temperature	TLA	513.35	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	20.1	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**31.42**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**29.41**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	521.21	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	505.49	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	520.96	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	506.26	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**67.54**	ft3
Effective Tank diameter	D_E	7.40	ft
Effective Tank Height	H_E	3.14	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**0.337**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.075	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.075	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.075	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.075	-
ethylbenzene	0.0863	0.0423	0.0440	106.17	106	0.25571	0.019073	0.075	**0.25571**
xylenes	0.2511	0.1231	0.1280	106.17	106	0.74429	0.055515	0.075	**0.74429**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.075	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.075	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	1.6185
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	0.9801
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.4994
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.2713
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.0829
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.0721
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0018
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0380

Monthly Calculations (continued) — MAY

Tank No.	A-5		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.52**	lb/month
		2.62E-04	ton/month
Time Period		**May**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1739.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**3.14**	ft
Diameter	D	**7.40**	ft
Throughput	Q	**900**	gal/month
Turnovers	N	**10.49**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**2.14**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 $H_{E)}$	HL	**1.57**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.1114435	
Partially Insulated	P_{VA}	0.1126033	
Fully Insulated	P_{VA}	0.0976197	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**517.90**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	528.40	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	507.40	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	520.93	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**524.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**525.06**	°R
Fully Insulated: TLA = TB	**TLA**	**520.9**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**527.89**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**529.20**	**°R**
Fully Insulated; Tv = TB	**Tv**	**520.93**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.089E-03	
Partially Insulated	Wv	2.105E-03	
Fully Insulated	Wv	1.854E-03	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.27**	lb/month
Vapor Space Volume	Vv	67.5	ft3
Stock Vapor Density	Wv	0.0021	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.062	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	31	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.25**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	120	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0021	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1114	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0623**	**per day**
Average Daily Vapor Temperature Range	ΔTv	34.87	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1114	psia
Average Daily Liquid Surface Temperature	TLA	524.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	21.0	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**34.87**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**32.77**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	533.48	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	516.04	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	533.25	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	516.87	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**67.54**	ft3
Effective Tank diameter	D_E	7.40	ft
Effective Tank Height	H_E	3.14	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**0.524**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.111	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.111	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.111	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.111	-
ethylbenzene	0.1336	0.0695	0.0641	106.17	106	0.25510	0.028429	0.111	**0.25510**
xylenes	0.3901	0.2030	0.1872	106.17	106	0.74490	0.083014	0.111	**0.74490**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.111	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.111	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.1802
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.3462
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.6951
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.3870
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1236
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1078
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0030
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0584

Monthly Calculations (continued) — JUNE

Tank No.	A-5		
ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Total Losses (Eq.1-1: LT = LS+LW)	**LT**	**0.70**	lb/month
		3.51E-04	ton/month
Time Period		**June**	
Nearest US Location		**Albany, NY**	
Daily total solar insolation on a horizontal surface; Table 7.1-7	I	**1853.0**	Btu/ft^2-day
Absolute Pressure	P_A	14.55	psi
Ideal Gas Constant	R	10.73	piai ft3/lb-mole R
Product Information			
Product Type		**Diesel Additive**	
Vapor Molecular weight	Mv	**106**	Lb/lb-mole
Average organic liquid density	WL	**6.10**	lb/gal
Average Reid Vapor Pressure	RVP	**0.00**	
Product factor; 0.4 for crude oils or 1 for other organic liquids	Kc	**1.00**	
Vapor Pressure Equation Constant A	A	**0.00**	
Vapor Pressure Equation Constant B (Table 7.1-2)	B	**0.0**	°R
Tank design data			
Shell height	Hs	**3.14**	ft
Diameter	D	**7.40**	ft
Throughput	Q	**900**	gal/month
Turnovers	N	**10.83**	per year
Roof Type:		**0.00**	
Tank Cone Roof Slope (If unknown, use 0.0625)	SR	**0.0625**	ft/ft
Dome Roof Radius (If unknown, use tank diameter (D) or (2Rs))	RR	**NA**	ft
Maximum Filling Height -use (Pi/4)D if unknown	HLX	**2.14**	ft
Minimum Filling Height (use 0 if unknown)	HLN	**1.00**	ft
Liquid height (assume 1/2 $H_{E)}$	HL	**1.57**	ft
Tank Insulation (pick from drop down list)		**Not Insulated**	
Tank Construction (pick from drop down list)		**Welded**	
Tank Shell Color (pick from drop down list)		**Gray, light**	
Tank Shell Condition (pick from drop down list)		**Average**	
Tank Interior Condition (pick from drop down list)		**Light Rust**	
Tank paint solar absorptance, dimensionless, Table 7.1-6	α	**0.58**	
Breather Vent Setting Range (Default Assumption: +/- 0.03)	PBP	**0.03**	psi
		-0.03	
True Vapor Pressure; Eq. 1-25, PvA = exp(A-(B/TLA))			
Not Insulated	P_{VA}	0.1556972	
Partially Insulated	P_{VA}	0.1573442	
Fully Insulated	P_{VA}	0.1360798	
Average Daily Ambient Temperature (TAA); Eq. 1-30 TAA = ((TAX+TAN	**TAA**	**527.45**	°R
Average daily maximum ambient temperature, Table 7.1-7	TAX	537.30	°R
Average daily minimum ambient temperature, Table 7.1-7	TAN	517.60	°R
Liquid Bulk Temperature; Eq 1-31: TB = TAA + 0.003 αs I	TB	530.67	°R
Average Daily Liquid Surface Temperature (TLA)			
Not Insulated: Eq. 1-28, TLA = 0.4*TAA + 0.6*TB + 0.005*α*I	**TLA**	**534.76**	°R
Partially Insulated: Eq. 1-29, TLA = 0.3*TAA + 0.7*TB + 0.005*αR*I	**TLA**	**535.08**	°R
Fully Insulated: TLA = TB	**TLA**	**530.7**	
Average Vapor Temperature (Tv)			
Not Insulated; Eq. 1-33, Tv = 0.7*TAA + 0.3*TB + 0.009*α*I	**Tv**	**538.09**	**°R**
Partially Insulated; Eq. 1-34, Tv = 0.6*TAA + 0.4*TB + 0.01*αR*I	**Tv**	**539.49**	**°R**
Fully Insulated; Tv = TB	**Tv**	**530.67**	**°R**
Stock Vapor Density; Eq. 1-22, Wv = (Mv*PVA)/(R*Tv)			
Not Insulated	Wv	2.863E-03	
Partially Insulated	Wv	2.886E-03	
Fully Insulated	Wv	2.537E-03	

ROUTINE EMISSIONS CALCULATIONS	**Symbol**		**Units**
Standing Losses; Eq.1-2, Ls = 365 (Vv * Wv * KE * Ks)	**Ls**	**0.36**	lb/month
Vapor Space Volume	Vv	67.5	ft3
Stock Vapor Density	Wv	0.0029	lb/ft3
Vapor Space Expansion Factor (0 < KE <= 1); Eq. 1-5	KE	0.062	per day
Vented Vapor Saturation Factor	Ks	1.00	NA
Constant; Number of Daily Events in a Year	365	30	days/month
Working Losses; Eq.1-35, Lw = VQ * KN * Kp * Wv * KB	**Lw**	**0.34**	lb/month
Net Working Loss Throughput (Eq. 1-39: VQ=5.614*Q)	VQ	120	ft3/month
Working Loss Turnover Factor Eq 1-35 K_N=(180+N)/6N for N>36, else K_N=1	KN	1.0000	
Working Loss Product Factor	Kp	1.00	
Stock Vapor Density	Wv	0.0029	lb/ft3
Vent Setting Correction Factor	KB	1.00	
Vented Vapor Saturation Factor; Eq. 1-21, Ks = 1/(1+0.053*PvA*Hvo))	**Ks**	**1.00**	
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1557	psia
Vapor Space Outage	Hvo	0.00	ft
Vapor Space Expansion Factor (Eq. 1-5: (ΔTv/TLA)+[(ΔPv-ΔPB)/(PA-PvA)]	**KE**	**0.0618**	**per day**
Average Daily Vapor Temperature Range	ΔTv	35.28	°R
Average Daily Vapor Pressure Range	ΔPv	0.0000	psi
Breather Vent Pressure Setting Range (Equation 1-10: ΔPB = PBP - PBV)	ΔPB	0.0600	psi
Vapor Pressure at Avg Daily Liq Surface Temp	PvA	0.1557	psia
Average Daily Liquid Surface Temperature	TLA	534.76	°R
Atmospheric Pressure	P_A	14.55	psia
Average Daily Vapor Temperature Range (ΔTv)			
Average daily ambient temperature range - Equation 1-11 (ΔTA=TAX-TAN)	ΔTA	19.7	°R
Not Insulated - Equation 1-7 (ΔTV = 0.7 ΔTA + 0.02 α I)	**ΔTv**	**35.28**	**°R**
Partially Insulated - Equation 1-8 (ΔTV = 0.6 ΔTA + 0.02 αR I)	**ΔTv**	**33.31**	°R
Fully Insulated, constant temperature	**ΔTv**	**0.00**	°R
Average Daily Vapor Pressure Range (ΔPv)			
Not Insulated - Equation 1-9: ΔPV = PVX - PVN	ΔPv	**0.00000**	psia
Vapor pressure at ave. daily max liquid surface temp, (Eq. 1-25 PVX = exp[A	PVX	1.00000	psia
Vapor pressure at ave daily min liquid surface temp, (Eq. 1-25 PVN = exp[A	PVN	1.00000	psia
Average daily max. liquid surface temp.; Fig. 7.1-17 TLX = TLA + 0.25ΔTV	TLX	543.58	°R
Average daily min. liquid surface temp.; Fig. 7.1-17 TLN = TLA - 0.25ΔTV	TLN	525.94	°R
Partially Insulated - Equation 1-9: ΔPV = PVX - PVN	**ΔPv**	**0.00000**	**psia**
Vapor pressure at the average daily max liquid surface temp, (Eq. 1-25 using	PVX	1.00000	psia
Vapor pressure at the average daily min liquid surface temp, (Eq. 1-25 using	PVN	1.0000000	psia
Average daily maximum liquid surface temperature, deg R (TLX = TLA + 0.2	TLX	543.41	°R
Average daily minimum liquid surface temperature, deg R (TLN = TLA - 0.25	TLN	526.75	°R
Fully Insulated (ΔPv = 0)	**ΔPv**	**0.00**	**psia**
Vapor Space Volume (Eq.1-3: Vv = ((Pi / 4) D^2)Hvo	**Vv**	**67.54**	ft3
Effective Tank diameter	D_E	7.40	ft
Effective Tank Height	H_E	3.14	ft
Vapor Space Outage Hvo = 1/2 H_E	Hvo	1.57	ft

HAPS Speciation	**lb/month**
Product	additive
Total HAP Emissions =	**0.703**
Eq. 40-2 L_{Ti} =Z_{Vi}(L_T)	

				Vapor Weight Concentrations Eq. 40-6 ZVi = yiMi / MV			**Vapor Mole Fraction** Eq. 40-5 yi = Pi / PVA		
Individual HAPS	**L_{Ti} (lb/month)**	**Standing, lb/yr**	**Working, lb/yr**	**M_i**	**M_V**	**Z_{Vi}**	**$P_i = P_{VAi}(x_i)$**	**P_{VA}**	**y_i**
hexane	0.0000	0.0000	0.0000	86.18	106	0.00000	0.000000	0.156	-
benzene	0.0000	0.0000	0.0000	78.11	106	0.00000	0.000000	0.156	-
2,2,4 TMP	0.0000	0.0000	0.0000	114.23	106	0.00000	0.000000	0.156	-
toluene	0.0000	0.0000	0.0000	92.14	106	0.00000	0.000000	0.156	-
ethylbenzene	0.1789	0.0913	0.0877	106.17	106	0.25456	0.039634	0.156	**0.25456**
xylenes	0.5240	0.2673	0.2567	106.17	106	0.74544	0.116064	0.156	**0.74544**
naphthalene	0.0000	0.0000	0.0000	128.17	106	0.00E+00	0.00E+00	0.156	**0.00E+00**
cumene	0.0000	0.0000	0.0000	120.19	106	0.00E+00	0.00E+00	0.156	**0.00E+00**

	Liquid Mole Fraction Eq. 40-4 xi = (ZLiML)/Mi				**Component Vapor Pressure** PVAi=(0.019337)10^(A-(B/(TLA+C)))			
Individual HAPS	**Z_{Li}**	**M_L**	**M_i**	**X_i**	**A**	**B**	**C**	**P_{VAi}**
hexane	0.00000	106.17	86.18	0.00000	6.878	1171.5	224.37	2.7955
benzene	0.00000	106.17	78.11	0.00000	6.906	1211	220.79	1.7540
2,2,4 TMP	0.00000	106.17	114.23	0.00000	6.812	1257.8	220.74	0.9152
toluene	0.00000	106.17	92.14	0.00000	7.017	1377.6	222.64	0.5206
ethylbenzene	0.23000	106.17	106.17	0.23000	6.95	1419.3	212.61	0.1723
xylenes	0.77000	106.17	106.17	0.77000	7.009	1462.3	215.11	0.1507
naphthalene	0.00000	106.17	128.17	0.00000	7.146	1831.6	211.82	0.0046
cumene	0.00000	106.17	120.19	0.00000	6.929	1455.8	207.2	0.0835