TAT Refinery
Calculation Constants

Calculation Constants

Pollutant	Mol Wt lb/lbmol
NO2	46
CO	28
VOC (as CH4)	16
SO2	64
S	32

Fuel Natural Gas

Fuel S Content 100 ppmvd

$$\frac{100 \text{ lb-mol S}}{1000000 \text{ lb-mol CH4}} \quad 32 \quad \frac{\text{lb S}}{\text{lb-mol S}} \quad \frac{1}{359} \quad \frac{\text{lb-mol CH4}}{\text{scf}} = 8.91\text{E-06 lb S/scf}$$

Nat Gas Heat Content (LHV) 915.0 BTU/scf
Nat Gas Heat Content (HHV) 1050.0 BTU/scf

Exhaust Molar Density = 359 scf/lb-mol

Base Temperature = 460 deg R

Standard Temperature = 32 deg F

Standard Pressure = 14.7 psi

Heat Rate and Exhaust Flow Adjustment Factor = 1

Site Elevation 2080 feet

Site Ambient Pressure 13.59 psi

Emission Rate Contingency 10%

TAT Refinery
Performance Data

Furnace	Duty	Net Heat Const (LHV) (BTU/h)	Adjusted CT Heat Const (LHV) (BTU/h)
Crude Heater	100%	35,000,000	35,000,000
Reformer Heater 1	100%	3,000,000	3,000,000
Reformer Heater 2	100%	3,000,000	3,000,000
Reformer Heater 3	100%	8,000,000	8,000,000
Reformer Heater 4	100%	6,000,000	6,000,000
Reformer Heater 5	100%	1,500,000	1,500,000
Hydrocracker 1	100%	6,000,000	6,000,000
Hydrocracker 2	100%	7,000,000	7,000,000
Hydrocracker 3	100%	10,000,000	10,000,000
Hydrocracker 4	100%	7,000,000	7,000,000
Olefin	100%	30,000,000	30,000,000
Hydrogen	100%	50,000,000	50,000,000
Boiler 1	100%	20,000,000	20,000,000
Boiler 2	100%	20,000,000	20,000,000
Boiler 3	100%	20,000,000	20,000,000
Flare	100%	10,000,000	10,000,000
S Recovery Tail Gas			

TAT Refinery
Performance Data

Furnace	Duty	Fuel Usage (scf/hr)	Mfg's Exhaust Flow (lb/hr)	Adjusted Exhaust Flow (1) (lb/hr)	Exhaust Flow Wet (lbmol/hr)	Exhaust Flow Dry (lbmol/hr)	Exhaust Flow Dry @5%O2 (lbmol/hr)	Exhaust Flow (scfm)	Exhaust Flow (dscfm@ 5%O2)
Crude Heater	100%	38,251	28,216	28,216	1,019	833	937	6,097	5,775
Reformer Heater 1	100%	3,279	2,419	2,419	87	71	80	523	495
Reformer Heater 2	100%	3,279	2,419	2,419	87	71	80	523	495
Reformer Heater 3	100%	8,743	6,449	6,449	233	190	214	1,394	1,320
Reformer Heater 4	100%	6,557	4,837	4,837	175	143	161	1,045	990
Reformer Heater 5	100%	1,639	1,209	1,209	44	36	40	261	248
Hydrocracker 1	100%	6,557	4,837	4,837	175	143	161	1,045	990
Hydrocracker 2	100%	7,650	5,643	5,643	204	167	187	1,219	1,155
Hydrocracker 3	100%	10,929	8,062	8,062	291	238	268	1,742	1,650
Hydrocracker 4	100%	7,650	5,643	5,643	204	167	187	1,219	1,155
Olefin	100%	32,787	24,185	24,185	873	714	803	5,226	4,950
Hydrogen	100%	54,645	40,309	40,309	1,456	1,189	1,338	8,710	8,250
Boiler 1	100%	21,858	16,124	16,124	582	476	535	3,484	3,300
Boiler 2	100%	21,858	16,124	16,124	582	476	535	3,484	3,300
Boiler 3	100%	21,858	16,124	16,124	582	476	535	3,484	3,300
Flare	100%	10,929	500	500	18	15	17	108	102
S Recovery Tail Gas					55	44		331	

TAT Refinery
Performance Data

Furnace	Duty	Exhaust Temp (F)	Calc Exhaust Flow (acfm)	Molecular Weights (lb/lbmol)				
				39.92	28.01	32.00	44.01	18.02
				Wet Exhaust Analysis (% Volume)				
				Ar	N2	O2	CO2	H2O
Crude Heater	100%	410	11,664	0.84%	70.21%	2.45%	8.19%	18.30%
Reformer Heater 1	100%	410	1,000	0.84%	70.21%	2.45%	8.19%	18.30%
Reformer Heater 2	100%	410	1,000	0.84%	70.21%	2.45%	8.19%	18.30%
Reformer Heater 3	100%	410	2,666	0.84%	70.21%	2.45%	8.19%	18.30%
Reformer Heater 4	100%	410	2,000	0.84%	70.21%	2.45%	8.19%	18.30%
Reformer Heater 5	100%	410	500	0.84%	70.21%	2.45%	8.19%	18.30%
Hydrocracker 1	100%	410	2,000	0.84%	70.21%	2.45%	8.19%	18.30%
Hydrocracker 2	100%	410	2,333	0.84%	70.21%	2.45%	8.19%	18.30%
Hydrocracker 3	100%	410	3,333	0.84%	70.21%	2.45%	8.19%	18.30%
Hydrocracker 4	100%	410	2,333	0.84%	70.21%	2.45%	8.19%	18.30%
Olefin	100%	410	9,998	0.84%	70.21%	2.45%	8.19%	18.30%
Hydrogen	100%	410	16,663	0.84%	70.21%	2.45%	8.19%	18.30%
Boiler 1	100%	410	6,665	0.84%	70.21%	2.45%	8.19%	18.30%
Boiler 2	100%	410	6,665	0.84%	70.21%	2.45%	8.19%	18.30%
Boiler 3	100%	410	6,665	0.84%	70.21%	2.45%	8.19%	18.30%
Flare	100%	410	207	0.84%	70.21%	2.45%	8.19%	18.30%
S Recovery Tail Gas		100	407	0.72%	0.58%	2.88%	17.86%	20.05%

TAT Refinery
Performance Data

Furnace	Duty	Total Wet	Total Dry	Total Mol Wt Wet (lb/lbmol)	Total Mol Wt Dry (lb/lbmol)	Dry Exhaust Analysis (% Volume) Ar	N2	O2	CO2
Crude Heater	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Reformer Heater 1	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Reformer Heater 2	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Reformer Heater 3	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Reformer Heater 4	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Reformer Heater 5	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Hydrocracker 1	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Hydrocracker 2	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Hydrocracker 3	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Hydrocracker 4	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Olefin	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Hydrogen	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Boiler 1	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Boiler 2	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Boiler 3	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
Flare	100%	1.00	0.82	27.69	29.86	1.03%	85.95%	3.00%	10.03%
S Recovery Tail Gas		0.42	0.22	30.52	41.89	3.28%	2.62%	13.06%	81.04%

TAT Refinery
Emission Calculation Summary

Engine	Load	NOx Conc (ppmvd@15%O2)	Calc NOx as NO2 (lb/hr)	Calc NOx (lb/MMBTU)	CO Conc (ppmvd@15%O2)	Calc CO (lb/hr)	Calc CO (lb/MMBTU)	SO2 Conc (ppmvd@15%O2)
Crude Heater	100%	20	0.9	0.027	50	1.4	0.041	5.0
Reformer Heater 1	100%	20	0.1	0.027	50	0.1	0.041	5.0
Reformer Heater 2	100%	20	0.1	0.027	50	0.1	0.041	5.0
Reformer Heater 3	100%	20	0.2	0.027	50	0.3	0.041	5.0
Reformer Heater 4	100%	20	0.2	0.027	50	0.2	0.041	5.0
Reformer Heater 5	100%	20	0.0	0.027	50	0.1	0.041	5.0
Hydrocracker 1	100%	20	0.2	0.027	50	0.2	0.041	5.0
Hydrocracker 2	100%	20	0.2	0.027	50	0.3	0.041	5.0
Hydrocracker 3	100%	20	0.3	0.027	50	0.4	0.041	5.0
Hydrocracker 4	100%	20	0.2	0.027	50	0.3	0.041	5.0
Olefin	100%	20	0.8	0.027	50	1.2	0.041	5.0
Hydrogen	100%	20	1.4	0.027	50	2.1	0.041	5.0
Boiler 1	100%	20	0.5	0.027	50	0.8	0.041	5.0
Boiler 2	100%	20	0.5	0.027	50	0.8	0.041	5.0
Boiler 3	100%	20	0.5	0.027	50	0.8	0.041	5.0
Flare	100%		0.7	0.068		3.7	0.370	5.0

TAT Refinery
Emission Calculation Summary

Engine	Load	Calc 1 SO2 (lb/hr)	Calc 2 SO2 (lb/hr)	Calc SO2 (lb/MMBTU)	VOC Factor (lb/MMscf)	Calc VOC (lb/hr)	Calc VOC (lb/MMBTU)
Crude Heater	100%	0.33	0.68	0.0094	5.5	0.21	0.0060
Reformer Heater 1	100%	0.03	0.06	0.0094	5.5	0.02	0.0060
Reformer Heater 2	100%	0.03	0.06	0.0094	5.5	0.02	0.0060
Reformer Heater 3	100%	0.08	0.16	0.0094	5.5	0.05	0.0060
Reformer Heater 4	100%	0.06	0.12	0.0094	5.5	0.04	0.0060
Reformer Heater 5	100%	0.01	0.03	0.0094	5.5	0.01	0.0060
Hydrocracker 1	100%	0.06	0.12	0.0094	5.5	0.04	0.0060
Hydrocracker 2	100%	0.07	0.14	0.0094	5.5	0.04	0.0060
Hydrocracker 3	100%	0.09	0.19	0.0094	5.5	0.06	0.0060
Hydrocracker 4	100%	0.07	0.14	0.0094	5.5	0.04	0.0060
Olefin	100%	0.28	0.58	0.0094	5.5	0.18	0.0060
Hydrogen	100%	0.47	0.97	0.0094	5.5	0.30	0.0060
Boiler 1	100%	0.19	0.39	0.0094	5.5	0.12	0.0060
Boiler 2	100%	0.19	0.39	0.0094	5.5	0.12	0.0060
Boiler 3	100%	0.19	0.39	0.0094	5.5	0.12	0.0060
Flare	100%	0.01	0.19	0.0006		1.4	#REF!

TAT Refinery
Boiler HAP Emission Analysis

HAP Analysis - AP-42 Factors

HAP Name	1,3-Butadie	Acetaldehyde	Acrolein	Ammonia	Benzene	Ethylbenzene	Formaldehyde	Naphthalene	PAH (as Benzo(	Propylene Oxide	Toluene	Xylene (Total)
AP-42 Boiler Factor (lb/10^6 scf)					2.1E-03		7.5E-02		1.2E-06		3.4E-03	

Combined Cycle - Natural Gas Combustion

Engine	Load	Adjusted CT Heat Const (HHV) (MMBTU/h)	1,3-Butadiene (ton/yr)	Acetaldehyde (ton/yr)	Acrolein (ton/yr)	Ammonia (ton/yr)	Benzene (ton/yr)	Ethylbenzene (ton/yr)	Formaldehyde (ton/yr)	Naphthalene (ton/yr)	PAH (as Benzo(a)pyren (ton/yr)	Propylene Oxide (ton/yr)	Toluene (ton/yr)	Xylene (Total) (ton/yr)
Crude Heat	1	35.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E-04	0.0E+00	1.3E-02	0.0E+00	2.0E-07	0.0E+00	5.7E-04	0.0E+00
Reformer H	1	3.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-05	0.0E+00	1.1E-03	0.0E+00	1.7E-08	0.0E+00	4.9E-05	0.0E+00
Reformer H	1	3.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-05	0.0E+00	1.1E-03	0.0E+00	1.7E-08	0.0E+00	4.9E-05	0.0E+00
Reformer H	1	8.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.0E-05	0.0E+00	2.9E-03	0.0E+00	4.6E-08	0.0E+00	1.3E-04	0.0E+00
Reformer H	1	6.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-05	0.0E+00	2.2E-03	0.0E+00	3.4E-08	0.0E+00	9.8E-05	0.0E+00
Reformer H	1	1.50	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-05	0.0E+00	5.4E-04	0.0E+00	8.6E-09	0.0E+00	2.4E-05	0.0E+00
Hydrocrack	1	6.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-05	0.0E+00	2.2E-03	0.0E+00	3.4E-08	0.0E+00	9.8E-05	0.0E+00
Hydrocrack	1	7.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-05	0.0E+00	2.5E-03	0.0E+00	4.0E-08	0.0E+00	1.1E-04	0.0E+00
Hydrocrack	1	10.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-04	0.0E+00	3.6E-03	0.0E+00	5.7E-08	0.0E+00	1.6E-04	0.0E+00
Hydrocrack	1	7.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.0E-05	0.0E+00	2.5E-03	0.0E+00	4.0E-08	0.0E+00	1.1E-04	0.0E+00
Olefin	1	30.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-04	0.0E+00	1.1E-02	0.0E+00	1.7E-07	0.0E+00	4.9E-04	0.0E+00
Hydrogen	1	50.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E-04	0.0E+00	1.8E-02	0.0E+00	2.9E-07	0.0E+00	8.1E-04	0.0E+00
Boiler 1	1	20.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-04	0.0E+00	7.2E-03	0.0E+00	1.1E-07	0.0E+00	3.3E-04	0.0E+00
Boiler 2	1	20.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-04	0.0E+00	7.2E-03	0.0E+00	1.1E-07	0.0E+00	3.3E-04	0.0E+00
Boiler 3	1	20.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-04	0.0E+00	7.2E-03	0.0E+00	1.1E-07	0.0E+00	3.3E-04	0.0E+00
Flare	1	10.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-04	0.0E+00	3.6E-03	0.0E+00	5.7E-08	0.0E+00	1.6E-04	0.0E+00
S Recovery	0	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total			**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**2.4E-03**	**0.0E+00**	**8.5E-02**	**0.0E+00**	**1.4E-06**	**0.0E+00**	**3.8E-03**	**0.0E+00**

TAT Refinery
Boiler HAP Emission Analysis

HAP Analysis - AP-42 Factors

HAP Name
AP-42 Boiler Factor (lb/10^6 scf)

Combined Cycle - Natural Gas C
Adjusted CT Heat Const 0.126111

Engine	Load	(HHV) (MMBTU/h)	1,3-Butadiene (g/s)	Acetaldehyde (g/s)	Acrolein (g/s)	Ammonia (g/s)	Benzene (g/s)	Ethylbenzene (g/s)	Formaldehyde (g/s)	Naphthalene (g/s)	PAH (as Benzo(a)pyrene (g/s)	Propylene Oxide (g/s)	Toluene (g/s)	Xylene (Total) (g/s)
Crude Heat	1	35.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-05	0.0E+00	3.6E-04	0.0E+00	5.8E-09	0.0E+00	1.6E-05	0.0E+00
Reformer H	1	3.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.7E-07	0.0E+00	3.1E-05	0.0E+00	5.0E-10	0.0E+00	1.4E-06	0.0E+00
Reformer H	1	3.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.7E-07	0.0E+00	3.1E-05	0.0E+00	5.0E-10	0.0E+00	1.4E-06	0.0E+00
Reformer H	1	8.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-06	0.0E+00	8.3E-05	0.0E+00	1.3E-09	0.0E+00	3.7E-06	0.0E+00
Reformer H	1	6.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-06	0.0E+00	6.2E-05	0.0E+00	9.9E-10	0.0E+00	2.8E-06	0.0E+00
Reformer H	1	1.50	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E-07	0.0E+00	1.6E-05	0.0E+00	2.5E-10	0.0E+00	7.0E-07	0.0E+00
Hydrocrack	1	6.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-06	0.0E+00	6.2E-05	0.0E+00	9.9E-10	0.0E+00	2.8E-06	0.0E+00
Hydrocrack	1	7.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-06	0.0E+00	7.2E-05	0.0E+00	1.2E-09	0.0E+00	3.3E-06	0.0E+00
Hydrocrack	1	10.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-06	0.0E+00	1.0E-04	0.0E+00	1.7E-09	0.0E+00	4.7E-06	0.0E+00
Hydrocrack	1	7.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-06	0.0E+00	7.2E-05	0.0E+00	1.2E-09	0.0E+00	3.3E-06	0.0E+00
Olefin	1	30.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.7E-06	0.0E+00	3.1E-04	0.0E+00	5.0E-09	0.0E+00	1.4E-05	0.0E+00
Hydrogen	1	50.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-05	0.0E+00	5.2E-04	0.0E+00	8.3E-09	0.0E+00	2.3E-05	0.0E+00
Boiler 1	1	20.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-06	0.0E+00	2.1E-04	0.0E+00	3.3E-09	0.0E+00	9.4E-06	0.0E+00
Boiler 2	1	20.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-06	0.0E+00	2.1E-04	0.0E+00	3.3E-09	0.0E+00	9.4E-06	0.0E+00
Boiler 3	1	20.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-06	0.0E+00	2.1E-04	0.0E+00	3.3E-09	0.0E+00	9.4E-06	0.0E+00
Flare	1	10.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-06	0.0E+00	1.0E-04	0.0E+00	1.7E-09	0.0E+00	4.7E-06	0.0E+00
S Recovery	0	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Total			**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**1.4E-05**	**0.0E+00**	**5.2E-04**	**0.0E+00**	**8.3E-09**	**0.0E+00**	**2.3E-05**	**0.0E+00**

TAT Refinery
Modeling Exhaust Data Summary

Model Input Data - English Units

Source ID	Engine	Load	Exhaust Flow (acfm)	Exhaust Temp (F)	Exit Diam (ft)	Exit Height (ft)
00001	Crude Heater	100%	11,664	410	10	100
00002	Reformer Heat	100%	1,000	410	3	100
00003	Reformer Heat	100%	1,000	410	3	100
00004	Reformer Heat	100%	2,666	410	3	100
00005	Reformer Heat	100%	2,000	410	3	100
00006	Reformer Heat	100%	500	410	3	100
00007	Hydrocracker 1	100%	2,000	410	3	100
00008	Hydrocracker 2	100%	2,333	410	3	100
00009	Hydrocracker 3	100%	3,333	410	3	100
00010	Hydrocracker 4	100%	2,333	410	3	100
00011	Olefin	100%	9,998	410	3	100
00012	Hydrogen	100%	16,663	410	3	100
00013	Boiler 1	100%	6,665	410	3	100
00014	Boiler 2	100%	6,665	410	3	100
00015	Boiler 3	100%	6,665	410	3	100
00016	Flare	100%	2,418	1,832	3	180
00017	S Recovery Ta	0%	407	100	10	120

Model Input Data - Metric Units

	Engine	Load	Exit Height (m)	Exit Temp (K)	Exit Vel (m/s)	Exit Diam (m)
00001	Crude Heater	100%	30.48	483.0	0.75	3.048
00002	Reformer Heat	100%	30.48	483.0	0.72	0.914
00003	Reformer Heat	100%	30.48	483.0	0.72	0.914
00004	Reformer Heat	100%	30.48	483.0	1.92	0.914
00005	Reformer Heat	100%	30.48	483.0	1.44	0.914
00006	Reformer Heat	100%	30.48	483.0	0.36	0.914
00007	Hydrocracker 1	100%	30.48	483.0	1.44	0.914
00008	Hydrocracker 2	100%	30.48	483.0	1.68	0.914
00009	Hydrocracker 3	100%	30.48	483.0	2.40	0.914
00010	Hydrocracker 4	100%	30.48	483.0	1.68	0.914
00011	Olefin	100%	30.48	483.0	7.19	0.914
00012	Hydrogen	100%	30.48	483.0	11.98	0.914
00013	Boiler 1	100%	30.48	483.0	4.79	0.914
00014	Boiler 2	100%	30.48	483.0	4.79	0.914
00015	Boiler 3	100%	30.48	483.0	4.79	0.914
00016	Flare	100%	54.86	1273.0	40.30	0.835

TAT Refinery
Example Calculation

Sample Exhaust Flow and NOx Mass Emission Rate Calculation

Boiler
Crude Heater

Exhaust Flow	28,216	lb/hr	Engineering Data
Exhaust Mol Weight Wet	27.69	lb/lbmol	Engineering Data
Exhaust Mol Weight Dry	29.86	lb/lbmol	Engineering Data
Exhaust H2O	18.30%		Engineering Data
Exhaust O2 Wet	2.45%		Engineering Data
Ehaust O2 Dry	3.00%		Engineering Data
Ideal Gas Density	359	scf/lbmol	
NOx Mol Weight	46	lb/lbmol	
Exhaust Temp	410	deg F	
Base Temperature	460	deg F	
Standard Temperature	32	deg F	
Ambient Pressure	13.59	psi	
Standard Pressure	14.70	psi	

Exhaust Flow

$$\frac{28{,}216}{1}\ \frac{lb}{hr} * \frac{1}{27.69}\ \frac{lbmol}{lb} = 1{,}019\ \frac{lbmol\ wet}{hr}$$

$$1{,}019\ \frac{lbmol\ wet}{hr} * 359\ \frac{scf}{lbmol} = 365{,}822\ \frac{scf}{hr}$$

$$365{,}822\ \frac{scf}{hr} * \left(\frac{460 + 410}{460 + 32}\right) * \frac{14.70}{13.59} = 699{,}842\ \frac{acf}{hr}$$

$$699{,}842\ \frac{acf}{hr} * \frac{1\ hr}{60\ min} = 11{,}664\ \frac{acf}{min}$$

Mass Emission Calculation

Remove H2O from Exhaust

H2O Volume $\quad 1{,}019\ lbmol * 18.30\% = 186\ \frac{lbmol\ H2O}{hr}$

$1{,}019\ lbmol - 186 = 833\ \frac{lbmol\ exhaust\ dry}{hr}$

Correct to 5% O2

$21.00\% - 3.00\% = 18.00\%$

$21.00\% - 5.00\% = 16.00\%$

$833 * \left(\frac{18.00\%}{16.00\%}\right) = 937\ \frac{lbmol\ exhaust\ dry\ corrected\ to\ 15\%\ O2}{hr}$

NOx Emissions = $\quad 20$ ppmvd @ 15% O2

$937 * \frac{20}{1.00E+06} = 0.02\ \frac{lbmol\ NOx}{hr}$

$$\frac{0.02}{1}\ \frac{lbmol\ NOx}{hr} * \frac{46}{1}\ \frac{lb}{lbmol} = 0.9\ \frac{lb\ NOx}{hr}$$

10% Contingency $\quad 0.9 * (1 + 0.10) = 0.9\ \frac{lb\ NOx}{hr}$

TAT Refinery
Example Calculation

Sample Exhaust Flow and CO Mass Emission Rate Calculation

Boiler
Crude Heater

Exhaust Flow	28,216	lb/hr	Engineering Data
Exhaust Mol Weight Wet	27.69	lb/lbmol	Engineering Data
Exhaust Mol Weight Dry	29.86	lb/lbmol	Engineering Data
Exhaust H2O	18.30%		Engineering Data
Exhaust O2 Wet	2.45%		Engineering Data
Ehaust O2 Dry	3.00%		Engineering Data
Ideal Gas Density	359	scf/lbmol	
CO Mol Weight	28	lb/lbmol	
Exhaust Temp	410	deg F	
Base Temperature	460	deg F	
Standard Temperature	32	deg F	
Ambient Pressure	13.59	psi	
Standard Pressure	14.70	psi	

Exhaust Flow

$$\frac{28{,}216}{1}\ \frac{lb}{hr} * \frac{1}{27.69}\ \frac{lbmol}{lb} = 1{,}019\ \frac{lbmol\ wet}{hr}$$

$$1{,}019\ \frac{lbmol\ wet}{hr} * 359\ \frac{scf}{lbmol} = 365{,}822\ \frac{scf}{hr}$$

$$365{,}822\ \frac{scf}{hr} * \left(\frac{460 + 410}{460 + 32}\right) * \frac{14.70}{13.59} = 699{,}842\ \frac{acf}{hr}$$

$$699{,}842\ \frac{acf}{hr} * \frac{1\ hr}{60\ min} = 11{,}664\ \frac{acf}{min}$$

Mass Emission Calculation

Remove H2O from Exhaust

H2O Volume $1{,}019\ lbmol * 18.30\% = 186\ \frac{lbmol\ H2O}{hr}$

$1{,}019\ lbmol - 186 = 833\ \frac{lbmol\ exhaust\ dry}{hr}$

Correct to 5% O2

$21.00\% - 3.00\% = 18.00\%$

$21.00\% - 5.00\% = 16.00\%$

$833 * \left(\frac{18.00\%}{16.00\%}\right) = 937\ \frac{lbmol\ exhaust\ dry\ corrected\ to\ 15\%\ O2}{hr}$

CO Emissions = 50 ppmvd @ 15% O2

$937 * \frac{50}{1.00E+06} = 0.05\ \frac{lbmol\ CO}{hr}$

$\frac{0.05}{1}\ \frac{lbmol\ CO}{hr} * \frac{28}{1}\ \frac{lb}{lbmol} = 1.3\ \frac{lb\ CO}{hr}$

10% Contingency $1.3 * (1 + 0.10) = 1.4\ \frac{lb\ CO}{hr}$

TAT Refinery
Example Calculation

Sample Exhaust Flow and VOC Mass Emission Rate Calculation

Boiler
Crude Heater

Exhaust Flow	28,216	lb/hr	Engineering Data
Exhaust Mol Weight Wet	27.69	lb/lbmol	Engineering Data
Exhaust Mol Weight Dry	29.86	lb/lbmol	Engineering Data
Exhaust H2O	18.30%		Engineering Data
Exhaust O2 Wet	2.45%		Engineering Data
Ehaust O2 Dry	3.00%		Engineering Data
Ideal Gas Density	359	scf/lbmol	
VOC Mol Weight	16	lb/lbmol	
Exhaust Temp	410	deg F	
Base Temperature	460	deg F	
Standard Temperature	32	deg F	
Ambient Pressure	13.59	psi	
Standard Pressure	14.70	psi	

Exhaust Flow

$$\frac{28{,}216}{1}\ \frac{lb}{hr} * \frac{1}{27.69}\ \frac{lbmol}{lb} = 1{,}019\ \frac{lbmol\ wet}{hr}$$

$$1{,}019\ \frac{lbmol\ wet}{hr} * 359\ \frac{scf}{lbmol} = 365{,}822\ \frac{scf}{hr}$$

$$365{,}822\ \frac{scf}{hr} * \left(\frac{460 + 410}{460 + 32}\right) * \frac{14.70}{13.59} = 699{,}842\ \frac{acf}{hr}$$

$$699{,}842\ \frac{acf}{hr} * \frac{1\ hr}{60\ min} = 11{,}664\ \frac{acf}{min}$$

Mass Emission Calculation

Remove H2O from Exhaust

H2O Volume $\quad 1{,}019\ lbmol * 18.30\% = 186\ \frac{lbmol\ H2O}{hr}$

$1{,}019\ lbmol - 186 = 833\ \frac{lbmol\ exhaust\ dry}{hr}$

Correct to 15% O2

$21.00\% - 3.00\% = 18.00\%$

$21.00\% - 15.00\% = 6.00\%$

$833 * \left(\frac{18.00\%}{6.00\%}\right) = 2{,}498\ \frac{lbmol\ exhaust\ dry\ corrected\ to\ 15\%\ O2}{hr}$

VOC Emissions = $\quad 50\ ppmvd\ @\ 15\%\ O2$

$2{,}498 * \frac{50}{1.00E+06} = 0.12\ \frac{lbmol\ VOC}{hr}$

$$\frac{0.12}{1}\ \frac{lbmol\ VOC}{hr} * \frac{16}{1}\ \frac{lb}{lbmol} = 2.0\ \frac{lb\ VOC}{hr}$$

10% Contingency $\quad 2.0 * (1 + 0.10) = 2.2\ \frac{lb\ VOC}{hr}$

TAT Refinery
Example Calculation

Sample Exhaust Flow and SO2 Mass Emission Rate Calculation

Boiler
Crude Heater

Exhaust Flow	28,216	lb/hr	Engineering Data
Exhaust Mol Weight Wet	27.69	lb/lbmol	Engineering Data
Exhaust Mol Weight Dry	29.86	lb/lbmol	Engineering Data
Exhaust H2O	18.30%		Engineering Data
Exhaust O2 Wet	2.45%		Engineering Data
Ehaust O2 Dry	3.00%		Engineering Data
Ideal Gas Density	359	scf/lbmol	
SO2 Mol Weight	64	lb/lbmol	
Exhaust Temp	410	deg F	
Base Temperature	460	deg F	
Standard Temperature	32	deg F	
Ambient Pressure	13.59	psi	
Standard Pressure	14.70	psi	

Exhaust Flow

$$\frac{28{,}216}{1}\ \frac{lb}{hr} * \frac{1}{27.69}\ \frac{lbmol}{lb} = 1{,}019\ \frac{lbmol\ wet}{hr}$$

$$1{,}019\ \frac{lbmol\ wet}{hr} * 359\ \frac{scf}{lbmol} = 365{,}822\ \frac{scf}{hr}$$

$$365{,}822\ \frac{scf}{hr} * \left(\frac{460 + 410}{460 + 32}\right) * \frac{14.70}{13.59} = 699{,}842\ \frac{acf}{hr}$$

$$699{,}842\ \frac{acf}{hr} * \frac{1\ hr}{60\ min} = 11{,}664\ \frac{acf}{min}$$

Mass Emission Calculation

Remove H2O from Exhaust

H2O Volume: 1,019 lbmol * 18.30% = 186 $\frac{lbmol\ H2O}{hr}$

1,019 lbmol - 186 = 833 $\frac{lbmol\ exhaust\ dry}{hr}$

Correct to 5% O2

21.00% - 3.00% = 18.00%

21.00% - 5.00% = 16.00%

$$833 * \left(\frac{18.00\%}{16.00\%}\right) = 937\ \frac{lbmol\ exhaust\ dry\ corrected\ to\ 15\%\ O2}{hr}$$

SO2 Emissions = 5 ppmvd @ 15% O2

$$937 * \frac{5}{1.00E+06} = 0.005\ \frac{lbmol\ SO2}{hr}$$

$$\frac{0.005}{1}\ \frac{lbmol\ SO2}{hr} * \frac{64}{1}\ \frac{lb}{lbmol} = 0.3\ \frac{lb\ SO2}{hr}$$

10% Contingency: $0.3 * (1 + 0.10) = 0.3\ \frac{lb\ SO2}{hr}$

TAT Refinery
Example Calculation

Sample SO2 Calculation

Boiler
Crude Heater

Fuel Heat Content (LHV) =	915.0	BTU/scf
Heat Input =	35	MMBTU/hr
Ideal Gas Density	359	scf/lbmol
S Mol Weight	32	lb
SO2 Mol Weight	64	lb
Fuel S Concentration	100	ppmvd

Calculate Fuel Flow

$$35{,}000{,}000 \frac{\text{BTU}}{\text{hr}} * \frac{1 \text{ scf}}{915 \text{ BTU}} = 38{,}251 \frac{\text{scf}}{\text{hr}}$$

Calculate Sulfur Emissions

$$\frac{100 \text{ lb-mol S}}{1000000 \text{ lb-mol CH4}} * 32 \frac{\text{lb S}}{\text{lb-mol S}} * \frac{1 \text{ lb-mol CH4}}{359 \text{ scf}} = 8.91\text{E-06} \frac{\text{lb S}}{\text{scf}}$$

$$8.91\text{E-06} \frac{\text{lb S}}{\text{scf}} * 38{,}251 \frac{\text{scf}}{\text{hr}} = 0.341 \frac{\text{lb S}}{\text{hr}}$$

$$0.3410 \frac{\text{lb S}}{\text{hr}} * \frac{64 \text{ lb SO2}}{32 \text{ lb S}} = 0.68 \frac{\text{lb SO2}}{\text{hr}}$$

TAT Refinery
Example Calculation

Flare Sample NOx Calculation

Hours per Day	24
Hours per Year	8760

NOx Emis Factor = 0.068 lb/MMBTU (AP-42 Table 13.5-1)
Flare Heat Input = 10.0 MMBTU/hr

Calculate NOx Emissions

$$10.0000 \frac{\text{MMBTU}}{\text{hr}} * 0.068 \frac{\text{lb}}{\text{MMBTU}} = 0.68 \frac{\text{lb}}{\text{hr}}$$

Instantaneous Emissions

$$0.68 \frac{\text{lb}}{\text{hr}} * \frac{454}{3600} \frac{\text{gm-hr}}{\text{lb-s}} = 0.09 \frac{\text{gm}}{\text{s}}$$

Daily Emissions

$$0.09 \frac{\text{gm}}{\text{s}} * \frac{24}{24} \frac{\text{hr}}{\text{hr}} = 0.09 \frac{\text{gm}}{\text{s}}$$

Annual Emissions

$$0.09 \frac{\text{gm}}{\text{s}} * \frac{8760}{8760} \frac{\text{hr}}{\text{hr}} = 0.09 \frac{\text{gm}}{\text{s}}$$

$$0.09 \frac{\text{gm}}{\text{s}} * 31{,}536{,}000 \frac{\text{s}}{\text{yr}} * \frac{1}{908{,}000} \frac{\text{ton}}{\text{gm}} = 2.98 \frac{\text{ton}}{\text{yr}}$$

MHA Refinery

Tail Gas Exhaust Calculations

Species	Exhaust Flow (lb-mol/hr)	Molecular Weight (lb/lb-mol)	Emission Rate (lb/hr)
Ar	0.40	39.948	15.98
CO	0.17	28.010	4.76
CO2	9.87	44.009	434.37
H2	0.17	2.016	0.34
H2O	11.08	18.015	199.61
N2	31.87	28.014	892.81
O2	1.59	31.998	50.88
SO2	0.11	64.063	7.05

Total Wet	55.26	lb-mol/hr
Total Dry	44.18	lb-mol/hr
Mol Density	359	scf/lb-mol
Flow Rate	19,838	scf/hr
	331	scfm
Stack Temp	100	F
Base Temperature =	460	deg R
Standard Temperature =	32	deg F
Standard Pressure =	14.7	psi
Site Elevation	2080	feet
Site Ambient Pressure	13.59	psi
Flow Rate	407	acfm

MHA Refinery

Soybean Processing Emission Factors

Process	PM10 Emission Factor lb/ton
Truck Unloading	0.059
Meal Handling	0.034
Meal Loadout	0.029

Emission factors from AP-42
Table 9.9.1-1. Particulate Emission Factors For Grain Elevators

MHA Refinery

Soy Bean Processing Emission Rates

Soy Beans	765,000	lb/day
	15.94	ton/hr

	Process Rate	Uncontrolled		Control	Controlled			
	ton/hr	lb/hr	ton/yr		lb/hr	ton/yr	gm/s	Source ID
Truck Unloading	15.94	0.94	4.12	0%	0.94	4.12	0.1186	20
Meal Handling	15.94	0.54	2.37	0%	0.54	2.37	0.0683	21
Meal Loadout	15.94	0.46	2.02	0%	0.46	2.02	0.0583	22
Total			**8.52**		**1.94**	**8.52**		

Stack Data (all stacks)

Stack Height	20	ft
Stack Exhaust Temp	70	F
Stack Diam	1	ft
Stack Exhaust Flow	1000	acfm
	21.22	ft/s

Stack Height m	Stack Temp K	Stack Velocity m/s	Stack Diam m
6.10	294.1	6.47	0.30

Table 9.9.1-1. PARTICULATE EMISSION FACTORS FOR GRAIN ELEVATORSa

Emission Source
Grain receiving (SCC 3-02-005-05)
Straight truck (SCC 3-02-005-51)
Hopper truck (SCC 3-02-005-52)
Railcar (SCC 3-02-005-53)
Barge (SCC 3-02-005-54)
Continuous barge unloader (SCC 3-02-005-56)
Marine leg (SCC 3-02-005-57)
Ships (SCC 3-02-005-55)
Grain cleaning (SCC 3-02-005-03)
Internal vibrating (SCC 3-02-005-37)
Grain drying (SCC 3-02-005-04)
Column dryer (SCC 3-02-005-27)
Rack dryer (SCC 3-02-005-28)
Self-cleaning screens (<50 mesh)
Headhouse and grain handling (SCC 3-02-005-30) (legs, conveyors, belts, distributor, scale,enclosed cleaners, etc
Storage bin (vent) (SCC 3-02-005-40)
Grain shipping (SCC 3-02-005-06)
Truck (unspecified) (SCC 3-02-005-60)
Railcar (SCC 3-02-005-63)
Barge (SCC 3-02-005-64)
Ship (SCC 3-02-005-65*)

a Specific sources of emission factors are cited in Reference 1, Table 4-16 and supporting tables, except as indica
Factors are in units of lb/ton of grain handled or processed. Lb/ton divided by 2 gives kg/Mg. SCC = Source Classif
data available. Example uses of emission factors in this table are provided in Section 9.9.1.3.
b Weight of total filterable PM, regardless of size, per unit weight of grain throughput.
c Weight of PM # 10 micrometers (μm) in aerodynamic diameter per unit weight of grain throughput.
d Weight of PM # 2.5μm in aerodynamic diameter per unit weight of grain throughput.
e Mean of two values from References 18 and 19.
f Reference 19.
g Emission factor for PM-10 scaled to PM-2.5 using the mean ratio of 17 percent from Reference 40.
h PM-10 emission factor scaled to total particulate using the ratio of 25 percent presented in Reference 1.
j Reference 40.
k Unloading a vessel with a marine leg is analogous to use of a marine leg in barge unloading.
m Mean of six A- and C-rated data points from References 20, 21, 22, 23, and 24.
n PM-10 emission factor estimated by taking 25 percent of the filterable PM emission factor.
p Mean of two D-rated data points from Reference 2.
q Based on average of wheat and sorghum PM emission factors reported in Reference 42. PM emission factors ba
aspirated capture/collection system. Due to natural removal processes, uncontrolled emissions may be overestima
emissions that occur without such a system.

Type of Control	FILTERABLE PM	FOOTNOTE	RATING	PM-10c	FOOTNOTE	RATING	PM-2.5d
None	0.18	e	E	0.059	f	E	0.01
None	0.035	e	E	0.0078	f	E	0.0013
None	0.032	f	E	0.0078	f	E	0.0013
None	0.029	h	E	0.0073	j	E	0.0019
None	0.15	h	E	0.038	j	E	0.005
None	0.15	k	E	0.038	k	E	0.005
Cyclone	0.075	m	E	0.019	n	E	0.0032
None	0.22	p	E	0.055	n	E	0.0094
None	3	p	E	0.75	n	E	0.13
	0.47	p	E	0.12	n	E	0.02
None	0.061	f	E	0.034	f	E	0.0058
None	0.025	q	E	0.0063	n,q	E	0.0011
None	0.086	e	E	0.029	f	E	0.0049
None	0.027	f	E	0.0022	f	E	0.00037
None	0.016	h	E	0.004	j	E	0.00055
None	0.048	h	E	0.012	j	E	0.0022

ated in the following footnotes.
fication Code. ND = no

ased on data at the inlet of an
ated compared to those

FOOTNOTE	RATING
g	E
g	E
g	E
j	E
j	E
k	E
g	E
g	E
g	E
g	E
g	E
g,q	E
g	E
g	E
j	E
j	E

MHA Refinery

Standby Generator Data Source Number 19

Operating Data

Annual Operating Hours	500			
Daily Operating Hours	1			
Hours per 3 Hour Period	1			
Rated Power	1490	hp		
Fuel Consumption	69.3	gal/hr	0.137 MMBTU/gal	491.3 lb/hr
Heat Input	9.5	MMBTU/hr		

Emissions Data

	Emission Factor	Emissions (lb/hr)	Instant (gm/s)	3-Hour (gm/s)	Daily (gm/s)	Annual (gm/s)	Annual (ton/yr)
NOx (gm/hp-hr)	6.00	19.6916	2.4833	0.8278	0.1035	0.1417	4.9229
CO (gm/hp-hr)	0.44	1.4441	0.1821	0.0607	0.0076	0.0104	0.3610
VOC (gm/hp-hr)	0.12	0.3938	0.0497	0.0166	0.0021	0.0028	0.0985
SOx (as SO2) (weight fraction)	0.001	0.4913	0.0620	0.0207	0.0026	0.0035	0.1228
PM10 (gm/hp-hr)	0.05	0.1641	0.0207	0.0069	0.0009	0.0012	0.0410

Note: SO2 emission factor based on fuel sulfur concentration of 0.05% by weight

Stack Data

Stack Height	20	ft
Stack Exhaust Temp	975	F
Stack Diam	1	ft
Stack Exhaust Flow	7775	acfm
	164.99	ft/s

Stack Height m	Stack Temp K	Stack Velocity m/s	Stack Diam m
6.10	796.9	50.29	0.30

MHA Refinery

Standby Generator HAP Emission Calculations

Daily Operating Hours	1
Annual Operating Hours	500

Fuel Usage 9.4941 MMBTU/hr

HAP	1,3-butadiene	acetaldehyde	acrolein	ammonia	benzene	ethylbenzene	formaldehyde
Factor (AP-42 Table 3.3-2 - lb/MMBTU)	3.91E-05	7.67E-04	9.25E-05		9.33E-04		1.18E-03
Instantaneous Emissions (lb/hr)	3.71E-04	7.28E-03	8.78E-04	0.00E+00	8.86E-03	0.00E+00	1.12E-02
Instantaneous Emissions (gm/s)	4.68E-05	9.18E-04	1.11E-04	0.00E+00	1.12E-03	0.00E+00	1.41E-03
Average Daily Emissions (gm/s)	1.95E-06	3.83E-05	4.61E-06	0.00E+00	4.65E-05	0.00E+00	5.89E-05
Average Annual Emissions (gm/s)	2.67E-06	5.24E-05	6.32E-06	0.00E+00	6.38E-05	0.00E+00	8.06E-05
Average Annual Emissions (ton/yr)	9.28E-05	1.82E-03	2.20E-04	0.00E+00	2.21E-03	0.00E+00	2.80E-03

MHA Refinery

Standby Generator HAP Emission Calculatic

Daily Operating Hours
Annual Operating Hours

Fuel Usage

HAP	naphthalene	PAH as Benzo(	propylene oxi	toluene	xylene
Factor (AP-42 Table 3.3-2 - lb/MMBTU)	8.48E-05	1.68E-04		4.09E-04	2.85E-04

Instantaneous Emissions (lb/hr)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
8.05E-04	1.60E-03	0.00E+00	3.88E-03	2.71E-03

Instantaneous Emissions (gm/s)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
1.02E-04	2.01E-04	0.00E+00	4.90E-04	3.41E-04

Average Daily Emissions (gm/s)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
4.23E-06	8.38E-06	0.00E+00	2.04E-05	1.42E-05

Average Annual Emissions (gm/s)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
5.80E-06	1.15E-05	0.00E+00	2.80E-05	1.95E-05

Average Annual Emissions (ton/yr)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
2.01E-04	3.99E-04	0.00E+00	9.71E-04	6.76E-04

	NOx	CO	SO2	VOC	PM10
Instant	2.4833	0.1821	0.0620	0.0497	0.0207
3-Hour	0.8278	0.0607	0.0207	0.0166	0.0069
Daily	0.1035	0.0076	0.0026	0.0021	0.0009
Annual	0.1417	0.0104	0.0035	0.0028	0.0012
ual (ton/	4.9229	0.3610	0.1228	0.0985	0.0410

MHA Refinery

Fire Pump Data Source Number 18

Operating Data

Annual Operating Hours	500			
Daily Operating Hours	1			
Hours per 3 Hour Period	1			
Rated Power	290	hp		
Fuel Consumption	13.5	gal/hr	0.137 MMBTU/gal	95.7
Heat Input	1.8	MMBTU/hr		

Emissions Data

	Emission Factor	Emissions (lb/hr)	Instant	3-Hour (gm/s)	Daily
NOx (gm/hp-hr)	5.70	3.6410	0.4592	0.1531	0.0191
CO (gm/hp-hr)	0.25	0.1597	0.0201	0.0067	0.0008
VOC (gm/hp-hr)	0.08	0.0511	0.0064	0.0021	0.0003
SOx (as SO2) (weight fraction)	0.001	0.0957	0.0121	0.0040	0.0005
PM10 (gm/hp-hr)	0.07	0.0447	0.0056	0.0019	0.0002

Note: SO2 emission factor from EPA AP-42, Tables 3.3-1.

Stack Data

Stack Height	20	ft
Stack Exhaust Temp	855	F
Stack Diam	1	ft
Stack Exhaust Flow	1506	acfm
	31.96	ft/s

MHA Refinery

Fire Pump HAP Emission Calculations

Daily Operating Hours	1
Annual Operating Hours	500
Fuel Usage	1.8495 MMBTU/hr

HAP	1,3-butadiene	acetaldehyde	acrolein	ammonia	benzene	ethylbenzene	formaldehyde
Factor (AP-42 Table 3.3-2 - lb/MMBTU)	3.91E-05	7.67E-04	9.25E-05		9.33E-04		1.18E-03
Instantaneous Emissions (lb/hr)	7.23E-05	1.42E-03	1.71E-04	0.00E+00	1.73E-03	0.00E+00	2.18E-03
Instantaneous Emissions (gm/s)	9.12E-06	1.79E-04	2.16E-05	0.00E+00	2.18E-04	0.00E+00	2.75E-04
Average Daily Emissions (gm/s)	3.80E-07	7.45E-06	8.99E-07	0.00E+00	9.07E-06	0.00E+00	1.15E-05
Average Annual Emissions (gm/s)	5.21E-07	1.02E-05	1.23E-06	0.00E+00	1.24E-05	0.00E+00	1.57E-05
Average Annual Emissions (ton/yr)	1.81E-05	3.55E-04	4.28E-05	0.00E+00	4.31E-04	0.00E+00	5.46E-04

MHA Refinery

Fire Pump HAP Emission Calculations

Daily Operating Hours
Annual Operating Hours

Fuel Usage

HAP	naphthalene	PAH as Benzo(	propylene oxi	toluene	xylene
Factor (AP-42 Table 3.3-2 - lb/MMBTU)	8.48E-05	1.68E-04		4.09E-04	2.85E-04

Instantaneous Emissions (lb/hr)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
1.57E-04	3.11E-04	0.00E+00	7.56E-04	5.27E-04

Instantaneous Emissions (gm/s)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
1.98E-05	3.92E-05	0.00E+00	9.54E-05	6.65E-05

Average Daily Emissions (gm/s)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
8.24E-07	1.63E-06	0.00E+00	3.97E-06	2.77E-06

Average Annual Emissions (gm/s)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
1.13E-06	2.24E-06	0.00E+00	5.44E-06	3.79E-06

Average Annual Emissions (ton/yr)

naphthalene	Benzo(a) pyre	propylene oxi	toluene	xylene
3.92E-05	7.77E-05	0.00E+00	1.89E-04	1.32E-04

	NOx	CO	SO2	VOC	PM10
Instant	0.4592	0.0201	0.0121	0.0064	0.0056
3-Hour	0.1531	0.0067	0.0040	0.0021	0.0019
Daily	0.0191	0.0008	0.0005	0.0003	0.0002
Annual	0.0262	0.0011	0.0007	0.0004	0.0003
ual (ton/	0.9102	0.0399	0.0239	0.0128	0.0112

Truck	Empty (lbs)	Material	Mat. Dens (lb/unit)	Capacity (unit)	Units	Loaded (lbs)	Average (lbs)	Trips per Day	Trip Dist (miles)
Butane	29,500	Butane	4.81	10,000	gal	77,600	53,550	3.15	2
Soy Beans	27,000	Soy Beans		30	ton	87,000	57,000	8.50	2
Soy Meal	27,000	Soy Meal		30	ton	87,000	57,000	6.70	2
Gasoline	27,500	Gasoline	6.21	12,500	gal	105,125	66,313	23.00	2
Diesel	27,500	Diesel	7.03	11,000	gal	104,830	66,165	22.00	2
Sulfur	27,000	Sulfur		21	ton	69,000	48,000	0.14	2
Propane	27,000	Propane	4.24	10,000	gal	69,400	48,200	0.84	2

MHA Refinery

Vehicle Traffic Fugitive Dust Calculations

Emission Factor Referneces:
Paved Roads: AP-42 Chp 13.2.1, Equation (1)
Unpaved Roads: AP-42 Chp 13.2.2, Equation (2)

Constants

Surface Silt Content	4.5	Percent
Surface Material Moisture Conten	0.2	Percent
No. Days with <= 0.01 inch of pp	82	
Silt Loading (Paved Roads)	3	gm/m^2 Worst-case public road (Table 13.2.1-2)

Unpaved Road Constants:	k	a	b	c
PM	10	0.8	0.5	0.4
PM10	2.6	0.8	0.4	0.3

Paved Road Constants:	k
PM	0.082
PM10	0.016

Vehicle	Paved/ Unpaved	Dist Travelled (mi/day)	Dist Travelled (mi/yr)	Operating Hours (hr/day)	Vehicle Weight (ton)	Emission Controls Decription	Emission Controls Efficiency	PM Factor (lb/VMT)	PM Emissions (lb/hr)	PM Emissions (lb/day)	PM Emissions (ton/yr)	PM10 Factor (lb/VMT)	PM10 Emissions (lb/hr)	PM10 Emissions (lb/day)	PM10 Emissions (ton/yr)
Butane	p	6.30	2,300	24.00	26.78			2.85	0.75	17.93	3.27	0.56	0.15	3.50	0.64
Soy Beans	p	17.00	6,205	24.00	28.50			3.13	2.21	53.13	9.70	0.61	0.43	10.37	1.89
Soy Meal	p	13.40	4,891	24.00	28.50			3.13	1.74	41.88	7.64	0.61	0.34	8.17	1.49
Gasoline	p	46.00	16,790	24.00	33.16			3.92	7.52	180.38	32.92	0.77	1.47	35.20	6.42
Diesel	p	44.00	16,060	24.00	33.08			3.91	7.17	171.97	31.38	0.76	1.40	33.55	6.12
Sulfur	p	0.29	104	24.00	24.00			2.41	0.03	0.69	0.13	0.47	0.01	0.13	0.02
Propane	p	1.68	613	24.00	24.10			2.43	0.17	4.08	0.75	0.47	0.03	0.80	0.15
Total									19.59	470.05	85.78		3.82	91.72	16.74

Vehicle Traffic Fugitive Dust

Emission Factor References:
Paved Roads: AP-42 Chp 13.2.1, Equation (1)
Unpaved Roads: AP-42 Chp 13.2.2, Equation (2)

Constants

Surface Silt Content	4.5	Percent
Surface Material Moisture Content	0.2	Percent
No. Days with <= 0.01 inch of ppt	82	
Silt Loading (Paved Roads)	70	gm/m^2

Unpaved Road Constants:	k	a	b	c
PM10	2.6	0.8	0.4	0.3

Paved Road Constants:	k
PM10	0.016

Loader Daily Unpaved PM10 Emissions

Distance Travelled	6	mi/day
Vehicle Weight	27	tons
Control Efficiency	0%	

Emission Factor

$$2.6 * \left(\left(\frac{4.5}{12}\right)^{0.8}\right) * \left(\left(\frac{27}{3}\right)^{0.4}\right) / \left(\left(\frac{0.2}{0.2}\right)^{0.3}\right)\right) * \left(\frac{365 - 82}{365}\right)$$

$$= 2.21 \frac{lb}{VMT}$$

$$2.21 \frac{lb}{VMT} * 6 \frac{VMT}{day} * (100\% - 0\%) = 13.91 \frac{lb}{day}$$

$$13.91 \frac{lb}{day} * 454 \frac{gm}{lb} * \frac{1}{86400} \frac{day}{sec} = 0.0731 \frac{gm}{sec}$$

Truck Daily Paved PM10 Emissions

Distance Travelled	13	mi/day
Vehicle Weight	29	tons
Control Efficiency	0%	

Emission Factor
VMT

$$0.016 * \left(\left(\frac{70}{2}\right)^{0.65}\right) * \left(\left(\frac{28.5}{3}\right)^{1.5}\right) = 4.72 \frac{lb}{VMT}$$

$$4.72 * 13 \frac{VMT}{day} * (100\% - 0\%) = 63.31 \frac{lb}{day}$$

$$63.31 \frac{lb}{day} * 454 \frac{gm}{lb} * \frac{1}{86400} \frac{day}{sec} = 0.3327 \frac{gm}{sec}$$

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4003
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Crude Oil Storage

Tank Dimensions

Diameter (ft):	85.00
Volume (gallons):	2,037,515.00
Turnovers:	35.76
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	26
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude Oil	All	42.58	37.32	47.84	40.96	0.8000	N/A	N/A	200.0000			225.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0033	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0060	0.0060	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0070	0.0073	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0040	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0040	0.0067	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.2580	N/A	N/A	114.2200	0.0010	0.0004	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0100	0.0026	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.8563	N/A	N/A	206.9416	0.9497	0.9757	242.55	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0140	0.0009	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Crude Oil	29.46	864.68	458.15	0.00	1,352.28
Hexane (-n)	0.20	3.46	3.08	0.00	6.73
Benzene	0.18	5.19	2.73	0.00	8.09
Isooctane	0.01	0.86	0.17	0.00	1.04
Toluene	0.08	8.65	1.21	0.00	9.93
Ethylbenzene	0.01	3.46	0.15	0.00	3.62
Xylene (-m)	0.03	12.11	0.43	0.00	12.56
Isopropyl benzene	0.00	0.86	0.02	0.00	0.88
1,2,4-Trimethylbenzene	0.00	2.85	0.02	0.00	2.88
Cyclohexane	0.21	6.05	3.34	0.00	9.61
Unidentified Components	28.74	821.19	447.01	0.00	1,296.94

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4016
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Hydrocrackate Storage

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	211,507.00
Turnovers:	135.03
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Hydrocrackate	All	42.58	37.32	47.84	40.96	11.8000	N/A	N/A	85.0000			105.00	
Benzene						0.7058	N/A	N/A	78.1100	0.0060	0.0004	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0120	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0050	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0150	0.0019	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0020	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0200	0.0004	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						12.9972	N/A	N/A	84.9966	0.9150	0.9962	106.22	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0250	0.0001	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Hydrocrackate	316.36	215.35	9,497.73	0.00	10,029.44
Hexane (-n)	0.59	3.23	17.80	0.00	21.62
Benzene	0.14	1.29	4.21	0.00	5.64
Toluene	0.12	4.31	3.73	0.00	8.16
Ethylbenzene	0.01	1.08	0.29	0.00	1.37
Xylene (-m)	0.04	5.38	1.19	0.00	6.61
Isopropyl benzene	0.00	0.43	0.05	0.00	0.48
Cyclohexane	0.29	2.58	8.84	0.00	11.72
Unidentified Components	315.15	197.05	9,461.63	0.00	9,973.83

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4017
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Naphtha Storage

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	211,507.00
Turnovers:	19.86
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Naphtha	All	42.58	37.32	47.84	40.96	11.8000	N/A	N/A	80.0000			100.00	
Benzene						0.7058	N/A	N/A	78.1100	0.0060	0.0004	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0120	0.0009	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0050	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0150	0.0019	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0020	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0200	0.0004	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						12.9345	N/A	N/A	79.9788	0.9150	0.9962	100.66	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0250	0.0001	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Naphtha	297.75	29.23	8,939.04	0.00	9,266.02
Hexane (-n)	0.56	0.44	16.95	0.00	17.95
Benzene	0.13	0.18	4.01	0.00	4.32
Toluene	0.12	0.58	3.55	0.00	4.25
Ethylbenzene	0.01	0.15	0.27	0.00	0.43
Xylene (-m)	0.04	0.73	1.13	0.00	1.90
Isopropyl benzene	0.00	0.06	0.05	0.00	0.11
Cyclohexane	0.28	0.35	8.42	0.00	9.05
Unidentified Components	296.60	26.75	8,904.66	0.00	9,228.01

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4018
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Ethanol Storage

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	211,507.00
Turnovers:	22.84
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Ethanol	All	42.58	37.32	47.84	40.96	2.3000	N/A	N/A	46.0000			46.00	

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Ethanol	18.20	37.04	546.47	0.00	601.70

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4019
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Alkylate Storage

Tank Dimensions

Diameter (ft):	45.00
Volume (gallons):	475,890.00
Turnovers:	67.07
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	13
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Alkylate	All	42.58	37.32	47.84	40.96	2.0000	N/A	N/A	100.0000			111.00	

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Alkylate	51.00	158.73	1,110.35	0.00	1,320.08

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4020
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Reformate Storage

Tank Dimensions

Diameter (ft):	45.00
Volume (gallons):	475,890.00
Turnovers:	75.46
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	13
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Reformate	All	42.58	37.32	47.84	40.96	2.0000	N/A	N/A	90.0000			110.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0250	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0180	0.0078	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0024	0.0011	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0140	0.0005	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0100	0.0073	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.2580	N/A	N/A	114.2200	0.0400	0.0063	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0050	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0700	0.0080	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						2.6785	N/A	N/A	89.9642	0.7456	0.9668	113.57	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0700	0.0020	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Reformate	45.90	178.57	999.31	0.00	1,223.79
Hexane (-n)	0.33	1.79	7.29	0.00	9.41
Benzene	0.36	3.21	7.76	0.00	11.33
Isooctane	0.29	7.14	6.30	0.00	13.73
Toluene	0.37	12.50	8.02	0.00	20.88
Ethylbenzene	0.02	2.50	0.49	0.00	3.02
Xylene (-m)	0.09	12.50	2.04	0.00	14.63
Isopropyl benzene	0.00	0.89	0.08	0.00	0.98
1,2,4-Trimethylbenzene	0.01	4.46	0.15	0.00	4.62
Cyclohexane	0.05	0.43	1.09	0.00	1.56
Unidentified Components	44.38	133.14	966.10	0.00	1,143.62

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4021
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Bio Diesel Storage

Tank Dimensions

Diameter (ft):	45.00
Volume (gallons):	475,890.00
Turnovers:	9.27
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	13
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Bio Diesel	All	42.58	37.32	47.84	40.96	0.2000	N/A	N/A	180.0000			200.00	

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Bio Diesel	8.58	24.97	186.89	0.00	220.44

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4022
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Raw Light HC Storage

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	211,507.00
Turnovers:	19.86
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Raw Light HC	All	42.58	37.32	47.84	40.96	0.5000	N/A	N/A	165.0000			185.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0100	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0000	0.0000	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0001	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0000	0.0000	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.1875	N/A	N/A	92.1300	0.0003	0.0001	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.5103	N/A	N/A	165.0638	0.9866	0.9993	186.51	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0029	0.0003	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Raw Light HC	13.26	32.64	397.99	0.00	443.89
Hexane (-n)	0.00	0.00	0.00	0.00	0.00
Benzene	0.00	0.00	0.01	0.00	0.01
Toluene	0.00	0.01	0.05	0.00	0.07
Ethylbenzene	0.00	0.00	0.01	0.00	0.01
Xylene (-m)	0.00	0.09	0.12	0.00	0.22
1,2,4-Trimethylbenzene	0.00	0.33	0.09	0.00	0.42
Unidentified Components	13.25	32.21	397.72	0.00	443.17

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4023
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Light Slop HC Storage

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	211,507.00
Turnovers:	19.86
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Light Slop HC	All	42.58	37.32	47.84	40.96	6.8000	N/A	N/A	120.0000			140.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0100	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0000	0.0000	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0001	0.0000	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0000	0.0000	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.1875	N/A	N/A	92.1300	0.0003	0.0000	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						6.9112	N/A	N/A	120.0008	0.9866	0.9999	140.40	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0029	0.0000	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Light Slop HC	173.53	31.67	5,209.73	0.00	5,414.93
Hexane (-n)	0.00	0.00	0.00	0.00	0.00
Benzene	0.00	0.00	0.01	0.00	0.01
Toluene	0.00	0.01	0.05	0.00	0.07
Ethylbenzene	0.00	0.00	0.01	0.00	0.01
Xylene (-m)	0.00	0.09	0.12	0.00	0.22
1,2,4-Trimethylbenzene	0.00	0.32	0.09	0.00	0.41
Unidentified Components	173.52	31.25	5,209.45	0.00	5,414.22

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4040
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Regular Gasoline Storage

Tank Dimensions

Diameter (ft):	67.00
Volume (gallons):	1,054,949.00
Turnovers:	11.65
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	20
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Regular Gasoline	All	42.58	37.32	47.84	40.96	7.0000	N/A	N/A	85.0000			105.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0250	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0180	0.0022	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0024	0.0003	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0140	0.0001	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0100	0.0021	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.2580	N/A	N/A	114.2200	0.0400	0.0018	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0700	0.0023	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						9.4412	N/A	N/A	84.9453	0.7456	0.9904	106.54	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0700	0.0006	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Regular Gasoline	285.82	40.74	4,965.57	0.00	5,292.12
Hexane (-n)	0.60	0.41	10.46	0.00	11.47
Benzene	0.64	0.73	11.13	0.00	12.51
Isooctane	0.52	1.63	9.04	0.00	11.19
Toluene	0.66	2.85	11.50	0.00	15.02
Ethylbenzene	0.04	0.57	0.71	0.00	1.32
Xylene (-m)	0.17	2.85	2.93	0.00	5.95
Isopropyl benzene	0.01	0.20	0.11	0.00	0.32
1,2,4-Trimethylbenzene	0.01	1.02	0.22	0.00	1.25
Cyclohexane	0.09	0.10	1.56	0.00	1.75
Unidentified Components	283.08	30.37	4,917.91	0.00	5,231.36

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4041
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Premium Gasoline Storage

Tank Dimensions

Diameter (ft):	67.00
Volume (gallons):	1,054,949.00
Turnovers:	39.81
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	20
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Premium Gasoline	All	42.58	37.32	47.84	40.96	7.0000	N/A	N/A	85.0000			105.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0250	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0180	0.0022	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0024	0.0003	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0140	0.0001	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0100	0.0021	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.2580	N/A	N/A	114.2200	0.0400	0.0018	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0700	0.0023	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						9.4412	N/A	N/A	84.9453	0.7456	0.9904	106.54	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0700	0.0006	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Premium Gasoline	285.82	139.28	4,965.57	0.00	5,390.66
Hexane (-n)	0.60	1.39	10.46	0.00	12.45
Benzene	0.64	2.51	11.13	0.00	14.28
Isooctane	0.52	5.57	9.04	0.00	15.13
Toluene	0.66	9.75	11.50	0.00	21.91
Ethylbenzene	0.04	1.95	0.71	0.00	2.70
Xylene (-m)	0.17	9.75	2.93	0.00	12.84
Isopropyl benzene	0.01	0.70	0.11	0.00	0.82
1,2,4-Trimethylbenzene	0.01	3.48	0.22	0.00	3.71
Cyclohexane	0.09	0.33	1.56	0.00	1.98
Unidentified Components	283.08	103.84	4,917.91	0.00	5,304.83

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4043
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Off-Road Gasoline Storage

Tank Dimensions

Diameter (ft):	30.00
Volume (gallons):	169,205.00
Turnovers:	186.16
Self Supp. Roof? (y/n):	N
No. of Columns:	1.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	1
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	10
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Off-Road Gasoline	All	42.58	37.32	47.84	40.96	7.0000	N/A	N/A	85.0000			105.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0250	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0180	0.0022	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0024	0.0003	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0140	0.0001	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0100	0.0021	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.2580	N/A	N/A	114.2200	0.0400	0.0018	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0050	0.0000	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0700	0.0023	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						9.4412	N/A	N/A	84.9453	0.7456	0.9904	106.54	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0700	0.0006	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Off-Road Gasoline	127.98	237.52	3,842.20	0.00	4,207.70
Hexane (-n)	0.27	2.38	8.09	0.00	10.74
Benzene	0.29	4.28	8.61	0.00	13.18
Isooctane	0.23	9.50	7.00	0.00	16.73
Toluene	0.30	16.63	8.90	0.00	25.82
Ethylbenzene	0.02	3.33	0.55	0.00	3.89
Xylene (-m)	0.08	16.63	2.26	0.00	18.97
Isopropyl benzene	0.00	1.19	0.09	0.00	1.28
1,2,4-Trimethylbenzene	0.01	5.94	0.17	0.00	6.11
Cyclohexane	0.04	0.57	1.21	0.00	1.82
Unidentified Components	126.75	177.09	3,805.33	0.00	4,109.17

TANKS 4.0
Emissions Report - Summary Format
Tank Identification and Physical Characteristics

Identification

User Identification:	MHA-T4501
City:	Makoti
State:	ND
Company:	
Type of Tank:	Internal Floating Roof Tank
Description:	Mid Distillate Storage

Tank Dimensions

Diameter (ft):	86.00
Volume (gallons):	2,085,738.00
Turnovers:	9.56
Self Supp. Roof? (y/n):	N
No. of Columns:	6.00
Eff. Col. Diam. (ft):	1.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Rim-Seal System

Primary Seal:	Liquid-mounted
Secondary Seal:	Rim-mounted

Deck Characteristics

Deck Fitting Category:	Typical
Deck Type:	Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Unbolted Cover, Ungasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Column Well (24-in. Diam.)/Built-Up Col.-Sliding Cover, Ungask.	6
Ladder Well (36-in. Diam.)/Sliding Cover, Ungasketed	1
Roof Leg or Hanger Well/Adjustable	26
Sample Pipe or Well (24-in. Diam.)/Slit Fabric Seal 10% Open	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Fargo, North Dakota (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0
Emissions Report - Summary Format
Liquid Contents of Storage Tank

Mixture/Component	Month	Daily Liquid Surf. Temperatures (deg F) Avg.	Min.	Max.	Liquid Bulk Temp. (deg F)	Vapor Pressures (psia) Avg.	Min.	Max.	Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Mid Distillate	All	42.58	37.32	47.84	40.96	0.2000	N/A	N/A	160.0000			200.00	
1,2,4-Trimethylbenzene						0.0099	N/A	N/A	120.1900	0.0033	0.0002	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						0.7058	N/A	N/A	78.1100	0.0060	0.0235	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						0.7409	N/A	N/A	84.1600	0.0070	0.0288	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.0576	N/A	N/A	106.1700	0.0040	0.0013	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						1.1933	N/A	N/A	86.1700	0.0040	0.0265	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane						0.2580	N/A	N/A	114.2200	0.0010	0.0014	114.22	Option 1: VP40 = .213 VP50 = .387
Isopropyl benzene						0.0258	N/A	N/A	120.2000	0.0010	0.0001	120.20	Option 2: A=6.963, B=1460.793, C=207.78
Toluene						0.1875	N/A	N/A	92.1300	0.0100	0.0104	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.1783	N/A	N/A	204.1062	0.9497	0.9040	212.41	
Xylene (-m)						0.0477	N/A	N/A	106.1700	0.0140	0.0037	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0
Emissions Report - Summary Format
Individual Tank Emission Totals

Annual Emissions Report

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Mid Distillate	16.41	58.50	401.63	0.00	476.54
Hexane (-n)	0.44	0.23	10.65	0.00	11.32
Benzene	0.39	0.35	9.45	0.00	10.19
Isooctane	0.02	0.06	0.58	0.00	0.66
Toluene	0.17	0.59	4.18	0.00	4.94
Ethylbenzene	0.02	0.23	0.51	0.00	0.77
Xylene (-m)	0.06	0.82	1.49	0.00	2.37
Isopropyl benzene	0.00	0.06	0.06	0.00	0.12
1,2,4-Trimethylbenzene	0.00	0.19	0.07	0.00	0.27
Cyclohexane	0.47	0.41	11.57	0.00	12.45
Unidentified Components	14.83	55.56	363.07	0.00	433.46

TANKS 4.0
Emissions Report - Summary Format
Total Emissions Summaries - All Tanks in Report

Annual Emissions Report

Tank Identification			Losses (lbs)
MHA-T4003	Internal Floating Roof Tank	Makoti, ND	1,352.28
MHA-T4016	Internal Floating Roof Tank	Makoti, ND	10,029.44
MHA-T4017	Internal Floating Roof Tank	Makoti, ND	9,266.02
MHA-T4018	Internal Floating Roof Tank	Makoti, ND	601.70
MHA-T4019	Internal Floating Roof Tank	Makoti, ND	1,320.08
MHA-T4020	Internal Floating Roof Tank	Makoti, ND	1,223.79
MHA-T4021	Internal Floating Roof Tank	Makoti, ND	220.44
MHA-T4022	Internal Floating Roof Tank	Makoti, ND	443.89
MHA-T4023	Internal Floating Roof Tank	Makoti, ND	5,414.93
MHA-T4040	Internal Floating Roof Tank	Makoti, ND	5,292.12
MHA-T4041	Internal Floating Roof Tank	Makoti, ND	5,390.66
MHA-T4043	Internal Floating Roof Tank	Makoti, ND	4,207.70
MHA-T4501	Internal Floating Roof Tank	Makoti, ND	476.54
Total Emissions for all Tanks:			45,239.60