ATTACHMENT 3
EMISSION RATE CALCULATIONS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TABLE 3-1
SUMMARY OF PROPOSED ALLOWABLE EMISSION RATES

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			Proposed Allowable Hourly and Annual Emission Rates													
			VOC		NO_X		CO		$PM/PM_{10}/PM_{2.5}$		SO_2		H_2S		Benzene	
EPN	FIN	Description	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
Normal Operations																
FUG	FUG	Site Fugitives	1.29	5.62	--	--	--	--	--	--	--	--	0.001	0.01	0.01	0.03
FL-1	TK-01, TK-02	Controlled Condensate Tank Emissions	0.01	0.05	--	--	--	--	--	--	--	--	--	--	0.0001	0.0002
FL-1	TK-03, TK-04	Controlled Produced Water Tank Emissions	0.11	0.10	--	--	--	--	--	--	--	--	0.0001	0.0004	0.0004	0.0004
FL-1	TRUCK2	Controlled Produced Water Truck Loading	0.01	0.002	--	--	--	--	--	--	--	--	--	--	0.00003	0.00001
TRUCK2	TRUCK2	Uncaptured Produced Water Truck Loading	0.11	0.04	--	--	--	--	--	--	--	--	--	--	0.0003	0.0001
FL-1	FL-1	Flare Combustion (normal operations waste gas, assist, and pilot gas combustion)	0.01	0.04	0.25	1.00	0.52	2.04	--	--	0.12	0.52	0.0001	0.001	0.000003	0.00001
Alternative Operating Scenarios (AOS)																
FL-1	SEP-GAS	Low Pressure Separator Gas to Flare - AOS	14.90	3.26	--	--	--	--	--	--	--	--	0.05	0.01	0.05	0.01
FL-1	TK-01, TK-02	Controlled Condensate Tank Emissions during blowcase downtime - AOS	5.51	4.74	--	--	--	--	--	--	--	--	0.004	0.02	0.02	0.01
TK-01, TK-02 TK-03, TK-04	TK-01, TK-02 TK-03, TK-04	Uncontrolled Tank Standing Loss Emissions during blowcase and flare downtime - AOS	0.68	0.06	--	--	--	--	--	--	--	--	--	--	0.003	0.0003
FL-1	TRUCK1	Controlled Condensate Truck Loading - AOS	0.53	0.14	--	--	--	--	--	--	--	--	--	--	0.002	0.001
TRUCK1	TRUCK1	Uncaptured Condensate Truck Loading - AOS	11.42	3.07	--	--	--	--	--	--	--	--	--	--	0.05	0.01
FL-1	FL-1	Flare Combustion (lp separator and tanks waste gas combustion) - AOS	--	--	9.06	2.83	18.10	5.65	--	--	5.02	2.69	0.05	0.03	--	--
Scheduled Maintenance, Startup and Shutdown Events																
MSS-FUG	MSS-FUG	Miscellaneous MSS Fugitive Events	5.72	0.12	--	--	--	--	--	--	--	--	--	--	0.02	0.0001
FL-1-MSS	MSS-CLEAN-TK	Tank Cleanout Activities	3.45	0.004	--	--	--	--	--	--	--	--	0.01	0.00001	0.01	0.0000001
FL-1-MSS	FL-1-MSS	Flare Combustion (tank clean-outs)	--	--	0.82	0.001	1.63	0.002	--	--	0.93	0.001	0.01	0.00001	--	--
MSS-BC	MSS-BC	Blasting and Coating MSS Activities	--	--	--	--	--	--	2.74	1.46	--	--	--	--	--	--
		Site-Wide Emissions:	**43.75**	**17.25**	**10.13**	**3.83**	**20.25**	**7.69**	**2.74**	**1.46**	**6.07**	**3.21**	**0.13**	**0.07**	**0.17**	**0.06**

Note: Aggregated HAP emissions at the Site will be below 10 tpy.
Hourly emissions are conservatively represented as all scenarios occuring at one time. In reality, all operating scenarios, MSS events, and normal operations would not occur in same hour timespan.

TABLE 3-2
SUMMARY OF FLARE EMISSION RATES

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			Proposed Allowable Hourly and Annual Emission Rates													
			VOC		NO_X		CO		$PM/PM_{10}/PM_{2.5}$		SO_2		H_2S		Benzene	
EPN	**FIN**	**Description**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
Normal Operations																
FL-1	TK-01, TK-02	Controlled Condensate Tank Emissions	0.01	0.05	--	--	--	--	--	--	--	--	--	--	0.0001	0.0002
FL-1	TK-03, TK-04	Controlled Produced Water Tank Emissions	0.11	0.10	--	--	--	--	--	--	--	--	0.0001	0.0004	0.0004	0.0004
FL-1	TRUCK2	Controlled Produced Water Truck Loading	0.01	0.002	--	--	--	--	--	--	--	--	--	--	0.00003	0.00001
FL-1	FL-1	Flare Combustion (normal operations waste gas, assist, and pilot gas combustion)	0.01	0.04	0.25	1.00	0.52	2.04	--	--	0.12	0.52	0.0001	0.001	0.000003	0.00001
FL-1	SEP-GAS	Low Pressure Separator Gas to Flare - AOS	14.90	3.26	--	--	--	--	--	--	--	--	0.05	0.01	0.05	0.01
FL-1	TK-01, TK-02	Controlled Condensate Tank Emissions during blowcase downtime - AOS	5.51	4.74	--	--	--	--	--	--	--	--	0.004	0.02	0.02	0.01
FL-1	TRUCK1	Controlled Condensate Truck Loading - AOS	0.53	0.14	--	--	--	--	--	--	--	--	--	--	0.002	0.001
FL-1	FL-1	Flare Combustion (lp separator and tanks waste gas combustion) - AOS	--	--	9.06	2.83	18.10	5.65	--	--	5.02	2.69	0.05	0.03	--	--
		FL-1 TOTAL:	**21.08**	**8.33**	**9.31**	**3.83**	**18.62**	**7.69**	**--**	**--**	**5.14**	**3.21**	**0.10**	**0.06**	**0.07**	**0.02**
Scheduled Maintenance, Startup and Shutdown Events																
FL-1-MSS	MSS-CLEAN-TK	Tank Cleanout Activities	3.45	0.004	--	--	--	--	--	--	--	--	0.01	0.00001	0.01	0.0000001
FL-1-MSS	FL-1-MSS	Flare Combustion (tank clean-outs)	--	--	0.82	0.001	1.63	0.002	--	--	0.93	0.001	0.01	0.00001	--	--
		FL-1-MSS TOTAL:	**3.45**	**0.00**	**0.82**	**0.001**	**1.63**	**0.002**	**--**	**--**	**0.93**	**0.001**	**0.02**	**0.00002**	**0.01**	**0.0000001**

NOTE: This summary table provided for assistance in determining total Flare emission rates from sources shown on Table 3-1. Reference table only.

CALCULATION OF SITE FUGITIVES (FIN FUG) POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Component	Number of Components	Emission Factors [a] (lb/hr-component)	Annual Operating Hours (hr/yr)	Maximum VOC[a] (wt%)	Maximum Benzene[a] (wt%)	Maximum H_2S (wt%)	Reduction Credit [a] (%)	PTE VOC Hourly [b] (lb/hr)	PTE VOC Annual [c] (T/yr)	PTE Benzene Hourly [b] (lb/hr)	PTE Benzene Annual [c] (T/yr)	PTE H_2S Hourly [b] (lb/hr)	PTE H_2S Annual [c] (T/yr)
Valves													
Gas Streams valves	129	0.00992	8,760	30%	0.11%	0.11%	0%	0.38	1.68	0.001	0.01	0.001	0.01
Light Oil valves	111	0.0055	8,760	100%	0.47%	--	0%	0.61	2.67	0.003	0.01	--	--
Water/Light Oil valves	128	0.000216	8,760	--	0.03%	--	0%	0.03	0.12	0.00001	0.00004	--	--
Pumps													
Water/Light Oil pump	2	0.000052	8,760	--	0.03%	--	0%	0.0001	0.0005	0.00000003	0.0000001	--	--
Flanges													
Gas Streams flanges	216	0.00086	8,760	30%	0.11%	0.11%	0%	0.06	0.24	0.0002	0.001	0.0002	0.001
Light Oil flanges	114	0.000243	8,760	100%	0.47%	--	0%	0.03	0.12	0.0001	0.001	--	--
Water/Light Oil flanges	24	0.000006	8,760	--	0.03%	--	0%	0.0001	0.001	0.00000004	0.0000002	--	--
Connectors													
Gas Streams connectors	236	0.00044	8,760	30%	0.11%	0.11%	0%	0.03	0.14	0.0001	0.001	0.0001	0.001
Light Oil connectors	207	0.000463	8,760	100%	0.47%	--	0%	0.10	0.42	0.0005	0.002	--	--
Water/Light Oil connectors	212	0.000243	8,760	--	0.03%	--	0%	0.05	0.23	0.00002	0.0001	--	--
							TOTAL:	**1.29**	**5.62**	**0.005**	**0.03**	**0.001**	**0.01**

[a] Fugitive Emission Factors and Reduction Credits are per TCEQ Technical Guidance Document for Equipment Leak Fugitives, dated October 2000. The emission factors are for total hydrocarbon, except for the emission factors associated with Water/Light Oil. As indicated on page 6 of 55 in the mentioned Guidance document, these factors are based off of a known stream constituency of 50%-99% water, and remainder VOC. Therefore, applying a VOC wt % would be double counting for the reduction due to water.

[b] Hourly VOC emission rates are calculated as follows:
(129 components) * (0.00992 lb/hr-component) * (30% VOC) * (100% - 0% reduction credit) = 0.38 lb/hr

[c] Annual VOC emission rates are calculated as follows:
(129 components) * (0.00992 lb/hr-component) * (8,760 hr/yr) * (30% VOC) * (100% - 0% reduction credit) / (2,000 lb/T) = 1.68 T/yr

SUMMARY OF TANKS SENT TO FLARE POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

	Condensate Storage Tanks FIN: TK-01, TK-02 EPN: FL-1						Produced Water Storage Tanks FIN: TK-03, TK-04 EPN: FL-1					
	VOC Emissions		Benzene Emissions		H_2S Emissions[c]		VOC Emissions		Benzene Emissions		H_2S Emissions[c]	
	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)
Flash Emissions[a]	--	--	--	--	--	--	5.43	4.76	0.02	0.02	--	--
WB Emissions [b]	0.68	2.38	0.003	0.01	--	--	0.07	0.02	0.0002	0.0001	--	--
Total Uncontrolled Total	0.68	2.38	0.003	0.01	--	--	5.50	4.78	0.02	0.02	0.004	0.02
Total Controlled Total	0.01	0.05	0.0001	0.0002	--	--	0.11	0.10	0.0004	0.0004	0.0001	0.0004

[a] VOC Flash Emissions are calculated using the WinSim stream simulation program. Data inputs included the pressurized stream data and throughputs represented in this submittal. See the pages at the end of this attachment for a printout of the data inputs and emissions reports. Condensate tanks would not experience flash emissions when blowcase skids are operational, as explained in the process descrption.

[b] The Working/Breathing emissions are calculated using AP 42 Chapter 7 calculations with data inputs from the stream data and throughputs. See the following pages for the represented calculations.

[c] The Ideal Gas Law was used to estimate the H2S emission rates using the maximum sulfur concentration in the gas coming off the tanks (500 ppm). An example calculation for hourly H2S emissions from FIN TK-03 and TK-04 follows:

H_2S (lb/hr) = (% Vol H_2S in stream) * (Total Volumetric Flow of Gas, scf/hr) * (1 atm STP) * (34.0798 lb/lb-mol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = (500 ppm /10^6) * (101.62 scf/hr) * (1 atm) * (34.0789 lb/lbmol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = 0.004 lb/hr

NOTE: The emissions shown for condensate tanks are due to unloaded liquids sitting in the tanks while the blowcases are operational. During this time there would be no condensate liquids flowing to the tanks; however, any liquid already in the condensate tanks would remain and have breathing (standing losses) emissions. These emissions will be controlled by the flare control device with a destruction efficiency of 98%. The produced water emissions shown are due to produced water flowing into the produced water tanks from the LP separator. These emissions would be routed to the flare control device with a destruction efficiency of 98%.

CALCULATION OF STORAGE TANK WORKING AND BREATHING POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Variable	Description	Units	Value
L_T	total loss = Ls + Lw	Ton/yr	See Table
L_S	standing loss = 292 Vv Wv Ke Ks (Condensate Tanks) standing loss = 365 Vv Wv Ke Ks (Produced Water Tanks)	lb/yr	See Table
L_W	working loss = 0.001 Mv Pv Q Kn Kp	lb/yr	See Table
L_H	working loss = 0.001 Mv Pmax Qh	lb/hr	See Table
	Roof Construction		Cone
RVP	Condensate Reid Vapor Pressure	psia	10.24
DPb	Breather vent pressure range	psi	0.06
I	Solar insolation factor	Btu/ft2-day	1521
P_A	Atmospheric Pressure	psia	14.7
Mv	Vapor Molecular Weight	lb/lb-mol	34
T	Annual Average Temperature	°F	72.1
T_{AX}	Daily Maximum Ambient Temperature	°R	541.6
T_{AN}	Daily Minimum Ambient Temperature	°R	522.5
DT_A	Daily average ambient temperature range	°R	19.1
Kp	Product factor		1

Material	No. of Tanks	Tank Specifications: V/H – Tank Type	D – Tank Diameter (ft)	H/L – Tank Height/ Length (ft)	Capacity – Tank Capacity (bbl)	Color – Paint Color	Paint Conditions	a – Paint Solar Absorbance Factor	Material Specifications: Mv – Vapor Molecular Weight	P_{MAX} – Reid Vapor Pressure (psia)	Q^2 – Max. Hourly Thruput (bbl/hr)	Annual thruput (bbl)	DTv – Daily Vapor Temp. Range °F	Hvo – Vapor Space Outage (ft)	Vv – Vapor Space Volume (ft3)	T_{LA} – Daily Average Liquid Surface Temp °R	P_{VA} – Average Vapor Pressure (psia)	Wv – Vapor Density (lb/ft3)	DPv – Daily Vapor Pressure Range	Ke – Vapor Space Expan. Factor	Ks – Vented Vapor Sat. Factor	Kn – Turnover Factor	L_S – Standing Loss per tank (lb/yr)	L_W – Working Loss per tank (lb/yr)	VOC L_T – Total Loss (lb/hr)	VOC L_H – Total Loss (T/yr)	Benzene L_T – Total Loss (lb/hr)	Benzene L_H – Total Loss (T/yr)
Condensate	2	V	12	25	500	Gray	Good	0.54	34	10.24	--	--	36.75	12.63	1428.4	539.8	10.564	0.06201	2.95264	0.7675	0.12	--	4,764.20	--	**0.68**	**2.38**	**0.003**	**0.01**
PW	2	V	12	25	500	Gray	Good	0.54	34	0.102	20	146,000	36.75	12.63	1428.4	539.8	0.028	0.00016	0.01772	0.0662	0.98	0.27	10.82	37.53	**0.07**	**0.02**	**0.0002**	**0.0001**

NOTE: Tank working and breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Molecular Weight are determined based on the WinSim condensate stream and Off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

The condensate emissions shown are due to unloaded liquids sitting in the tanks while the blowcase is working. During this time there would be no condensate liquids flowing to the tanks; however, any liquid already in the condensate tanks would remain and have breathing (standing losses) emissions. These emissions would be routed to the flare control device with a destruction efficiency of 98%. Based on 80% blowcase working time, this scenario is being shown to occur for 292 days in a year.

The produced water emissions shown are due to produce water flowing into the produced water tanks. These emissions will be routed to the flare control device with a destruction efficiency of 98%.

CALCULATION OF PRODUCED WATER TRUCK LOADING POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Sample Calculations for Produced Water:

Loading Loss (lb/Mgal) = 12.46 * S * P * M / T (AP-42 Section 5.2)
Maximum Loading Loss = 12.46 * 0.60 * 0.100 * 34 / 560 = 0.05 lb/Mgal

Hourly Uncollected Emissions PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (1 - Capture Efficiency)
Hourly Uncollected Emissions PTE = (8.19 Mgal/hr) * (0.045 lb/Mgal) * (1 - 0.70) = 0.11 lb/hr

Hourly PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Destruction Efficiency)
Hourly PTE = (8.19 Mgal/hr) * (0.045 lb/Mgal) * (0.70) * (1 - 0.98) = 0.01 lb/hr

Annual Emissions = (Annual Throughput, Mgal/yr) * (Average Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Destruction Efficiency) / (2000 lb/T)
Annual Emissions = (6132.00 Mgal/yr) * (0.048 lb/Mgal) * (0.70) * (1 - 0.98) / (2000 lb/T) = 0.002 T/yr

FIN	EPN	Facility Name	S	P @ 560 °R (psia)	P @531.7 °R [a] (psia)	M	Maximum Loading Loss (lb/Mgal)	Average Loading Loss (lb/Mgal)	Hourly Throughput (Mgal/hr)	Annual Throughput (Mgals/yr)	Capture Efficiency [b]	Uncaptured Total Emissions – VOC – Hourly Uncollected Loading Emissions (lb/hr)	Uncaptured Total Emissions – VOC – Annual Uncollected Loading Emissions (T/yr)	Uncaptured Total Emissions – Benzene – Hourly Uncollected Loading Emissions (lb/hr)	Uncaptured Total Emissions – Benzene – Annual Uncollected Loading Emissions (T/yr)	Destruction Efficiency	Captured and Controlled Total Emissions – VOC – Hourly PTE (lb/hr)	Captured and Controlled Total Emissions – VOC – Annual PTE (T/yr)	Captured and Controlled Total Emissions – Benzene – Hourly PTE (lb/hr)	Captured and Controlled Total Emissions – Benzene – Annual PTE (T/yr)
TRUCK2	FL-1/ TRUCK2	Produced Water Truck Loading	0.60	0.10	0.021	34	0.045	0.048	8.19	6,132.00	0.70	0.11	0.04	0.0003	0.0001	0.98	0.01	0.002	0.00003	0.00001

Daily maximum and daily minimum ambient temperature from Tanks 4.09d for this area's annual averages (81.6 and 62.5, for average of 72.1).

[a] Annual Average Condensate and Produced Water Vapor Pressure are calculated as follow:

Annual Average Produced Water Vapor Pressure at T_{LA}:
P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(72.1+459.6) - 2.227]log10(10.24*.01) - 7261/(72.1+459.6) + 12.82}
0.021 psia

[b] Capture Efficiency of 70% represented based upon TCEQ Guidance.

NOTE: During normal operations produced water liquids will flow to the tanks (FINs TK-03 and TK-04) and load out via truck (FIN TRUCK2). All VOC loading emissions are routed to the flare control device with a destruction efficiency of 98%. The calculations shown demonstrate normal operations regarding loading of the produced water tanks. Condensate liquids will be routed to the blowcase skids on Site and sent down pipeline during normal operations, emissions for condensate loading activities when blowcase skids are down for maintenance are demonstrated in subsequent pages.

SUMMARY OF PROCESS FLARE FUEL GAS COMBUSTION POTENTIAL TO EMIT- NORMAL OPERATIONS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			VOC		NO_X		CO		SO_2		Benzene		H_2S	
EPN	**FIN**	**Description**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
FL-1	FL-1	Pilot Gas Combustion	0.0001	0.0004	0.003	0.01	0.01	0.04	0.001	0.004	0.00000003	0.0000001	0.0000004	0.000002
FL-1	FL-1	Flare Assist Gas Combustion	0.01	0.04	0.22	0.96	0.44	1.93	0.11	0.48	0.000003	0.00001	0.00003	0.0001
FL-1	FL-1	Waste Gas Combustion	--	--	0.03	0.03	0.07	0.07	0.01	0.04	--	--	0.0001	0.0004
		Totals:	**0.01**	**0.04**	**0.25**	**1.00**	**0.52**	**2.04**	**0.12**	**0.52**	**0.000003**	**0.00001**	**0.0001**	**0.001**

NOTE: Pilot Gas Combustion and Flare Assist Gas Combustion calculations are shown on subsequent pages. Waste Gas Combustion shown here is the combined sum of the waste gas from the Condensate tanks standing losses and Produced Water tanks and loading operations shown on subsequent pages.

CALCULATION OF FLARE PILOT GAS AND FLARE ASSIST GAS POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV (Btu/scf)	Heat Release scf/hr	Operating Hours (hr/yr)	Pollutant	Emission Factors	Units	Emission Rates: Hourly [a] (lb/hr)	Emission Rates: Annual [b] (T/yr)
FL-1	FL-1	Flare 1- Process Pilot Gas Combustion	1,292	15	8,760	VOC	5.5	lb/MMscf	0.0001	0.0004
						NO_X	0.138	lb/MMBtu	0.003	0.01
						CO	0.2755	lb/MMBtu	0.01	0.04
						$PM/PM_{10}/PM_{2.5}$	-- [c]	--	--	--
						SO_2	500	ppm H_2S	0.001	0.004
						Benzene	0.0021	lb/MMscf	0.00000003	0.0000001
						H_2S	500	ppm H_2S	0.0000004	0.000002
FL-1	FL-1	Flare 1- Process Flare Assist Gas Combustion	1,292	1,250	8,760	VOC	5.5	lb/MMscf	0.01	0.04
						NO_X	0.138	lb/MMBtu	0.22	0.96
						CO	0.2755	lb/MMBtu	0.44	1.93
						$PM/PM_{10}/PM_{2.5}$	-- [c]	--	--	--
						SO_2	500	ppm H_2S	0.11	0.48
						Benzene	0.0021	lb/MMscf	0.000003	0.00001
						H_2S	500	ppm H_2S	0.00003	0.0001

[a] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN FL-1 follows:

CO (lb/hr) = (Heat Release, scf/hr) * (Lower Heating Value, Btu/scf) * (MM/10^6)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (15 scf/hr) * (1,292 Btu/scf) * (MM/10^6)*(0.2755 lb/MMBtu)

= 0.01 lb/hr CO

The Emission Factors for VOC and Benzene were based upon AP-42 Table 1.4-2 and 1.4-3 (dated 7/98). An example calculation for hourly VOC emissions for EPN FL-1 follows:

VOC (lb/hr) = (Heat Release, scf/hr) * (MM/10^6) * (Emission Factor, lb/MMscf)

VOC (lb/hr) = (15 scf/hr) * (MM/10^6) * (5.5 lb/MMscf)

= 0.0001 lb/hr VOC

A material balance approach was used to estimate the SO_2 and H_2S emission rates using the maximum sulfur concentration in the natural gas. As shown in Figure 6-1, H_2S concentration at the site is conservatively represented at 500 ppm. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions for the pilot gas of EPN FL-1 follows:

SO_2 (lb/hr) = Heat Release (scf/hr)*(Sulfur Content, ppmv)*(100% conversion to SO_2)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO_2/34.065 lb H2S)

SO_2 (lb/hr) = (15 scf/hr)*((500 ppm H2S)/(10^6 scf gas))*(100% converted to SO2)*(1 lb-mol/379 scf)*(34.065 lb H2S/lb-mol)*(64.06 lb SO2/34.065 lb H2S)

= 0.001 lb/hr SO_2

[b] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Hourly Emissions, lb/hr)*(Annual Operating Hours, hr/yr)*(1 T/2,000 lb)

CO (T/yr) = (0.01 lb/hr)*(8,760 hr/yr)*(1 T/2,000 lb)

CO (T/yr) = 0.04 T/yr CO

[c] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

PROCESS FLARE WASTE GAS COMBUSTION EMISSIONS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[c] (T/yr)
FL-1	FL-1	Process Flare	1,699	0.03	163.30	NO_X	0.1380	lb/MMBtu	0.004	0.01
		Condensate Tanks Standing Losses				CO	0.2755	lb/MMBtu	0.01	0.02
						$PM/PM_{10}/PM_{2.5}$	-- [f]	--	--	--
						SO_2	-- [c]	--	--	--
						H_2S	-- [c]	--	--	--
FL-1	FL-1	Process Flare	1,673	0.20	332.57	NO_X	0.1380	lb/MMBtu	0.03	0.02
		Produced Water Tank and Loading				CO	0.2755	lb/MMBtu	0.06	0.05
						$PM/PM_{10}/PM_{2.5}$	-- [f]	--	--	--
						SO_2	-- [d]	--	0.01	0.04
						H_2S	-- [d]	--	0.0001	0.0004

[a] Waste gas stream lower heating value was taken from WinSim calculated stream value.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN Fl-1 follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (0.03 MMBtu/hr)*(0.2755 lb/MMBtu)

= 0.01 lb/hr CO

[c] Emissions from the condensate tanks routed to the Flare are due to unloaded liquids sitting in the tanks while the blowcase is working. During this time any liquid already in the condensate tanks would remain and have breathing (standing losses) emissions controlled by a flare. H_2S and SO_2 emission from the condensate tanks are shown in the following pages under AOS, where liquids will flow to the tanks and experience flashing losses.

[d] H_2S emissions are routed from the produced water tanks to the flare and then converted to SO_2. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions for EPN FL-1 follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (100% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.004 lb/hr H2S at Condensate Tanks)* (98%) * (100%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= 0.01 lb/hr SO_2

[e] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (0,163.30 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= 0.02 T/yr CO

[f] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

CALCULATION OF FLARE FEED RATES FROM FINs TK-01, TK-02 STANDING LOSSES

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-01, TK-02 Total Emissions:[a]

VOC Emissions (lb/hr):	0.68
VOC Emissions (TPY):	2.38
Hydrocarbon Emissions (lb/hr):	1.15
Hydrocarbon Emissions (TPY):	4.02

Constituent	Heating Value[b] (Btu/lb)	Condensate Tanks Flash Gas Weight (%)	TK-01, TK-02 Emissions[c] Hourly (lb/hr)	TK-01, TK-02 Emissions[c] Annual (T/yr)	Flare Feed Rate[d] Hourly (MMBtu/hr)	Flare Feed Rate[d] Annual (MMBtu/yr)
Methane	23,861	19.02%	0.22	0.76	0.01	35.91
Ethane	22,304	15.75%	0.18	0.63	0.004	27.82
Propane	21,646	19.03%	0.22	0.77	0.005	33.00
I-Butane	21,242	7.91%	0.09	0.32	0.002	13.32
N-Butane	21,293	12.77%	0.15	0.51	0.003	21.28
I-Pentane	21,025	6.04%	0.07	0.24	0.001	9.89
N-Pentane	21,072	4.85%	0.06	0.19	0.001	7.85
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	4.66%	0.05	0.19	0.001	7.79
Cyclohexane	20,195	0.31%	0.004	0.01	0.0001	0.40
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	2.02%	0.02	0.08	0.0004	3.27
Octanes	20,747	0.58%	0.01	0.02	0.0002	0.81
Nonanes	20,687	0.13%	0.001	0.01	0.00002	0.41
Decanes Plus	20,638	0.24%	0.003	0.01	0.0001	0.40
Benzene	18,172	0.17%	0.002	0.01	0.00004	0.36
Toluene	18,422	0.29%	0.003	0.01	0.0001	0.36
Ethylbenzene	18,658	0.04%	0.0005	0.002	0.00001	0.07
Xylene	18,438	0.17%	0.002	0.01	0.00004	0.36
	VOC	59.21%				
				Total:	**0.03**	**163.30**

[a] Total VOC Emissions were determined from the Uncontrolled Streams for FINs TK-01, TK-02 on the Tank Summary table. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)
Total HC (lb/hr) = (00.68 lb/hr) * (1 / 59.21%)
Total HC (lb/hr) = 1.15 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Condensate Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6
MMBtu/hr Methane = (23,861 Btu/lb) * (0.22 lb/hr) * 99% / (10^6)
MMBtu/hr Methane = 0.01 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6
MMBtu/yr Methane = (23,861 Btu/lb) * (0.76 T/yr) * (2,000 lb/T) * 99% / (10^6)
MMBtu/yr Methane = 35.91 MMBtu/yr

CALCULATION OF FLARE FEED RATES FROM FINs TK-03, TK-04, and TRUCK2

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-03, TK-04 and TRUCK2 Total Emissions:[a]

VOC Emissions (lb/hr):	6.00
VOC Emissions (TPY):	4.88
Hydrocarbon Emissions (lb/hr):	10.13
Hydrocarbon Emissions (TPY):	8.24

Constituent	Heating Value[b] (Btu/lb)	Produced Water Tanks Flash Gas Weight (%)	TK-03, TK-04 and TRUCK2 Emissions[c] Hourly (lb/hr)	TK-03, TK-04 and TRUCK2 Emissions[c] Annual (T/yr)	Flare Feed Rate[d] Hourly (MMBtu/hr)	Flare Feed Rate[d] Annual (MMBtu/yr)
Methane	23,861	18.58%	1.88	1.53	0.04	72.28
Ethane	22,304	15.45%	1.57	1.27	0.03	56.09
Propane	21,646	18.82%	1.91	1.55	0.04	66.43
I-Butane	21,242	7.95%	0.81	0.66	0.02	27.48
N-Butane	21,293	12.83%	1.30	1.06	0.03	44.24
I-Pentane	21,025	6.08%	0.62	0.50	0.01	20.60
N-Pentane	21,072	4.88%	0.49	0.40	0.01	16.52
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	4.69%	0.48	0.39	0.01	16.00
Cyclohexane	20,195	0.31%	0.03	0.03	0.001	1.19
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	2.04%	0.21	0.17	0.004	6.94
Octanes	20,747	0.58%	0.06	0.05	0.001	2.03
Nonanes	20,687	0.13%	0.01	0.01	0.0002	0.41
Decanes Plus	20,638	0.24%	0.02	0.02	0.0004	0.81
Benzene	18,172	0.17%	0.02	0.01	0.0004	0.36
Toluene	18,422	0.30%	0.03	0.02	0.001	0.72
Ethylbenzene	18,658	0.04%	0.004	0.003	0.0001	0.11
Xylene	18,438	0.17%	0.02	0.01	0.0004	0.36
	VOC	59.23%				
				Total:	**0.20**	**332.57**

[a] Total VOC Emissions were determined by adding the Uncontrolled Streams for FINs TK-03 and TK-04 on the Tank Summary table and the uncontrolled emissions associated with the produced water loading, FIN TRUCK2. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (6.00 lb/hr) * (1/ 59.23%)

Total HC (lb/hr) = 10.13 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Produced Water Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (1.88 lb/hr) * 99% / (10^6)

MMBtu/hr Methane = 0.04 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (1.53 T/yr) * (2,000 lb/T) * 99% / (10^6)

MMBtu/yr Methane = 72.28 MMBtu/yr

CALCULATION OF SEPARATOR GAS ROUTED TO FLARE POTENTIAL TO EMIT - AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

											Potential to Emit (PTE)			
											VOC		H_2S	
Facility Identification Number (FIN)	Gas Throughput at Site (MSCF/day)	Gas Throughput (MSCF/hr)	Percentage of Year Separator Stream to Flare	Number of Hours per Year sent to Flare	Gas Volume Sent to Flare (MSCF/yr)	Gas Stream Molecular Weight (lb/lb-mol)	Max VOC Percentage in Gas (wt%)	Max Benzene Percentage in Gas (wt%)	Max H_2S Percentage in Gas (wt%)	Destruction Efficiency on Flare (%)	Hourly Emission Rate[b] (lb/hr)	Annual Emission Rate[c] (T/yr)	Hourly Emission Rate (lb/hr)	Annual Emission Rate (T/yr)
SEP-GAS	1000	41.67	5%	438	18,251	22.59	30%	0.11%	0.11%	98%	14.90	3.26	0.05	0.01

[a] During engine maintenance at other downstream sites, the low pressure separator gas at this site may be routed to flare 5% of the year.

[b] Hourly VOC emission rates are calculated as follows:

(Gas Throughput, MSCF/hr) / (379 scf/lb-mol) * (Gas Stream MW, lb/lb-mol) * (Maximum VOC Percentage in Gas) * (Destruction Efficiency on Flare) = (VOC Emissions, lb/hr)

(41.67 MSCF/hr) / (379 scf/lb-mol) * (22.59 lb/lb-mol) * (30%) * (100% - 98%) * (1000 scf/Mscf) = 14.90 lb/hr

[c] Annual VOC emission rates are calculated as follows:

(Gas Throughput at Site, MSCF/yr) / (379 scf/lb-mol) * (Gas Stream MW, lb/lb-mol) * (Max VOC Percentage in Gas) * (Destruction Efficiency on Flare) * (1000 scf/Mscf) / (2000 lb/T) = (VOC Emissions, T/yr)

(18,251 MSCF/yr) / (379 scf/lb-mol) * (22.59 lb/lb-mol) * (30%) * (100% - 98%) * (1000 scf/Mscf) / (2000 lb/T) = 3.26 T/yr

SUMMARY OF TANKS POTENTIAL TO EMIT - AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

	Condensate Storage Tanks FIN: TK-01, TK-02 EPN: FL-1						Produced Water Storage Tanks FIN: TK-03, TK-04 EPN: FL-1					
	VOC Emissions		Benzene Emissions		H_2S Emissions[c]		VOC Emissions		Benzene Emissions		H2S Emissionsc	
	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)	Hourly (lb/hr)	Annual (T/yr)
Flash Emissions[a]	268.71	235.39	0.78	0.68	0.22	0.96	--	--	--	--	--	--
WB Emissions during blowcase downtime[b]	6.96	1.78	0.03	0.01	--	--	--	--	--	--	--	--
Uncontrolled Total during blowcase downtime	275.67	237.17	0.81	0.69	0.22	0.96	--	--	--	--	--	--
Controlled Total during blowcase downtime[d]	**5.51**	**4.74**	**0.02**	**0.01**	**0.004**	**0.02**	--	--	--	--	--	--
Uncontrolled Total during blowcase and Flare	**0.68**	**0.06**	**0.003**	**0.0003**	--	--	**0.001**	**0.0001**	**0.000003**	**0.0000003**	--	--

[a] VOC Flash Emissions are calculated using the WinSim stream simulation program. Data inputs included the pressurized stream data and throughputs represented in this submittal. Produced water storage tank emissions are shown previously under normal operations. See the pages at the end of this attachment for a printout of the data inputs and emissions reports.

[b] The Working/Breathing emissions are calculated using AP 42 Chapter 7 calculations with data inputs from the stream data and throughputs. Produced water storage tank emissions are shown under normal operations. See the following pages for the represented calculations.

[c] The Ideal Gas Law was used to estimate the H2S emission rates using the maximum sulfur concentration in the gas coming off the tanks (500 ppm). An example calculation for hourly H2S emissions from FIN TK-03 and TK-04 follows:

H_2S (lb/hr) = (% Vol H_2S in stream) * (Total Volumetric Flow of Gas, scf/hr) * (1 atm STP) * (34.0798 lb/lb-mol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = (500 ppm /10^6) * (101.62 scf/hr) * (1 atm) * (34.0789 lb/lbmol H2S) / (1.314, atm-scf/lb-mol-K) / (298 K)

H_2S (lb/hr) = 0.22 lb/hr

NOTE: The calculations shown demonstrate two alternative operating scenarios regarding blowcase and flare maintenance downtime. Blowcase maintenance is conservately estimated to occur 20% of the year. During the blowcase downtime the wellheads will be producing liquids flowing to the tanks, and all VOC tank emissions will be routed to the flare control device with a destruction efficiency of 98%. H_2S emissions are conservatively represented to be captured at 98% and then 98% converted to SO_2 during combustion, while SO_2 emissions are represented at 100% H2S conversion to SO_2.

It is additionally planned that the flare will be down for maintenance 2% of the year and it is conservatively assumed to happen during blowcase downtime. During this time the well would be shut in and therefore gas and liquids would not be producing, but any liquids previously in storage tanks would have standing losses emitted to atmosphere.

CALCULATION OF STORAGE TANK WORKING AND BREATHING POTENTIAL TO EMIT - AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Variable	Description	Units	Value
L_H	total loss = Ls + Lw	Ton/yr	See Table
L_T	total loss = 0.001 Mv Pmax Qh	lb/hr	See Table
L_S	standing loss = 73 Vv Wv Ke Ks (blowcase downtime) standing loss = 7.3 Vv Wv Ke Ks (Flare downtime)	lb/yr	See Table
L_W	working loss = 0.001 Mv Pv (Q * 20%) Kn Kp	lb/yr	See Table
	Roof Construction		Cone
RVP	Condensate Reid Vapor Pressure	psia	10.24
ΔPb	Breather vent pressure range	psi	0.06
I	Solar insolation factor	Btu/ft2-day	1521
P_A	Atmospheric Pressure	psia	14.7
Mv	Vapor Molecular Weight	lb/lb-mol	34
T	Annual Average Temperature	°F	72.1
T_{AX}	Daily Maximum Ambient Temperature	°R	541.6
T_{AN}	Daily Minimum Ambient Temperature	°R	522.5
ΔT_A	Daily average ambient temperature range	°R	19.1
Kp	Product factor		1

WORKING AND BREATHING POTENTIAL TO EMIT DURING BLOWCASE DOWNTIME

		Tank Specifications							Material Specifications																VOC		Benzene	
		V/H	D	H/L	Capacity	Color		α	Mv	P_{MAX}	Q^2		ΔTv	Hvo	Vv	T_{LA}	P_{VA}	Wv	ΔPv	Ke	Ks	Kn	L_S	L_W	L_T	L_H	L_T	L_H
Material	No. of Tanks	Tank Type	Tank Diameter (ft)	Tank Height/ Length (ft)	Tank Capacity (bbl)	Paint Color	Paint Conditions	Paint Solar Absorbance Factor	Vapor Molecular Weight	Reid Vapor Pressure (psia)	Max. Hourly Thruput (bbl/hr)	Annual thruput (bbl)	Daily Vapor Temp. Range °F	Vapor Space Outage (ft)	Vapor Space Volume (ft3)	Daily Average Liquid Surface Temp °R	Average Vapor Pressure (psia)	Vapor Density (lb/ft3)	Daily Vapor Pressure Range	Vapor Space Expan. Factor	Vented Vapor Sat. Factor	Turnover Factor	Standing Loss during AOS (lb/yr)	Working Loss during AOS (lb/yr)	Total Loss (lb/hr)	Total Loss (T/yr)	Total Loss (lb/hr)	Total Loss (T/yr)
Condensate	2	V	12	25	500	Gray	Good	0.54	34	10.24	20	109,500	36.75	12.63	1428.4	539.8	10.564	0.06201	2.95264	0.7675	0.12	0.30	1,191.05	2,359.79	**6.96**	**1.78**	**0.03**	**0.01**

NOTE: Tank working and breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Molecular Weight are determined based on the WinSim condensate stream and Off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

The emissions shown are due to blowcase maintenance occuring 20% of the year. During the blowcase downtime the condensate liquids will flow to the tanks. These emissions would be controlled by a flare. The calculations shown demonstrate this alternative operating scenario regarding blowcase maintenance and downtime. Based on 20% downtime, this scenario is being shown to occur for 1752 hours in a year.

BREATHING LOSSES POTENTIAL TO EMIT DURING BLOWCASE AND FLARE DOWNTIME

		Tank Specifications							Material Specifications												VOC		Benzene	
		V/H	D	H/L	Capacity	Color		α	Mv	P_{MAX}	ΔTv	Hvo	T_{LA}	P_{VA}	Wv	ΔPv	Ke	Ks	L_S		L_T	L_H	L_T	L_H
Material	No. of Tanks	Tank Type	Tank Diameter (ft)	Tank Height/ Length (ft)	Tank Capacity (bbl)	Paint Color	Paint Conditions	Paint Solar Absorbance Factor	Vapor Molecular Weight	Reid Vapor Pressure (psia)	Daily Vapor Temp. Range °F	Vapor Space Outage (ft)	Daily Average Liquid Surface Temp °R	Average Vapor Pressure (psia)	Vapor Density (lb/ft3)	Daily Vapor Pressure Range	Vapor Space Expan. Factor	Vented Vapor Sat. Factor	Standing Loss (lb/yr)		Total Loss (lb/hr)	Total Loss (T/yr)	Total Loss (lb/hr)	Total Loss (T/yr)
Condensate	2	V	12	25	500	Gray	Good	0.54	34	10.24	36.75	12.63	539.8	10.564	0.06201	2.95264	0.7675	0.12	119.10		**0.68**	**0.06**	**0.003**	**0.0003**
PW	2	V	12	25	500	Gray	Good	0.54	34	0.102	36.75	12.63	539.8	0.028	0.00016	0.01772	0.0662	0.98	0.22		**0.001**	**0.0001**	**0.000003**	**0.0000003**

NOTE: Tanks breathing emissions are based on the equations found in EPA AP 42 Chapter 7. All factors used are represented in the table on this page. The Condensate Reid Vapor Pressure and Vapor Molecular Weight are determined based on the WinSim condensate stream and Off Gas stream. All other variables are found in AP 42 Chapter 7 or are default unit values.

The emissions shown are due to flare and blowcase maintenance occuring 2% of the year. During the flare and blowcase downtime the wellheads would be shut in. Therefore, there would be no condensate or produced water liquids flowing to the tanks; however, any liquid already in the tanks would remain and have breathing (standing losses) emissions. These emissions would not be controlled, as the flare is down for maintenance. The calculations shown demonstrate this alternative operating scenario regarding flare and blowcase maintenance and downtime. Based on 2% downtime, this scenario is being shown to occur for 175.2 hours in a year.

As shown on the summary page representing the Tank Emission sent to Flare, H_2S emissions are represented as occuring when the liquid streams flash during the change from a pressurized flow to the atmospheric tank. Due to the chemical properties of H_2S, the most conservative approach is to represent that all H_2S in the liquid will immediately flash, and there will be no H_2S emitted during working and breathing while the liquids are stored. Since there will be no liquid flow during the flare and blowcase downtime, there are no flash emissions and therefore no H_2S emissions from the standing loss of the tanks.

CALCULATION OF TRUCK LOADING POTENTIAL TO EMIT -AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Sample Calculations for condensate:

Loading Loss (lb/Mgal) = 12.46 * S * P * M / T (AP-42 Section 5.2)
Maximum Loading Loss = 12.46 * 0.60 * 10.240 * 34 / 560 = 4.65 lb/Mgal

Hourly Uncollected Emissions PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (1 - Capture Efficiency)
Hourly Uncollected Emissions PTE = (8.19 Mgal/hr) * (4.648 lb/Mgal) * (1 - 0.70) = 11.42 lb/hr

Hourly PTE = (Hourly Throughput, Mgal/hr) * (Maximum Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Destruction Efficiency)
Hourly PTE = (8.19 Mgal/hr) * (4.648 lb/Mgal) * (0.70) * (1 - 0.98) = 0.53 lb/hr

Annual Emissions = (Annual Throughput, Mgal/yr) * (Average Loading Loss, lb/Mgal) * (Capture Efficiency) * (1 - Destruction Efficiency) / (2000 lb/T)
Annual Emissions = (4599.00 Mgal/yr) * (4.456 lb/Mgal) * (0.70) * (1 - 0.98) / (2000 lb/T) = 0.14 T/yr

												Uncaptured Total Emissions					Captured and Controlled Total Emissions			
												VOC		Benzene			VOC		Benzene	
FIN	EPN	Facility Name	S	P @ 560 °R (psia)	P @531.7 °R [a] (psia)	M	Maximum Loading Loss (lb/Mgal)	Average Loading Loss (lb/Mgal)	Hourly Throughput (Mgal/hr)	Annual Throughput (Mgals/yr)	Capture Efficiency [b]	Hourly Uncollected Loading Emissions (lb/hr)	Annual Uncollected Loading Emissions (T/yr))	Hourly Uncollected Loading Emissions (lb/hr)	Annual Uncollected Loading Emissions (T/yr))	Destruction Efficiency	Hourly PTE (lb/hr)	Annual PTE (T/yr)	Hourly PTE (lb/hr)	Annual PTE (T/yr)
TRUCK1	FL-1/ TRUCK1	Condensate Truck Loading	0.60	10.24	9.322	34	4.648	4.456	8.19	4,599.00	0.70	11.42	3.07	0.05	0.01	0.98	0.53	0.14	0.002	0.001

Daily maximum and daily minimum ambient temperature from Tanks 4.09d for this area's annual averages (81.6 and 62.5, for average of 72.1).

[a] Annual Average Condensate and Produced Water Vapor Pressure are calculated as follow:

Annual Average Condensate Vapor Pressure at TLA :
P = exp{ [(2799/(T+459.6) - 2.227]log10(RVP) - 7261/(T+459.6) + 12.82}
exp{ [(2799/(72.1+459.6) - 2.227]log10(10.24) - 7261/(72.1+459.6) + 12.82}
9.322 psia

[b] Capture Efficiency of 70% represented based upon TCEQ Guidance.

NOTE: During the blowcase downtime the condensate will flow to the tanks (FIN TK-01 and TK-02) and load out via truck (FIN TRUCK1). All VOC loading emissions are routed to the flare control device with a destruction efficiency of 98%. The calculations shown demonstrate this alternative operating scenario regarding loading activities during blowcase maintenance and downtime. Based on blowcase 20% downtime, this scenario is being shown to occur for 1752 hours in a year.

SUMMARY OF PROCESS FLARE WASTE GAS COMBUSTION POTENTIAL TO EMIT- AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

			NO_X		CO		SO_2		H_2S	
EPN	**FIN**	**Description**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**	**(lb/hr)**	**(T/yr)**
FL-1	FL-1	Waste Gas Combustions (LP Separator Gas to Flare)	7.63	1.67	15.24	3.34	4.61	0.92	0.05	0.01
FL-1	FL-1	Waste Gas Combustion (Condensate Tanks and loading activities during blowcase downtime)	1.43	1.16	2.86	2.31	0.41	1.77	0.004	0.02
		Totals:	**9.06**	**2.83**	**18.10**	**5.65**	**5.02**	**2.69**	**0.05**	**0.03**

NOTE: Waste Gas Combustion shown here is from the LP sepreator gas event and Condensate tanks and loading operations during Alternative Operating Scenarios. See following pages for combustion calculations.

PROCESS FLARE WASTE GAS COMBUSTION EMISSIONS - AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

				Waste Gas Flow Rate					Potential to Emit	
EPN	FIN	Description	LHV[a] (Btu/scf)	Hourly (MMBtu/hr)	Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Hourly[b] (lb/hr)	Annual[c] (T/yr)
FL-1	FL-1	Process Flare	1,320	55.30	24,212.82	NO_X	0.1380	lb/MMBtu	7.63	1.67
		LP Separator Gas to Flare Event				CO	0.2755	lb/MMBtu	15.24	3.34
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	4.61	0.92
						H_2S	-- [c]	--	0.05	0.01
FL-1	FL-1	Process Flare	1,699	10.38	16,783.30	NO_X	0.1380	lb/MMBtu	1.43	1.16
		Condensate Tanks and Loading				CO	0.2755	lb/MMBtu	2.86	2.31
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.41	1.77
						H_2S	-- [c]	--	0.004	0.02

[a] Waste gas stream lower heating value was taken from WinSim calculated stream value.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions for EPN Fl-1 follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (10.38 MMBtu/hr)*(0.2755 lb/MMBtu)

= 2.86 lb/hr CO

[c] H_2S emissions are routed from the tanks to the flare and then converted to SO_2. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions for EPN FL-1 follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (100% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.22 lb/hr H2S at Condensate Tanks)* (98%) * (100%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= 0.41 lb/hr SO_2

[d] An example calculation for annual CO emissions for EPN FL-1 follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (16,783.30 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= 2.31 T/yr CO

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

CALCULATION OF FLARE FEED RATES FROM LP SEPARATOR - AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

LP SEP BD Volume (Mscf/hr)	41.67
LP SEP BD Volume (Mscf/yr)	18,251
Gas Density (lb/scf)	0.0598

Constituent	Heating Value[a] (Btu/lb)	Inlet Gas Weight (%)	Separator BD Emissions[b] Hourly (lb/hr)	Separator BD Emissions[b] Annual (T/yr)	Flare Feed Rate[c] Hourly (MMBtu/hr)	Flare Feed Rate[c] Annual (MMBtu/yr)
Methane	23,861	53.21%	1,325.92	290.37	31.32	13,718.47
Ethane	22,304	17.02%	424.12	92.88	9.36	4,101.76
Propane	21,646	11.10%	276.60	60.57	5.93	2,595.97
I-Butane	21,242	3.64%	90.70	19.86	1.89	826.86
N-Butane	21,293	5.09%	126.84	27.78	2.65	1,159.38
I-Pentane	21,025	2.43%	60.55	13.26	1.25	546.43
N-Pentane	21,072	1.79%	44.60	9.77	0.92	403.51
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	0.71%	17.69	3.87	0.36	158.74
Cyclohexane	20,195	0.28%	6.98	1.53	0.14	60.56
Other Hexanes	20,928	1.47%	36.63	8.02	0.75	328.97
Heptanes	20,825	0.72%	17.94	3.93	0.37	160.41
Octanes	20,747	0.19%	4.73	1.04	0.10	42.29
Nonanes	20,687	0.10%	2.49	0.55	0.05	22.30
Decanes Plus	20,638	0.03%	0.75	0.16	0.02	6.47
Benzene	18,172	0.08%	1.99	0.44	0.04	15.67
Toluene	18,422	0.21%	5.23	1.15	0.09	41.52
Ethylbenzene	18,658	0.01%	0.25	0.05	0.005	1.83
Xylene	18,438	0.11%	2.74	0.60	0.05	21.68
				Totals:	**55.30**	**24,212.82**

[a] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[b] Constituent Emission Rates were calculated from the known maximum blowdown volumes and density then proportioned using the Inlet Gas stream constituents weight percents. An example calculation for Methane emissions is as follows:

Methane (lb/hr) = Maximum BD Volume (Mscf/hr) * Gas Density (lb/scf) * Inlet Gas Weight % * 1000

Methane (lb/hr) = (41.67 Mscf/hr) * (0.0598 lb/scf) * 53.21% * 1,000

Methane (lb/hr) = 1,325.92 lb/hr

[c] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (1325.92 lb/hr) * 99% / (10^6)

MMBtu/hr Methane = 31.32 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (290.37 T/yr) * (2,000 lb/T) * 99% / (10^6)

MMBtu/yr Methane = 13,718.47 MMBtu/yr

CALCULATION OF FLARE FEED RATES FROM FINs TK-01, TK-02, and TRUCK1 - AOS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

TK-01, TK-02 and TRUCK1 Total Emissions:[a]

VOC Emissions (lb/hr):	302.17
VOC Emissions (TPY):	244.17
Hydrocarbon Emissions (lb/hr):	510.34
Hydrocarbon Emissions (TPY):	412.38

Constituent	Heating Value[b] (Btu/lb)	Condensate Tanks Flash Gas Weight (%)	TK-01, TK-02 and TRUCK1 Emissions[c] Hourly (lb/hr)	TK-01, TK-02 and TRUCK1 Emissions[c] Annual (T/yr)	Flare Feed Rate[d] Hourly (MMBtu/hr)	Flare Feed Rate[d] Annual (MMBtu/yr)
Methane	23,861	19.02%	97.07	78.43	2.29	3,705.41
Ethane	22,304	15.75%	80.38	64.95	1.77	2,868.32
Propane	21,646	19.03%	97.12	78.48	2.08	3,363.58
I-Butane	21,242	7.91%	40.37	32.62	0.84	1,358.11
N-Butane	21,293	12.77%	65.17	52.66	1.36	2,197.73
I-Pentane	21,025	6.04%	30.82	24.91	0.64	1,026.52
N-Pentane	21,072	4.85%	24.75	20.00	0.51	826.02
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	4.66%	23.78	19.22	0.49	788.38
Cyclohexane	20,195	0.31%	1.58	1.28	0.03	50.67
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	2.02%	10.31	8.33	0.21	340.01
Octanes	20,747	0.58%	2.96	2.39	0.06	97.19
Nonanes	20,687	0.13%	0.66	0.54	0.01	21.90
Decanes Plus	20,638	0.24%	1.22	0.99	0.02	40.05
Benzene	18,172	0.17%	0.87	0.70	0.02	24.93
Toluene	18,422	0.29%	1.48	1.20	0.03	43.33
Ethylbenzene	18,658	0.04%	0.20	0.16	0.004	5.85
Xylene	18,438	0.17%	0.87	0.70	0.02	25.30
	VOC	59.21%				
				Total:	**10.38**	**16,783.30**

[a] Total VOC Emissions were determined by adding the Uncontrolled Streams for FINs TK-01, TK-02 on the Tank Summary table with the uncontrolled emissions from the Condensate Truck Loading FIN TRUCK1. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (302.17 lb/hr) * (1 / 59.21%)

Total HC (lb/hr) = 510.34 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 (pg. 3-155)

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Condensate Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (97.07 lb/hr) * 99% / (10^6)

MMBtu/hr Methane = 2.29 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (78.43 T/yr) * (2,000 lb/T) * 99% / (10^6)

MMBtu/yr Methane = 3,705.41 MMBtu/yr

MISCELLANEOUS MSS ACTIVITIES (FIN MSS-FUG) POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Emissions Summary for **FIN MSS-FUG**

Pollutant	Hourly Max (lb/hr)	Annual Total (T/yr)
VOC	5.72	0.12
H_2S	0.00	0.00
PM	0.00	0.00
PM10	0.00	0.00
PM2.5	0.00	0.00
Benzene	0.02	0.0001

Activity	Description / Comments	Default Parameters		Equation Used		Input Parameters		Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (T/yr)
§106.352(i) Engine/Turbine Oil Changes / Filter Changes The emissions associated with an engine oil/filter change occur during the draining of the used engine oil into oil pan or container.	-Engine has been isolated and blow down occurs prior to oil change. The emissions associated with the blow down need to be accounted for in the oil and gas emission calculation spreadsheet. -Oil is drained into a 4 ft x 4 ft open pan and transferred to a closed container per Best Management Practice (BMP). -Input parameters based on manufacturer specifications of engine oil SAE 10W (a). -Used a 1380 hp Caterpillar G3516B LE engine (b) as basis for calculation. In order to account for emissions from larger horse power engines, the emissions are doubled. An average engine uses 112 gallons of motor oil and manufacturer recommends changing oil every 1000 hrs. We used 10 changes of oil per year as a conservative estimate. -Emission estimates for 1380 hp engine are being doubled to be conservative and to accommodate engines with higher hp. -Assume all emissions from opening, loading, and evaporation occur in three separate hours.	Temperature (F) Vapor Pressure (psia) Saturation Factor Molecular Weight (lb/lbmol) Motor Oil (gal/activity) U wind speed (mph) Vapor Pressure P_V (Pa) Molecular Weight (lb/lbmol) Surface Area Ap (m2) (4ft * 4ft) Evaporation time t (hrs) Number of activities per year (Number of oil changes per engine per year) Factor used to account for larger horsepower engines	212 0.001 1 500 112 3.52 10 500 1.48 10 10 2	Loading loss L_L (lb/1000 gal) Loading loss per activity (lb/activity) Evaporation Loss (lb/activity) Total (lb/yr/engine)	0.009 0.001 1.027 20.560	Number of Engines/Turbines	0	VOC	0.00	0.00
§106.352(i) Changing Engine Rod Packings Emissions from changing of the rod would be from clingage of lubricant in the casing.	-Engine has been isolated and blow down occurs prior to changing rod packing. The emissions associated with the blow down need to be accounted for in the oil and gas emission calculation spreadsheet. -Emissions from clingage are the evaporation of the lubricant adhered to the rod packing casing. -Casing volume for calculations is based on field observation of casing for a 1380hp G3516B LE engine(b). -Input parameters based on material specifications for AP 101(c) grease. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F) Vapor pressure (psia) Molecular weight (lb/lb-mole) V_V Casing volume (ft3) (1ft * 3ft) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year (Number of rod packing changes per year per engine)	104 0.001 500 2.355 10.73 10	Clingage Loss (lb/activity) Total (lb/yr/engine)	0.0001 0.0010	Number of Engines	0	VOC	0.00	0.00
§106.352(i) Changing Wet and Dry Seals Emissions from changing seals would be from clingage of lubricant in the casing.	-Engine has been isolated and blow down occurs prior to changing seals. The emissions associated with the blow down need to be accounted for in the oil and gas emission calculation spreadsheet. -Emissions from clingage are the evaporation of the lubricant adhered to the rod packing casing. -Casing volume for calculations is based on field observation of casing for a 1380 hp Caterpillar G3516B LE engine (b). -Input parameters based on material specifications for AP 101(c) grease. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F) Vapor pressure of material stored (psia) Molecular weight (lb/lb-mole) V_V Casing volume (ft3) (1ft * 3ft) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year (Number of seal changes per year per engine)	104 0.001 500 2.355 10.73 2	Clingage Loss (lb/activity) Total (lb/yr/engine)	0.0001 0.0002	Number of Engines	0	VOC	0.00	0.00
§106.352(i) Glycol Dehydration Unit Emissions associated with replacement of glycol solution used in dehydration unit. There are two vessels in a dehydration unit: contactor and regenerator.	-Calculations based on physical properties of mono ethylene glycol (MEG)(d) because of its low molecular weight and high vapor pressure which gives the most conservative emissions estimate. -Typically the glycol solution used in dehydration unit is not entirely replaced but it is conservatively assumed that the glycol solution is drained once per year for vessel maintenance. -Per field experience, 4000 gal of glycol solution is used in a large dehydration unit. -Assume all emissions from opening, loading, and clingage occur in three separate hours.	Temperature (F) Vapor Pressure (psia) Saturation Factor Molecular Weight (lb/lbmol) Glycol Solution (gal/activity) Temperature (F) Vapor Pressure (psia) Molecular Weight (lb/lbmol) V_V Vessel volume (ft3) (5 ft radii * 30 ft height) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year	68 0.001 1 62.07 4000 68 0.001 62.07 2355 10.73 1	Loading loss L_L (lb/1000 gal) Loading loss per activity (lb/activity) Clingage Loss (lb/activity) Total (lb/yr/unit)	0.0015 0.0060 0.0155 0.0215	Number of Dehy Units	0	VOC	0.00	0.00
§106.352(i) Heater Treater	-Calculations based on condensate (RVP 10) because it has higher vapor pressure than crude oil (RVP 5) and results in a more conservative emission estimate. -Emission estimates are based on a large site that typically has 4 heater treaters. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F) Vapor pressure of material stored (psia) Molecular weight (lb/lb-mole) V_V Vessel volume (ft3) (2ft radii * 10 ft height) Ideal gas constant (psia-ft3/lb-mol-°R) Number of activities per year	100 10.5 66 125.6 10.73 1	Clingage Loss (lb/activity) Total (lb/yr/treater)	8.6913 8.6913	Number of Heater Treaters	0	VOC Benzene	0.00 0.00	0.00 0.00

MISCELLANEOUS MSS ACTIVITIES (FIN MSS-FUG) POTENTIAL TO EMIT

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

§106.352(i) Aerosol Lubricants	-45-50% VOC by weight volatilizes. -Material specification per Lubricant MSDS (f). -VOC evaporation is based off standard engineering judgment consistent with product specification. - Standard Industrial Size Cans (oz.) 16 -Assume 4 cans used in an hour as a maximum			Pounds of Emissions per Can (lb/can)	0.5	Number of 16 oz Cans Used	100	VOC	2.00	0.03
NRSP(i) Piping Components	-Calculations based on condensate (RVP 10) because it has higher vapor pressure than crude oil (RVP 5) and results in a more conservative emission estimate. -100 foot long pipe sections conservatively assumed for emission calculations. -Assume all emissions from maintenance activity occur in one hour.	Temperature (°F)	72.1	Clingage Loss (lb/activity)	5.7169	Number of 100 ft Piping Sections	10	VOC	5.72	0.03
		Vapor pressure of material stored (psia)	10.5					Benzene	0.02	0.0001
		Molecular weight (lb/lb-mole)	66							
		V_V Vessel volume (ft3) (0.5 ft radii * 100 ft height)	78.5							
		Ideal gas constant (psia-ft3/lb-mol-°R)	10.73							
		Number of activities per year	1	Total (lb/yr/section)	5.7169					
§106.352(i) Pneumatic Controllers	Based on field experience and recent site visits to two plants in Central Texas area, changing pneumatic controllers of equipment under pressure requires isolation of pipe section or process equipment and a blow down. There are no emissions associated with changing the controller.									
§106.352(i) Calibration	-Per Monitoring Division's Laboratory and Quality Assurance Section - One cylinder of pentane or other calibration gas used per year and a typical cylinder contains 100 lbs. -Assume one cylinder emptied in an hour.	Pounds of pentane in one cylinder (lb)	100	Pounds of pentane in one cylinder (lb/cylinder)	100	Number of Cylinders	1	VOC	0.05	0.05
§106.352(i) Safety	Safety factor to account for MSS activities with the same character and quantity of emissions as those listed in this rule.						1	VOC	0.72	0.01
								Benzene	0.003	0.00004
§106.352(i) Catalyst Handling and Maintenance	-Based on U.S. EPA AP-42, 13.2.4 "Aggregate Handling and Storage Piles" (Equation 1). -The mean wind speed is consistent with the assumptions in the TCEQ's default calculations. -Moisture content estimate based on process knowledge -Particle size multipliers taken from AP-42, Chapter 13.2.4. -Assumed Control Efficiency of 0%. -Dust thickness assumed to be fly ash thickness in SCR. -Dust density assumed as fly ash density. -Based upon maximum surface area changed in an hour. -Based upon maximum surface area changed in a year.	U wind speed (mph)	3.52	Emission Factor (lb PM/ton)	0.010	Number of Engines/Turbines with Catalyst	0	PM	0.00	0.00
		M material moisture content (%)	0.5	Emission Factor (lb PM10/ton)	0.005			PM10	0.00	0.00
		k particle size multiplier (PM)	0.74	Emission Factor (lb PM2.5/ton)	0.001			PM2.5	0.00	0.00
		k particle size multiplier (PM10)	0.35							
		k particle size multiplier (PM2.5)	0.053							
		Honeycomb (filter) surface area (ft2)	100	Dust generated per filter replacement (lb)	246.06					
		Dust thickness (mm)	10							
		Dust Density (lb/ft3)	75							
		Number of activities per hour	1							
		Number of activities per year	5	Dust generated per year (T/yr)	0.62					
§106.352(i) Gas Pipeline Blowdown	-Based on an estimate of 100 scf of gas being degassed per event at 900 psi -Assume all emissions from maintenance activity occur in one hour. -Includes blocking and venting lines for minor repair and replacement.	Volume degassed (scf)	0	Volume degassed (at pressure) (scf)	0.00			VOC	0.00	0.00
		Pressure at which stream is degassed (psi)	900					H2S	0.00	0.00
		Air Molecular Weight (lb/lb-mol)	28.96	Stream Specific Gravity	0.782			Benzene	0.00	0.00
		Molar volume conversion (scf/(lb/mol))	379.4	Stream Density (lb/scf)	0.060					
		Inlet stream VOC content (%)	30.00%							
		Inlet stream H_2S content (%)	0.08%							
		Inlet stream Benzene content (%)	0.11%							
		Type of Control Equipment								
		Control Efficiency (%)	0.00%							
		Events per Hour	1							
		Events per Year	40							
§106.352(i) Pigging Activities	-Based on an estimate of 50 scf of gas being degassed per event at 900 psi -Assume all emissions from maintenance activity occur in one hour.	Volume degassed (scf)	0	Volume degassed (at pressure) (scf)	0.00			VOC	0.00	0.00
		Pressure at which stream is degassed (psi)	900					H2S	0.00	0.00
		Air Molecular Weight (lb/lb-mol)	28.96	Stream Specific Gravity	0.782			Benzene	0.00	0.00
		Molar volume conversion (scf/(lb/mol))	379.4	Stream Density (lb/scf)	0.060					
		Inlet stream VOC content (%)	30.00%							
		Inlet stream H_2S content (%)	0.08%							
		Inlet stream Benzene content (%)	0.11%							
		Type of Control Equipment								
		Control Efficiency (%)	0.00%							
		Events per Hour	1							
		Events per Year	52							

TANK CLEANOUT MSS ACTIVITIES POTENTIAL TO EMIT (FIN MSS-CLEAN-TK)

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Emissions Summary for **FIN MSS-CLEAN-TK**

Pollutant	Hourly Max (lb/hr)	Annual Total (T/yr)
VOC	3.45	0.004
H_2S	0.01	0.00001
Benzene	0.01	0.0000001

Activity	Description / Comments	Default Parameters		Equation Used		Input Parameters		Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (T/yr)
§106.352(i) Condensate Tank Cleaning Activities	-For condensate tanks and storage vessels -Assumed volume drained was equal to 1% of the vessel volume -Assumed drained material is immediately placed in a closed vessel. To be conservative, this time is represented as 15 minutes -Assumed an average daily temperature of 95F, per TCEQ guidance. -Assume all emissions from opening, loading, and evaporation occur in three separate hours.	P, vapor pressure of material (psia)	10.24	Vv, volume of vessel (ft3)	2807.49	Number of Condensate Tanks	2	VOC	3.42	0.004
		Vessel Height (ft)	25					H_2S	0.01	0.00001
		Vessel Diameter (ft)	12					Benzene	0.01	0.00000003
		Vessel Volume (bbl)	500							
		Average Daily Temperature (F)	72.1	Lo, opening loss (lb/activity)	171.20					
		Ideal gas constant (psia-ft3/lb-mol-°R)	10.73							
		MWv, vapor molecular weight (lb/lb-mol)	34	Loading loss factor (lb/1000 gal loaded)	4.89					
		Saturation Factor	0.60	Vl, volume of liquid drained (gallon/activity)	210.00					
		U wind speed (mph)	3.52	Loading loss per activity (due to draining) (lb/activity)	1.03					
		Surface Area Ap (m2)	1	Vapor Pressure P_V (Pa)	70602.34					
		t, time material sits uncovered (hr)	0.25	Evaporation Loss (lb/activity)	20.71					
		Condensate stream H_2S content (%)	0.08%							
		Condensate stream Benzene content (%)	0.17%							
		Type of Control Equipment	Flare							
		Control Efficiency (%) (for opening losses only)	98.00%							
		Events per Hour per tank	1	Total (lb/yr/tank)	192.94					
		Events per Year per tank	1							
§106.352(i) Non-Condensate Tank Cleaning Activities	-For non-condensate tanks and storage vessels -Assumed volume drained was equal to 1% of the vessel volume -Assumed drained material is immediately placed in a closed vessel. To be conservative, this time is represented as 15 minutes -Assumed an average daily temperature of 95F, per TCEQ guidance. -Assume all emissions from opening, loading, and evaporation occur in three separate hours.	P, vapor pressure of material (psia)	0.10	Vv, volume of vessel (ft3)	2807.49	Number of Non-Condensate Tanks	2	VOC	0.03	0.00004
		Vessel Height (ft)	25					H_2S	0.0001	0.0000001
		Vessel Diameter (ft)	12					Benzene	0.0001	0.0000001
		Vessel Volume (bbl)	500							
		Average Daily Temperature (F)	72.1	Lo, opening loss (lb/activity)	1.672					
		Ideal gas constant (psia-ft3/lb-mol-°R)	10.73							
		MWv, vapor molecular weight (lb/lb-mol)	34	Loading loss factor (lb/1000 gal loaded)	0.04777					
		Saturation Factor	0.60	Vl, volume of liquid drained (gallon/activity)	210.00					
		U wind speed (mph)	3.52	Loading loss per activity (due to draining) (lb/activity)	0.01003					
		Surface Area Ap (m2)	1	Vapor Pressure P_V (Pa)	689.48					
		t, time material sits uncovered (hr)	0.25	Evaporation Loss (lb/activity)	0.202					
		Produced Water stream H_2S content (%)	0.08%							
		Produced Water stream Benzene content (%)	0.17%							
		Type of Control Equipment	Flare							
		Control Efficiency (%) (for opening losses only)	98.00%							
		0	1	Total (lb/yr/tank)	1.884					
		Events per Year per tank	1							

PROCESS FLARE WASTE GAS COMBUSTION EMISSIONS - MSS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

EPN	FIN	Description	LHV[a] (Btu/scf)	Waste Gas Flow Rate Hourly (MMBtu/hr)	Waste Gas Flow Rate Annual (MMBtu/yr)	Pollutant	Emission Factors	Units	Potential to Emit Hourly[b] (lb/hr)	Potential to Emit Annual[c] (T/yr)
FL-1-MSS	FL-1-MSS	Process Flare	1,699	5.89	13.71	NO_X	0.1380	lb/MMBtu	0.81	0.001
		Condensate Tank Clean Out				CO	0.2755	lb/MMBtu	1.62	0.002
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.92	0.001
						H_2S	-- [c]	--	0.01	0.00001
FL-1-MSS	FL-1-MSS	Process Flare	1,673	0.05	0.12	NO_X	0.1380	lb/MMBtu	0.01	0.00001
		Produced Water Tank Clean Out				CO	0.2755	lb/MMBtu	0.01	0.00002
						$PM/PM_{10}/PM_{2.5}$	-- [e]	--	--	--
						SO_2	-- [c]	--	0.01	0.00001
						H_2S	-- [c]	--	0.0001	0.0000001

[a] Waste gas stream lower heating value was taken from WinSim calculated stream value.

[b] Emission Factors for CO and NO_X are based upon the Draft TNRCC Guidance Document for Flares and Vapor Oxidizers (dated 10/00) for other high-Btu flares. An example calculation for hourly CO emissions from condensate tank cleaning activities for EPN FL-1-MSS follows:

CO (lb/hr) = (Hourly Waste Gas Flow Rate, MMBtu/hr)*(Emission Factor, lb/MMBtu)

CO (lb/hr) = (5.89 MMBtu/hr)*(0.2755 lb/MMBtu)

= 1.62 lb/hr CO

[c] H_2S emissions are routed from the tanks to the flare and then converted to SO_2. To be most conservative, SO_2 emission rates were determined based on the combustion efficiency of 100% H_2S converted to SO_2. H_2S emitted at the flare is conservatively represented as 2% of the captured stream. An example calculation for hourly SO_2 emissions from condensate tank cleaning activities for EPN FL-1-MSS follows:

SO_2 (lb/hr) = (Source H_2S Emission Rate, lb/hr) * (98% captured H2S stream) * (100% conversion to SO_2 at combustion) * (1 mol H_2S/34.07 lb H_2S) * (64.06 lb SO2/1 mol SO_2)

SO_2 (lb/hr) = (0.010 lb/hr H2S at Condensate Tanks)* (98%) * (100%) * (1 mol H2S/34.07 lb H2S) * (64.06 lb SO2/1 mol SO2)

= 0.92 lb/hr SO_2

[d] An example calculation for annual CO emissions for EPN FL-1-MSS follows:

CO (T/yr) = (Annual Waste Gas Flow Rate, MMBtu/yr) * (Emission Factor, lb/MMBtu) * (1 T / 2,000 lb)

CO (T/yr) = (013.71 MMBtu/yr) * (0.2755 lb/MMBtu) * (1 T / 2,000 lb)

= 0.002 T/yr CO

[e] The process flares are smokeless per 40 CFR §60.18 requirements; therefore, PM emissions are negligible.

[f] Produced Water Tank Clean Out is conservatively estimated by including both combustion of 98% of the waste gas by the flare and 100% uncontrolled emissions at the Produced Water Tank.

CALCULATION OF FLARE FEED RATES FROM CONDENSATE TANK CLEANING ACTIVITIES - MSS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

MSS Condensate Clean Out Total Emissions: [a]

VOC Emissions (lb/hr):	171.00
VOC Emissions (TPY):	0.20
Hydrocarbon Emissions (lb/hr):	288.80
Hydrocarbon Emissions (TPY):	0.34

Constituent	Heating Value[b] (Btu/lb)	Condensate Tanks Flash Gas Weight (%)	MSS Condensate Cleaning Activities Emissions [c] Hourly (lb/hr)	MSS Condensate Cleaning Activities Emissions [c] Annual (T/yr)	Flare Feed Rate [d] Hourly (MMBtu/hr)	Flare Feed Rate [d] Annual (MMBtu/yr)
Methane	23,861	19.02%	54.93	0.06	1.30	2.83
Ethane	22,304	15.75%	45.49	0.05	1.00	2.21
Propane	21,646	19.03%	54.96	0.06	1.18	2.57
I-Butane	21,242	7.91%	22.84	0.03	0.48	1.25
N-Butane	21,293	12.77%	36.88	0.04	0.77	1.67
I-Pentane	21,025	6.04%	17.44	0.02	0.36	0.82
N-Pentane	21,072	4.85%	14.01	0.02	0.29	0.83
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	4.66%	13.46	0.02	0.28	0.82
Cyclohexane	20,195	0.31%	0.90	0.001	0.02	0.04
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	2.02%	5.83	0.01	0.12	0.41
Octanes	20,747	0.58%	1.68	0.002	0.03	0.08
Nonanes	20,687	0.13%	0.38	0.0004	0.01	0.02
Decanes Plus	20,638	0.24%	0.69	0.001	0.01	0.04
Benzene	18,172	0.17%	0.49	0.001	0.01	0.04
Toluene	18,422	0.29%	0.84	0.001	0.02	0.04
Ethylbenzene	18,658	0.04%	0.12	0.0001	0.002	0.004
Xylene	18,438	0.17%	0.49	0.001	0.01	0.04
	VOC	59.21%				
				Total:	**5.89**	**13.71**

[a] Total VOC Emissions were determined by adding the MSS Condensate Tank Clean Out Stream. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)
Total HC (lb/hr) = (171.00 lb/hr) * (1 / 59.21%)
Total HC (lb/hr) = 288.80 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 #

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Condensate Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6
MMBtu/hr Methane = (23,861 Btu/lb) * (54.93 lb/hr) * 99% / (10^6)
MMBtu/hr Methane = 1.30 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6
MMBtu/yr Methane = (23,861 Btu/lb) * (0.06 T/yr) * (2,000 lb/T) * 99% / (10^6)
MMBtu/yr Methane = 2.83 MMBtu/yr

Note: Hourly MSS emissions determined from maximum event occuring in one hour. While the max MSS event for one hour may not always be routed to flare, the flare waste gas combustion emissions are included to be most conservative. The emissions shown here are associated with the opening loss of the condensate storage tanks.

CALCULATION OF FLARE FEED RATES FROM PRODUCED WATER TANK CLEANING ACTIVITIES - MSS

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

MSS Produced Water Tank Clean Out Total Emissions: [a]

VOC Emissions (lb/hr):	1.50
VOC Emissions (TPY):	0.002
Hydrocarbon Emissions (lb/hr):	2.53
Hydrocarbon Emissions (TPY):	0.003

Constituent	Heating Value[b] (Btu/lb)	Produced Water Tanks Flash Gas Weight (%)	MSS Produced Water Tank Cleaning Activities Emissions [c] Hourly (lb/hr)	MSS Produced Water Tank Cleaning Activities Emissions [c] Annual (T/yr)	Flare Feed Rate [d] Hourly (MMBtu/hr)	Flare Feed Rate [d] Annual (MMBtu/yr)
Methane	23,861	18.58%	0.47	0.001	0.01	0.05
Ethane	22,304	15.45%	0.39	0.000	0.01	0.00
Propane	21,646	18.82%	0.48	0.001	0.01	0.04
I-Butane	21,242	7.95%	0.20	0.0002	0.004	0.01
N-Butane	21,293	12.83%	0.32	0.000	0.01	0.00
I-Pentane	21,025	6.08%	0.15	0.0002	0.003	0.01
N-Pentane	21,072	4.88%	0.12	0.0001	0.002	0.00
Cyclopentane	20,350	0.00%	0.00	0.00	0.00	0.00
n-Hexane	20,928	4.69%	0.12	0.0001	0.002	0.004
Cyclohexane	20,195	0.31%	0.01	0.00001	0.0002	0.0004
Other Hexanes	20,928	0.00%	0.00	0.00	0.00	0.00
Heptanes	20,825	2.04%	0.05	0.0001	0.001	0.004
Octanes	20,747	0.58%	0.01	0.00002	0.0002	0.001
Nonanes	20,687	0.13%	0.003	0.000004	0.0001	0.0002
Decanes Plus	20,638	0.24%	0.01	0.00001	0.0002	0.000
Benzene	18,172	0.17%	0.004	0.00001	0.0001	0.0004
Toluene	18,422	0.30%	0.01	0.00001	0.0002	0.0004
Ethylbenzene	18,658	0.04%	0.001	0.000001	0.00002	0.00004
Xylene	18,438	0.17%	0.004	0.00001	0.0001	0.0004
	VOC	59.23%				
				Total:	**0.05**	**0.12**

[a] Total VOC Emissions were determined by adding the MSS Produced Water Tank Clean Out Stream. Total Hydrocarbon Emissions were calculated as follows:

Total HC (lb/hr) = VOC Emissions (lb/hr) * (1/ VOC% of stream)

Total HC (lb/hr) = (1.50 lb/hr) * (1/ 59.23%)

Total HC (lb/hr) = 2.53 lb/hr

[b] Heating values taken from Perry's Chemical Engineers' Handbook , Table 3-207 #

[c] Emission Rates were proportioned from the Total Hydrocarbon Emissions using the Produced Water Flash Gas stream constituents weight percents, generated by the WinSim program.

[d] An example calculation for the hourly flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/hr Methane = Methane Heating Value (Btu/lb) * Hourly Methane Emissions (lb/hr) * 99% of stream is combusted / 10^6

MMBtu/hr Methane = (23,861 Btu/lb) * (0.47 lb/hr) * 99% / (10^6)

MMBtu/hr Methane = 0.01 MMBtu/hr

An example calculation for the annual flare feed rate for Methane is demonstrated. Note that constituents with greater than 3 carbons use 98% destruction efficiency.

MMBtu/yr Methane = Methane Heating Value (Btu/lb) * Annual Methane Emissions (T/yr) * (2,000 lb/T) * 99% of stream is combusted / 10^6

MMBtu/yr Methane = (23,861 Btu/lb) * (0.001 T/yr) * (2,000 lb/T) * 99% / (10^6)

MMBtu/yr Methane = 0.05 MMBtu/yr

EMISSIONS FOR BLASTING AND COATING MSS ACTIVITIES (FIN MSS-BC)

PERMIT BY RULE REGISTRATION

FRANZ UNIT A3-A4

BURLINGTON RESOURCES OIL & GAS COMPANY LP

Emissions Summary for **FIN MSS-BC**

Pollutant	Hourly Max (lb/hr)	Annual Total (T/yr)
VOC	0.00	0.00
PM	2.21	1.18
PM10	0.53	0.28
PM2.5	0.00	0.00

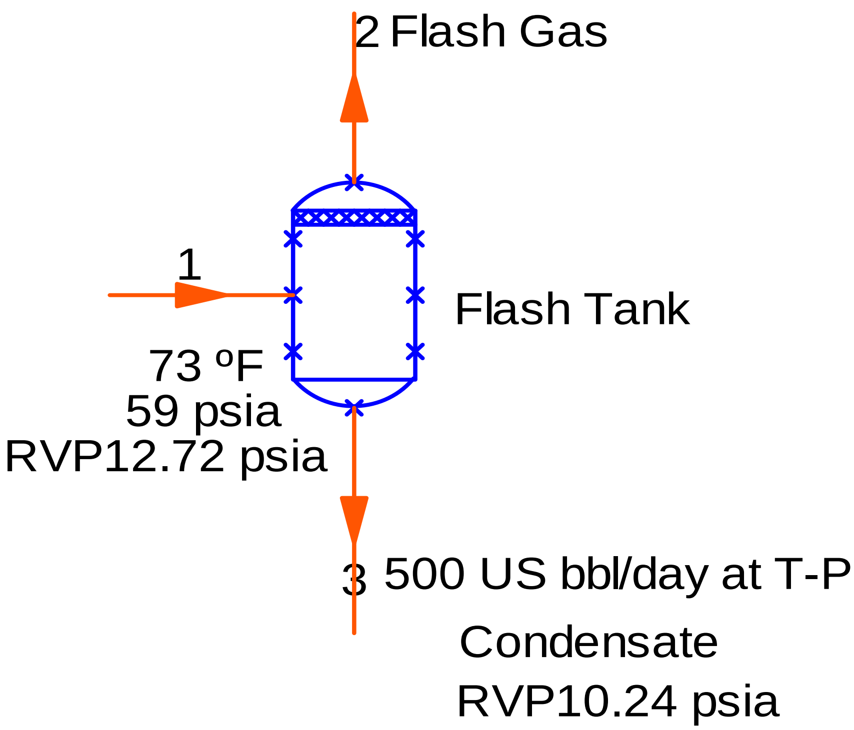
#	Activity	Description / Comments	Default Parameters		Equation Used		Input Parameters		Pollutant	Hourly Emissions (lb/hr)	Annual Emissions (T/yr)	Source for "Input Parameters"
1	***30 TAC 106.263 Abrasive Blasting***	-Blasting media usage rates provided by the site and includes a 25% factor of safety. Based on maximum of blasting with one nozzle at a time. -Based on worst-case PM/PM10 emissions factors from TCEQ's "Abrasive Blast Cleaning," Draft RG-169, March 2001.	PM10 Emission Factor (lb PM/lb usage)	0.0014			Number of Blasting Guns	1	PM10	0.53	0.28	Site-Specific Data
			PM Emission Factor (lb PM/lb usage)	0.0059					PM	2.21	1.18	
			Hourly Blasting Media Usage (lb/hr)	375								
			Annual Blasting Media Usage (T/yr)	200								
2	***30 TAC 106.263 Coating (hand-applied)***	Regardless of the amount of paint applied, if the coating is applied with brushes and/or rollers, the coating activity is De Minimis.										
3	***30 TAC 106.263 Coating (spray)***	-If use less than 100 gal/yr coating and less than 50 gal/yr of solvent, activity is De Minimis regardless of the application method. -Assume max VOC content as allowed by 30 TAC 115, i.e., 3.5 lb/gal. -Emission calculation formula and emission factors are defined in TCEQ Technical Guidance Document for Surface Coating Operations dated April 2001. -The calculations do not account for any enclosure or control device.	Maximum hourly coating usage rate (gal/hr-gun)	5	Maximum Hourly Emissions (lb/hr)	17.500			VOC	0.00	0.00	Site-Specific Data
			Maximum annual coating usage rate (gal/yr-gun)	99								
			Number of guns with concurrent coating	1	Maximum Annual Emissions (T/yr)	0.173						
			Max VOC content (lb/gal)	3.5								
4	***30 TAC 106.263 Coating (spray)***	-If use less than 100 gal/yr coating and less than 50 gal/yr of solvent, activity is De Minimis regardless of the application method. -Emission calculation formula and emission factors are defined in TCEQ Technical Guidance Document for Surface Coating Operations dated April 2001. -It is assumed that 90% of the overspray falls to the ground per TCEQ Memo dated January 10, 1994. -All PM is assumed to be PM and PM10 (i.e., no particle size distribution is applied).	Maximum hourly coating usage rate (gal/hr-gun)	5	Maximum Hourly Emissions (lb/hr)	4.543			PM10	0.00	0.00	Site-Specific Data
			Maximum annual coating usage rate (gal/yr-gun)	99					PM	0.00	0.00	
			Max Density (lb/gal)	23	Maximum Annual Emissions (T/yr)	0.040						
			Percent Overspray for PM (%)	50.00%								
			Max Solids content (%)	79.00%								
			Max Solids content (%)	70.00%								
			Fallout factor content (%)	90.00%								

DESIGN II for Windows

CONDENSATE SUMMARY REPORT

Simulation Result: SOLUTION REACHED

Problem:
Project:
Task:
By:
At: 23-Jan-12 2:14 PM



Details for Stream 1

Stream 1 (Strm 1)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Vapor Visc:	NBS81	Vapor ThC:	NBS81	Vapor Den:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.255852	0.215764	0.040088	0	0.503	130.326
49 : CARBON DIOXIDE	0.054934	0.021472	0.033462	0	0.108	15.5377
2 : METHANE	1.88608	1.26992	0.616157	0	3.708	49.9058
3 : ETHANE	1.06868	0.262114	0.806562	0	2.101	7.86899
4 : PROPANE	1.53307	0.122378	1.4107	0	3.014	2.10056
5 : ISOBUTANE	0.920659	0.030598	0.890061	0	1.81	0.832412
6 : N-BUTANE	1.92321	0.047086	1.87612	0	3.781	0.607713
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	0.393472
7 : ISOPENTANE	1.84539	0.016576	1.82881	0	3.628	0.219473
8 : N-PENTANE	1.87438	0.013206	1.86117	0	3.685	0.171805
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.096522
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.070658
52 : 2-METHYLPENTANE	0	0	0	0	0	0.063608
53 : 3-METHYLPENTANE	0	0	0	0	0	0.056697
10 : N-HEXANE	4.95732	0.010486	4.94683	0	9.746	0.05133
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.041535
40 : BENZENE	0.213125	0.000423	0.212702	0	0.419	0.048185
38 : CYCLOHEXANE	0.444053	0.000711	0.443341	0	0.873	0.038859
79 : 2-METHYLHEXANE	0	0	0	0	0	0.0179
80 : 3-METHYLHEXANE	0	0	0	0	0	0.017961
11 : N-HEPTANE	6.06007	0.003993	6.05608	0	11.914	0.015966
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.013936
41 : TOLUENE	1.2055	0.000625	1.20488	0	2.37	0.012551
12 : N-OCTANE	4.8917	0.001024	4.89067	0	9.617	0.005071
45 : ETHYL BENZENE	0.400309	0.00007956	0.400229	0	0.787	0.004813
43 : M-XYLENE	1.90439	0.000317	1.90407	0	3.744	0.004035
42 : O-XYLENE	0	0	0	0	0	0.002077
13 : N-NONANE	3.04784	0.000207	3.04763	0	5.992	0.001646
14 : N-DECANE	16.3786	0.000357	16.3782	0	32.2	0.000528
62 : WATER	0	0	0	0	0	0.006854
Total	50.8651	2.01734	48.8478	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	7.16727	6.04427	1.123	0	0.135301
49 : CARBON DIOXIDE	2.41759	0.944964	1.47263	0	0.045638
2 : METHANE	30.2583	20.3733	9.885	0	0.571205
3 : ETHANE	32.133	7.88126	24.2517	0	0.606594
4 : PROPANE	67.5994	5.39614	62.2033	0	1.27612
5 : ISOBUTANE	53.5087	1.77835	51.7303	0	1.01012
6 : N-BUTANE	111.777	2.73666	109.04	0	2.11008
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	133.137	1.1959	131.941	0	2.51331
8 : N-PENTANE	135.229	0.952728	134.276	0	2.5528
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	427.182	0.903638	426.278	0	8.06417
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	16.6468	0.033061	16.6137	0	0.314251
38 : CYCLOHEXANE	37.3697	0.059875	37.3098	0	0.70545
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	607.207	0.400105	606.807	0	11.4626
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	111.068	0.057541	111.01	0	2.0967
12 : N-OCTANE	558.749	0.116983	558.632	0	10.5479
45 : ETHYL BENZENE	42.4968	0.008446	42.4883	0	0.802237
43 : M-XYLENE	202.17	0.033681	202.136	0	3.81649
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	390.885	0.026573	390.859	0	7.37898
14 : N-DECANE	2330.28	0.050796	2330.23	0	43.9901
62 : WATER	0	0	0	0	0
Total	5297.28	48.9943	5248.29	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	20.8018	20.7027	0.099054	0	6.6192
49 : CARBON DIOXIDE	2.14296	2.06027	0.082682	0	0.681896
2 : METHANE	123.373	121.85	1.52247	0	39.2576
3 : ETHANE	27.1431	25.1501	1.99295	0	8.63702
4 : PROPANE	15.228	11.7423	3.48571	0	4.84561
5 : ISOBUTANE	5.13516	2.9359	2.19926	0	1.63403
6 : N-BUTANE	9.15372	4.51798	4.63574	0	2.91274
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	6.10933	1.5905	4.51883	0	1.94401
8 : N-PENTANE	5.86589	1.26709	4.5988	0	1.86655
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	13.2294	1.00618	12.2232	0	4.20963
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.566181	0.040613	0.525567	0	0.180161
38 : CYCLOHEXANE	1.16372	0.068267	1.09546	0	0.370301
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	15.3472	0.383146	14.9641	0	4.88353
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	3.03708	0.059925	2.97715	0	0.966408
12 : N-OCTANE	12.1827	0.098268	12.0844	0	3.87658
45 : ETHYL BENZENE	0.996565	0.007633	0.988932	0	0.31711
43 : M-XYLENE	4.73524	0.030442	4.7048	0	1.50677
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	7.55032	0.019881	7.53044	0	2.40254
14 : N-DECANE	40.5034	0.034257	40.4692	0	12.8883
62 : WATER	0	0	0	0	0
Total	314.264	193.566	120.699	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	81.901	81.8787	0.022316	0	9.25691
49 : CARBON DIOXIDE	8.17705	8.14832	0.028725	0	0.924216
2 : METHANE	482.443	481.914	0.528573	0	54.5284
3 : ETHANE	100.559	99.468	1.09105	0	11.3658
4 : PROPANE	48.4062	46.4405	1.96579	0	5.47115
5 : ISOBUTANE	13.0849	11.6114	1.4735	0	1.47893
6 : N-BUTANE	20.862	17.8685	2.99356	0	2.35794
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	9.67758	6.29036	3.38722	0	1.09381
8 : N-PENTANE	8.42287	5.01128	3.41158	0	0.952
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	14.2731	3.97943	10.2937	0	1.61323
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.461799	0.160625	0.301174	0	0.052195
38 : CYCLOHEXANE	1.03358	0.269994	0.763584	0	0.116821
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	15.6538	1.51533	14.1385	0	1.76928
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.27871	0.237002	2.04171	0	0.257553
12 : N-OCTANE	13.0591	0.388648	12.6704	0	1.47601
45 : ETHYL BENZENE	0.811759	0.03019	0.781569	0	0.09175
43 : M-XYLENE	3.85116	0.120399	3.73076	0	0.435279
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	8.76092	0.078627	8.68229	0	0.990208
14 : N-DECANE	51.038	0.135484	50.9025	0	5.7686
62 : WATER	0	0	0	0	0
Total	884.755	765.547	119.209	0	100

Properties

Temperature	F	73		
Pressure	psia	58.696		
Enthalpy	Btu/hr	-725104.8		
Entropy	Btu/hr/R	-798.7474		
Vapor Fraction		0.039660574		
		Total	Vapor	Liquid 1
Flowrate	lbmol/hr	50.8651	2.0173	48.8478
Flowrate	lb/hr	5297.2795	48.9943	5248.2852
Mole Fraction		1	0.039661	0.960339
Mass Fraction		1	0.009249	0.990751
Molecular Weight		104.1436	24.2866	107.4416
Enthalpy	Btu/lbmol	-14255.4421	369.0229	-14859.4105
Enthalpy	Btu/lb	-136.8825	15.1945	-138.3022
Entropy	Btu/lbmol/R	-15.7032	0.57503	-16.3755
Entropy	Btu/lb/R	-0.150784	0.023677	-0.152413
Cp	Btu/lbmol/R		10.6828	53.3877
Cp	Btu/lb/R		0.4399	0.4969
Cv	Btu/lbmol/R		8.5657	46.4937
Cv	Btu/lb/R		0.3527	0.4327
Cp/Cv			1.2472	1.1483
Density	lb/ft3		0.253115	43.4825
Z-Factor			0.985371	0.025375
Flowrate (T-P)	ft3/s		0.053768	
Flowrate (T-P)	gal/min			15.0491
Flowrate (STP)	MMSCFD		0.018373	
Flowrate (STP)	gal/min			14.8624
Specific Gravity	GPA STP			0
Viscosity	cP		0.011401	0.487897
Thermal Conductivity	Btu/hr/ft/R		0.016549	0.068505
Surface Tension	dyne/cm			19.926
Reid Vapor Pressure (ASTM-A	psia			12.72
True Vapor Pressure at 100 F	psia			185.9
Critical Temperature (Cubic E(	F	572.6714		
Critical Pressure (Cubic EOS)	psia	528.7944		
Dew Point Temperature	F	387.2267		
Bubble Point Temperature	F	-107.6862		
Water Dew Point Temperature could not be calculated				
Stream Vapor Pressure	psia	169.3405		
Latent Heat of Vaporization (N	Btu/lb	117.4355		
Latent Heat of Vaporization (P	Btu/lb	298.3557		
Vapor Sonic Velocity	ft/s	1147.7		
CO2 Freeze Up		No		
Heating Value (gross)	Btu/SCF	5655.05		
Heating Value (net)	Btu/SCF	5252.29		
Wobbe Number	Btu/SCF	2842.22		
Average Hydrogen Atoms		16.0089		
Average Carbon Atoms		7.3132		
Hydrogen to Carbon Ratio		2.1891		

Details for Stream 2

Stream 2 (Flash Gas)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Vapor Visc:	NBS81	Vapor ThC:	NBS81	Vapor Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Incipient Liquid 1 mol fra	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.250797	0.250797	0.000109	0	5.65196	519.165
49 : CARBON DIOXIDE	0.046706	0.046706	0.000177	0	1.05257	59.3908
2 : METHANE	1.79064	1.79064	0.002056	0	40.3538	196.299
3 : ETHANE	0.791085	0.791085	0.005979	0	17.8279	29.8176
4 : PROPANE	0.651887	0.651887	0.01898	0	14.6909	7.74031
5 : ISOBUTANE	0.205689	0.205689	0.0154	0	4.6354	3.01008
6 : N-BUTANE	0.331938	0.331938	0.034274	0	7.48054	2.18256
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	1.48838
7 : ISOPENTANE	0.12655	0.12655	0.037022	0	2.85194	0.770341
8 : N-PENTANE	0.101564	0.101564	0.038184	0	2.28884	0.599418
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.360909
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.263381
52 : 2-METHYLPENTANE	0	0	0	0	0	0.236664
53 : 3-METHYLPENTANE	0	0	0	0	0	0.210746
10 : N-HEXANE	0.081601	0.081601	0.105017	0	1.83896	0.17511
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.154099
40 : BENZENE	0.003315	0.003315	0.004519	0	0.074698	0.165296
38 : CYCLOHEXANE	0.005555	0.005555	0.009445	0	0.125182	0.132542
79 : 2-METHYLHEXANE	0	0	0	0	0	0.065693
80 : 3-METHYLHEXANE	0	0	0	0	0	0.066054
11 : N-HEPTANE	0.030507	0.030507	0.12987	0	0.687506	0.052938
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.051298
41 : TOLUENE	0.004816	0.004816	0.025861	0	0.108543	0.041971
12 : N-OCTANE	0.007657	0.007657	0.105197	0	0.172563	0.016404
45 : ETHYL BENZENE	0.000601	0.000601	0.008609	0	0.013536	0.015722
43 : M-XYLENE	0.002393	0.002393	0.040967	0	0.053921	0.013162
42 : O-XYLENE	0	0	0	0	0	0.007514
13 : N-NONANE	0.001513	0.001513	0.065614	0	0.034097	0.005197
14 : N-DECANE	0.002537	0.002537	0.352721	0	0.057178	0.001621
62 : WATER	0	0	0	0	0	0.024719
Total	4.43735	4.43735	1	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Incipient Liquid 1 mass fra	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	7.02568	7.02568	0.000028	0	4.65125
49 : CARBON DIOXIDE	2.05548	2.05548	0.00007	0	1.3608
2 : METHANE	28.7271	28.7271	0.000298	0	19.0184
3 : ETHANE	23.7864	23.7864	0.001622	0	15.7474
4 : PROPANE	28.7443	28.7443	0.00755	0	19.0297
5 : ISOBUTANE	11.9546	11.9546	0.008075	0	7.9144
6 : N-BUTANE	19.2922	19.2922	0.01797	0	12.7721
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	9.1301	9.1301	0.0241	0	6.04445
8 : N-PENTANE	7.32742	7.32742	0.02485	0	4.85101
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	7.03171	7.03171	0.08164	0	4.65524
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.258898	0.258898	0.003184	0	0.1714
38 : CYCLOHEXANE	0.467466	0.467466	0.007171	0	0.309479
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	3.05674	3.05674	0.1174	0	2.02367
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.443758	0.443758	0.0215	0	0.293784
12 : N-OCTANE	0.874636	0.874636	0.1084	0	0.57904
45 : ETHYL BENZENE	0.063762	0.063762	0.008245	0	0.042213
43 : M-XYLENE	0.254004	0.254004	0.03924	0	0.16816
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.194043	0.194043	0.07592	0	0.128463
14 : N-DECANE	0.360982	0.360982	0.4527	0	0.238983
62 : WATER	0	0	0	0	0
Total	151.049	151.049	1	0	100
	Total VOC	**89.454619**			

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	96.1908	96.1908	0	0	5.65196
49 : CARBON DIOXIDE	17.9137	17.9137	0	0	1.05257
2 : METHANE	686.781	686.781	0	0	40.3538
3 : ETHANE	303.413	303.413	0	0	17.8279
4 : PROPANE	250.025	250.025	0	0	14.6909
5 : ISOBUTANE	78.89	78.89	0	0	4.6354
6 : N-BUTANE	127.311	127.311	0	0	7.48054
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	48.5371	48.5371	0	0	2.85194
8 : N-PENTANE	38.9538	38.9538	0	0	2.28884
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	31.2972	31.2972	0	0	1.83896
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	1.27129	1.27129	0	0	0.074698
38 : CYCLOHEXANE	2.13047	2.13047	0	0	0.125182
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	11.7007	11.7007	0	0	0.687506
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.8473	1.8473	0	0	0.108543
12 : N-OCTANE	2.93685	2.93685	0	0	0.172563
45 : ETHYL BENZENE	0.230363	0.230363	0	0	0.013536
43 : M-XYLENE	0.917679	0.917679	0	0	0.053921
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.580298	0.580298	0	0	0.034097
14 : N-DECANE	0.973117	0.973117	0	0	0.057178
62 : WATER	0	0	0	0	0
Total	1701.9	1701.9	0	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	95.1733	95.1733	0	0	5.65196
49 : CARBON DIOXIDE	17.7242	17.7242	0	0	1.05257
2 : METHANE	679.516	679.516	0	0	40.3538
3 : ETHANE	300.204	300.204	0	0	17.8279
4 : PROPANE	247.38	247.38	0	0	14.6909
5 : ISOBUTANE	78.0555	78.0555	0	0	4.6354
6 : N-BUTANE	125.965	125.965	0	0	7.48054
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	48.0237	48.0237	0	0	2.85194
8 : N-PENTANE	38.5418	38.5418	0	0	2.28884
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	30.9661	30.9661	0	0	1.83896
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	1.25784	1.25784	0	0	0.074698
38 : CYCLOHEXANE	2.10794	2.10794	0	0	0.125182
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	11.5769	11.5769	0	0	0.687506
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	1.82776	1.82776	0	0	0.108543
12 : N-OCTANE	2.90578	2.90578	0	0	0.172563
45 : ETHYL BENZENE	0.227926	0.227926	0	0	0.013536
43 : M-XYLENE	0.907972	0.907972	0	0	0.053921
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.57416	0.57416	0	0	0.034097
14 : N-DECANE	0.962824	0.962824	0	0	0.057178
62 : WATER	0	0	0	0	0
Total	1683.9	1683.9	0	0	100

Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	2200.352	
Entropy	Btu/hr/R	20.63128	
Vapor Fraction		1	
		Total	Vapor
Flowrate	lbmol/hr	4.4373	4.4373
Flowrate	lb/hr	151.0493	151.0493
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		34.0405	34.0405
Enthalpy	Btu/lbmol	495.8711	495.8711
Enthalpy	Btu/lb	14.5671	14.5671
Entropy	Btu/lbmol/R	4.6495	4.6495
Entropy	Btu/lb/R	0.136586	0.136586
Cp	Btu/lbmol/R		14.1612
Cp	Btu/lb/R		0.416
Cv	Btu/lbmol/R		12.1115
Cv	Btu/lb/R		0.3558
Cp/Cv			1.1692
Density	lb/ft3		0.088753
Z-Factor			0.992026
Flowrate (T-P)	ft3/s		0.47275
Flowrate (STP)	MMSCFD		0.040414
Viscosity	cP		0.010016
Thermal Conductivity	Btu/hr/ft/R		0.012957
Critical Temperature (Cubic E	F	167.7513	
Critical Pressure (Cubic EOS)	psia	1674.2414	
Dew Point Temperature	F	70.0076	
Bubble Point Temperature	F	-302.363	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	1624.148	
Vapor Sonic Velocity	ft/s	942.31	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	1853.01	
Heating Value (net)	Btu/SCF	1698.55	
Wobbe Number	Btu/SCF	1700.81	
Average Hydrogen Atoms		6.1404	
Average Carbon Atoms		2.1591	
Hydrogen to Carbon Ratio		2.844	

Details for Stream 3

Stream 3 (Condensate)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	NBS81	Liquid 2 ThC:	NBS81	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.005054	0	0.005054	0	0.010887	
49 : CARBON DIOXIDE	0.008228	0	0.008228	0	0.017723	
2 : METHANE	0.095443	0	0.095443	0	0.205573	
3 : ETHANE	0.277591	0	0.277591	0	0.597899	
4 : PROPANE	0.881188	0	0.881188	0	1.89798	
5 : ISOBUTANE	0.71497	0	0.71497	0	1.53996	
6 : N-BUTANE	1.59127	0	1.59127	0	3.42742	
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	
7 : ISOPENTANE	1.71884	0	1.71884	0	3.70217	
8 : N-PENTANE	1.77282	0	1.77282	0	3.81844	
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	
52 : 2-METHYLPENTANE	0	0	0	0	0	
53 : 3-METHYLPENTANE	0	0	0	0	0	
10 : N-HEXANE	4.87571	0	4.87571	0	10.5017	
37 : METHYLCYCLOPENTA	0	0	0	0	0	
40 : BENZENE	0.20981	0	0.20981	0	0.451907	
38 : CYCLOHEXANE	0.438498	0	0.438498	0	0.944473	
79 : 2-METHYLHEXANE	0	0	0	0	0	
80 : 3-METHYLHEXANE	0	0	0	0	0	
11 : N-HEPTANE	6.02956	0	6.02956	0	12.987	
39 : METHYLCYCLOHEXAN	0	0	0	0	0	
41 : TOLUENE	1.20069	0	1.20069	0	2.58614	
12 : N-OCTANE	4.88404	0	4.88404	0	10.5197	
45 : ETHYL BENZENE	0.399708	0	0.399708	0	0.860924	
43 : M-XYLENE	1.902	0	1.902	0	4.09668	
42 : O-XYLENE	0	0	0	0	0	
13 : N-NONANE	3.04633	0	3.04633	0	6.56143	
14 : N-DECANE	16.376	0	16.376	0	35.2721	
62 : WATER	0	0	0	0	0	
Total	46.4278	0	46.4278	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.141592	0	0.141592	0	0.002751
49 : CARBON DIOXIDE	0.362116	0	0.362116	0	0.007037
2 : METHANE	1.53119	0	1.53119	0	0.029754
3 : ETHANE	8.34661	0	8.34661	0	0.162189
4 : PROPANE	38.8551	0	38.8551	0	0.755021
5 : ISOBUTANE	41.554	0	41.554	0	0.807466
6 : N-BUTANE	92.4848	0	92.4848	0	1.79714
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	124.007	0	124.007	0	2.40967
8 : N-PENTANE	127.902	0	127.902	0	2.48535
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	420.15	0	420.15	0	8.16423
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	16.3879	0	16.3879	0	0.318444
38 : CYCLOHEXANE	36.9022	0	36.9022	0	0.717073
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	604.15	0	604.15	0	11.7397
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	110.624	0	110.624	0	2.14961
12 : N-OCTANE	557.875	0	557.875	0	10.8405
45 : ETHYL BENZENE	42.433	0	42.433	0	0.824545
43 : M-XYLENE	201.916	0	201.916	0	3.92357
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	390.691	0	390.691	0	7.59179
14 : N-DECANE	2329.92	0	2329.92	0	45.2742
62 : WATER	0	0	0	0	0
Total	5146.23	0	5146.23	0	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.012722	0	0.012722	0	0.010887
49 : CARBON DIOXIDE	0.02071	0	0.02071	0	0.017723
2 : METHANE	0.240224	0	0.240224	0	0.205573
3 : ETHANE	0.698681	0	0.698681	0	0.597899
4 : PROPANE	2.2179	0	2.2179	0	1.89798
5 : ISOBUTANE	1.79954	0	1.79954	0	1.53996
6 : N-BUTANE	4.00514	0	4.00514	0	3.42742
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	4.32621	0	4.32621	0	3.70217
8 : N-PENTANE	4.46207	0	4.46207	0	3.81844
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	12.2719	0	12.2719	0	10.5017
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.52808	0	0.52808	0	0.451907
38 : CYCLOHEXANE	1.10367	0	1.10367	0	0.944473
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	15.1761	0	15.1761	0	12.987
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	3.02206	0	3.02206	0	2.58614
12 : N-OCTANE	12.2928	0	12.2928	0	10.5197
45 : ETHYL BENZENE	1.00604	0	1.00604	0	0.860924
43 : M-XYLENE	4.78722	0	4.78722	0	4.09668
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	7.66742	0	7.66742	0	6.56143
14 : N-DECANE	41.2175	0	41.2175	0	35.2721
62 : WATER	0	0	0	0	0
Total	116.856	0	116.856	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.002814	0	0.002814	0	0.002428
49 : CARBON DIOXIDE	0.007063	0	0.007063	0	0.006095
2 : METHANE	0.081876	0	0.081876	0	0.070647
3 : ETHANE	0.375501	0	0.375501	0	0.324001
4 : PROPANE	1.22792	0	1.22792	0	1.05951
5 : ISOBUTANE	1.18363	0	1.18363	0	1.0213
6 : N-BUTANE	2.53905	0	2.53905	0	2.19082
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	3.18353	0	3.18353	0	2.74691
8 : N-PENTANE	3.24962	0	3.24962	0	2.80393
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	10.1457	0	10.1457	0	8.75424
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.29708	0	0.29708	0	0.256335
38 : CYCLOHEXANE	0.755242	0	0.755242	0	0.651661
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	14.0766	0	14.0766	0	12.146
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	2.03461	0	2.03461	0	1.75556
12 : N-OCTANE	12.6532	0	12.6532	0	10.9178
45 : ETHYL BENZENE	0.780552	0	0.780552	0	0.673499
43 : M-XYLENE	3.72669	0	3.72669	0	3.21557
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	8.67857	0	8.67857	0	7.4883
14 : N-DECANE	50.8957	0	50.8957	0	43.9154
62 : WATER	0	0	0	0	0
Total	115.895	0	115.895	0	100

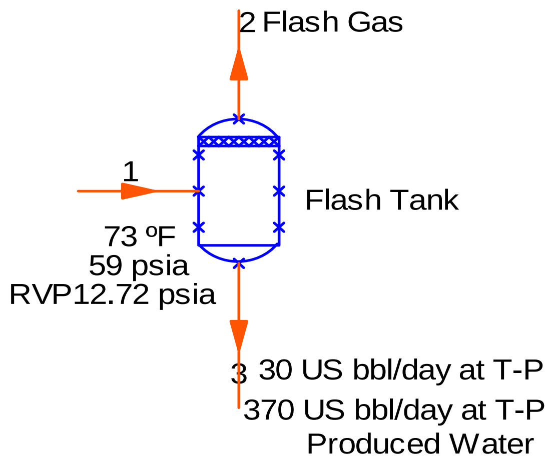
Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	-720218.3	
Entropy	Btu/hr/R	-795.5566	
Vapor Fraction		0	
		Total	Liquid 1
Flowrate	lbmol/hr	46.4278	46.4278
Flowrate	lb/hr	5146.2301	5146.2301
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		110.8438	110.8438
Enthalpy	Btu/lbmol	-15512.6596	-15512.6596
Enthalpy	Btu/lb	-139.9507	-139.9507
Entropy	Btu/lbmol/R	-17.1354	-17.1354
Entropy	Btu/lb/R	-0.15459	-0.15459
Cp	Btu/lbmol/R		54.6926
Cp	Btu/lb/R		0.4934
Cv	Btu/lbmol/R		47.8255
Cv	Btu/lb/R		0.4315
Cp/Cv			1.1436
Density	lb/ft3		44.0391
Z-Factor			0.00651
Flowrate (T-P)	gal/min		14.57
Flowrate (STP)	gal/min		14.4493
Specific Gravity	GPA STP		0.711988
Viscosity	cP		0.497323
Thermal Conductivity	Btu/hr/ft/R		0.066881
Surface Tension	dyne/cm		21.007
Reid Vapor Pressure (ASTM-A	psia		10.24
True Vapor Pressure at 100 F	psia		19.14
Critical Temperature (Cubic E	F	582.2503	
Critical Pressure (Cubic EOS)	psia	446.1619	
Dew Point Temperature	F	295.3338	
Bubble Point Temperature	F	69.9701	
Water Dew Point Temperature could not be calculated			
Stream Vapor Pressure	psia	14.7	
Latent Heat of Vaporization (N	Btu/lb	132.2427	
Latent Heat of Vaporization (P	Btu/lb	253.068	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	6018.43	
Heating Value (net)	Btu/SCF	5591.93	
Wobbe Number	Btu/SCF	2910.36	
Average Hydrogen Atoms		16.9521	
Average Carbon Atoms		7.8058	
Hydrogen to Carbon Ratio		2.1717	

DESIGN II for Windows

Simulation Result: SOLUTION REACHED

Problem:
Project:
Task:
By:
At: 26-Apr-12 11:53 AM



Details for Stream 1

Stream 1 (Strm 1)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Vapor Visc:	NBS81	Vapor ThC:	NBS81	Vapor Den:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.015195	0.010947	0.002578	0.001669	0.00503	130.395
49 : CARBON DIOXIDE	0.003262	0.000296	0.000586	0.00238	0.00108	15.5389
2 : METHANE	0.112011	0.058815	0.036183	0.017013	0.03708	49.9232
3 : ETHANE	0.063467	0.01216	0.047452	0.003854	0.02101	7.87044
4 : PROPANE	0.091046	0.005687	0.08314	0.00222	0.03014	2.10088
5 : ISOBUTANE	0.054676	0.001439	0.053087	0.00015	0.0181	0.832567
6 : N-BUTANE	0.114216	0.002212	0.111773	0.000231	0.03781	0.607779
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	0.393472
7 : ISOPENTANE	0.109594	0.000777	0.108736	0.00008118	0.03628	0.2195
8 : N-PENTANE	0.111316	0.000619	0.110632	0.00006465	0.03685	0.171819
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.096522
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.070658
52 : 2-METHYLPENTANE	0	0	0	0	0	0.063608
53 : 3-METHYLPENTANE	0	0	0	0	0	0.056697
10 : N-HEXANE	0.294406	0.000491	0.293863	0.00005131	0.09746	0.051335
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.041535
40 : BENZENE	0.012657	0.00001982	0.012635	0.00000207	0.00419	0.048173
38 : CYCLOHEXANE	0.026371	0.00003332	0.026335	0.00000348	0.00873	0.038854
79 : 2-METHYLHEXANE	0	0	0	0	0	0.0179
80 : 3-METHYLHEXANE	0	0	0	0	0	0.017961
11 : N-HEPTANE	0.359896	0.000187	0.35969	0.00001954	0.11914	0.015969
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.013936
41 : TOLUENE	0.071593	0.00002924	0.07156	0.000003054	0.0237	0.012548
12 : N-OCTANE	0.290509	0.00004797	0.290456	0.000005011	0.09617	0.005073
45 : ETHYL BENZENE	0.023774	0.000003724	0.023769	0.000000389	0.00787	0.004812
43 : M-XYLENE	0.113098	0.00001485	0.113082	0.000001552	0.03744	0.004034
42 : O-XYLENE	0	0	0	0	0	0.002077
13 : N-NONANE	0.181005	0.000009706	0.180995	0.000001014	0.05992	0.001647
14 : N-DECANE	0.972692	0.00001672	0.972674	0.000001747	0.322	0.000528
62 : WATER	299.058	0.000659	0.002055	299.055	99	9.8509
Total	302.078	0.094465	2.90128	299.083	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.425651	0.30667	0.072232	0.046749	0.007465
49 : CARBON DIOXIDE	0.143576	0.013041	0.025776	0.10476	0.002518
2 : METHANE	1.79698	0.943562	0.580479	0.272943	0.031514
3 : ETHANE	1.90832	0.365631	1.4268	0.115888	0.033466
4 : PROPANE	4.0146	0.250767	3.66595	0.09788	0.070404
5 : ISOBUTANE	3.17778	0.08364	3.0854	0.008737	0.055729
6 : N-BUTANE	6.63822	0.128555	6.49624	0.013429	0.116415
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	7.90677	0.056066	7.84485	0.005857	0.138661
8 : N-PENTANE	8.03099	0.044653	7.98168	0.004664	0.14084
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	25.3695	0.042326	25.3228	0.004421	0.444906
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.988619	0.001548	0.98691	0.000162	0.017337
38 : CYCLOHEXANE	2.21931	0.002804	2.21622	0.000293	0.03892
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	36.0609	0.018739	36.0402	0.001958	0.632401
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	6.59611	0.002694	6.59313	0.000281	0.115676
12 : N-OCTANE	33.1831	0.00548	33.177	0.000572	0.581933
45 : ETHYL BENZENE	2.5238	0.000395	2.52337	0.0000413	0.04426
43 : M-XYLENE	12.0065	0.001577	12.0048	0.000165	0.210558
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	23.2139	0.001245	23.2126	0.00013	0.407104
14 : N-DECANE	138.391	0.002379	138.388	0.000249	2.42696
62 : WATER	5387.62	0.011872	0.037015	5387.57	94.4829
Total	5702.22	2.28364	311.681	5388.25	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	1.05721	1.05035	0.006369	0.000483	1.02907
49 : CARBON DIOXIDE	0.030567	0.028432	0.001447	0.000688	0.029754
2 : METHANE	5.73738	5.64308	0.089376	0.004921	5.58469
3 : ETHANE	1.28505	1.16673	0.117213	0.001115	1.25085
4 : PROPANE	0.751666	0.545659	0.205365	0.000642	0.731662
5 : ISOBUTANE	0.26925	0.138076	0.131131	0.00004348	0.262085
6 : N-BUTANE	0.488384	0.212224	0.276093	0.00006683	0.475386
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.343177	0.074562	0.268591	0.00002348	0.334044
8 : N-PENTANE	0.332678	0.059383	0.273276	0.0000187	0.323824
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.77302	0.047127	0.725878	0.00001484	0.752448
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.033113	0.001901	0.031211	5.988E-07	0.032231
38 : CYCLOHEXANE	0.068247	0.003196	0.06505	0.000001007	0.066431
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.906428	0.017944	0.888478	0.000005651	0.882305
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.179569	0.002805	0.176763	8.834E-07	0.17479
12 : N-OCTANE	0.722066	0.004603	0.717462	0.000001449	0.70285
45 : ETHYL BENZENE	0.059071	0.000357	0.058714	1.125E-07	0.057499
43 : M-XYLENE	0.280752	0.001425	0.279326	4.488E-07	0.27328
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.448011	0.000931	0.447079	2.932E-07	0.436088
14 : N-DECANE	2.40423	0.001605	2.40263	5.053E-07	2.34025
62 : WATER	86.5642	0.06323	0.005075	86.4959	84.2605
Total	102.734	9.06363	7.16652	86.5039	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	4.15666	4.1543	0.001435	0.000929	3.21393
49 : CARBON DIOXIDE	0.114998	0.112452	0.000503	0.002043	0.088917
2 : METHANE	22.3648	22.3192	0.03104	0.014595	17.2925
3 : ETHANE	4.68397	4.61456	0.064189	0.005214	3.62164
4 : PROPANE	2.2771	2.15816	0.115854	0.003093	1.76066
5 : ISOBUTANE	0.634243	0.546109	0.087885	0.000249	0.490397
6 : N-BUTANE	1.01809	0.839375	0.178346	0.000369	0.787187
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.496449	0.294904	0.201394	0.00015	0.383854
8 : N-PENTANE	0.43778	0.23487	0.202792	0.000119	0.338492
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.797992	0.186394	0.611491	0.000107	0.617008
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.025414	0.007521	0.017891	0.000002931	0.01965
38 : CYCLOHEXANE	0.058006	0.012643	0.045357	0.000005994	0.04485
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.910748	0.070972	0.83973	0.00004561	0.704191
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.132362	0.011095	0.121261	0.000005175	0.102342
12 : N-OCTANE	0.77071	0.018204	0.752492	0.00001298	0.595913
45 : ETHYL BENZENE	0.047831	0.001413	0.046417	7.597E-07	0.036983
43 : M-XYLENE	0.227207	0.005637	0.221567	0.00000304	0.175677
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.519316	0.003683	0.515629	0.000002888	0.401535
14 : N-DECANE	3.02936	0.006346	3.02301	0.000005429	2.3423
62 : WATER	86.6295	0.250084	0.000593	86.3789	66.982
Total	129.333	35.8479	7.07888	86.4058	100

Properties

Temperature	F	73
Pressure	psia	58.696
Enthalpy	Btu/hr	-5613841
Entropy	Btu/hr/R	-8955.883
Vapor Fraction		0.000312717

		Total	Vapor	Liquid 1	Liquid 2
Flowrate	lbmol/hr	302.0783	0.094465	2.9013	299.0826
Flowrate	lb/hr	5702.2191	2.2836	311.6815	5388.254
Mole Fraction		1	0.0003127	0.009604	0.990083
Mass Fraction		1	0.0004005	0.05466	0.94494
Molecular Weight		18.8766	24.1745	107.429	18.0159
Enthalpy	Btu/lbmol	-18584.0559	367.8185	-14864.3389	-18626.1253
Enthalpy	Btu/lb	-984.501	15.2152	-138.3643	-1033.8692
Entropy	Btu/lbmol/R	-29.6476	0.606827	-16.3772	-29.7858
Entropy	Btu/lb/R	-1.5706	0.025102	-0.152446	-1.6533
Cp	Btu/lbmol/R		10.6567	53.5278	17.9953
Cp	Btu/lb/R		0.4408	0.4983	0.9989
Cv	Btu/lbmol/R		8.5394	46.6338	17.8361
Cv	Btu/lb/R		0.3532	0.4341	0.99
Cp/Cv			1.2479	1.1478	1.0089
Density	lb/ft3		0.251957	43.4913	62.2891
Z-Factor			0.985329	0.025367	0.00297
Flowrate (T-P)	ft3/s		0.002518		
Flowrate (T-P)	gal/min			0.893545	10.7856
Flowrate (STP)	MMSCFD		0.0008603		
Flowrate (STP)	gal/min			0.882562	10.7727
Specific Gravity	GPA STP			0.999892	0
Viscosity	cP		0.011398	0.523794	0.937835
Thermal Conductivity	Btu/hr/ft/R		0.016563	0.068546	0.348686
Surface Tension	dyne/cm			19.9805	72.3173
Reid Vapor Pressure (ASTM-A	psia			12.72	
True Vapor Pressure at 100 F	psia			135.2	
Critical Temperature (Cubic E	F	695.2202			
Critical Pressure (Cubic EOS)	psia	3226.0628			
Dew Point Temperature	F	288.7506			
Bubble Point Temperature	F	-25.285			
Water Dew Point	F	290.4184			
Liquid 2 Freezing Point	F	31.944			
Stream Vapor Pressure	psia	118.4577			
Latent Heat of Vaporization (N	Btu/lb	882.4853			
Latent Heat of Vaporization (P	Btu/lb	1094.168			
Vapor Sonic Velocity	ft/s	1150.67			
CO2 Freeze Up		No			
Heating Value (gross)	Btu/SCF	56.55			
Heating Value (net)	Btu/SCF	52.52			
Wobbe Number	Btu/SCF	69.48			
Average Hydrogen Atoms		2.1401			
Average Carbon Atoms		0.0731			
Hydrogen to Carbon Ratio		29.2635			

Details for Stream 2

Stream 2 (Flash Gas)

Thermodynamic Methods	K-Value: Vapor Visc:	PENG-ROB NBS81	Enthalpy: Vapor ThC:	PENG-ROB NBS81	Density: Vapor Den:	STD STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Incipient Liquid 1 mol fra	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.014695	0.014695	0.000107	0	5.54477	519.294
49 : CARBON DIOXIDE	0.001685	0.001685	0.000107	0	0.635613	59.3827
2 : METHANE	0.10377	0.10377	0.001994	0	39.1547	196.342
3 : ETHANE	0.046048	0.046048	0.005826	0	17.375	29.8222
4 : PROPANE	0.038238	0.038238	0.018637	0	14.4279	7.74173
5 : ISOBUTANE	0.012249	0.012249	0.01535	0	4.62182	3.01098
6 : N-BUTANE	0.019782	0.019782	0.034191	0	7.46415	2.18308
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	1.48838
7 : ISOPENTANE	0.007555	0.007555	0.036991	0	2.8505	0.770585
8 : N-PENTANE	0.006064	0.006064	0.038162	0	2.28807	0.599571
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	0.360909
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	0.263381
52 : 2-METHYLPENTANE	0	0	0	0	0	0.236664
53 : 3-METHYLPENTANE	0	0	0	0	0	0.210746
10 : N-HEXANE	0.004876	0.004876	0.105016	0	1.8397	0.175182
37 : METHYLCYCLOPENTA	0	0	0	0	0	0.154099
40 : BENZENE	0.000198	0.000198	0.004519	0	0.07469	0.165276
38 : CYCLOHEXANE	0.000332	0.000332	0.009445	0	0.125199	0.132552
79 : 2-METHYLHEXANE	0	0	0	0	0	0.065693
80 : 3-METHYLHEXANE	0	0	0	0	0	0.066054
11 : N-HEPTANE	0.001823	0.001823	0.129892	0	0.687959	0.052964
39 : METHYLCYCLOHEXAN	0	0	0	0	0	0.051298
41 : TOLUENE	0.000288	0.000288	0.025866	0	0.108569	0.041973
12 : N-OCTANE	0.000458	0.000458	0.10522	0	0.172711	0.016414
45 : ETHYL BENZENE	0.00003588	0.00003588	0.008611	0	0.01354	0.015723
43 : M-XYLENE	0.000143	0.000143	0.040976	0	0.053941	0.013164
42 : O-XYLENE	0	0	0	0	0	0.007514
13 : N-NONANE	0.00009046	0.00009046	0.06563	0	0.034132	0.005201
14 : N-DECANE	0.000152	0.000152	0.352808	0	0.057243	0.001622
62 : WATER	0.006545	0.006545	0.000649	0	2.46969	38.0378
Total	0.265025	0.265025	1	0	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Incipient Liquid 1 mass fra	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.411657	0.411657	0.000027	0	4.59416
49 : CARBON DIOXIDE	0.074134	0.074134	0.000042	0	0.82735
2 : METHANE	1.66478	1.66478	0.000289	0	18.5792
3 : ETHANE	1.38458	1.38458	0.00158	0	15.4521
4 : PROPANE	1.68605	1.68605	0.007414	0	18.8166
5 : ISOBUTANE	0.71191	0.71191	0.008049	0	7.94504
6 : N-BUTANE	1.14972	1.14972	0.01793	0	12.8311
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.545029	0.545029	0.02408	0	6.08262
8 : N-PENTANE	0.43749	0.43749	0.02484	0	4.88246
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.420145	0.420145	0.08164	0	4.68889
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.015461	0.015461	0.003185	0	0.172551
38 : CYCLOHEXANE	0.027924	0.027924	0.007171	0	0.311634
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.182687	0.182687	0.1174	0	2.03882
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.02651	0.02651	0.0215	0	0.295857
12 : N-OCTANE	0.052283	0.052283	0.1084	0	0.58349
45 : ETHYL BENZENE	0.003809	0.003809	0.008248	0	0.042514
43 : M-XYLENE	0.015176	0.015176	0.03925	0	0.169372
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.011601	0.011601	0.07594	0	0.129472
14 : N-DECANE	0.021584	0.021584	0.4529	0	0.240884
62 : WATER	0.117916	0.117916	0.000106	0	1.31596
Total	8.96044	8.96044	1	0	100
	Total VOC	5.425295			

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	5.63482	5.63482	0	0	5.54477
49 : CARBON DIOXIDE	0.645936	0.645936	0	0	0.635613
2 : METHANE	39.7906	39.7906	0	0	39.1547
3 : ETHANE	17.6572	17.6572	0	0	17.375
4 : PROPANE	14.6623	14.6623	0	0	14.4279
5 : ISOBUTANE	4.69688	4.69688	0	0	4.62182
6 : N-BUTANE	7.58538	7.58538	0	0	7.46415
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	2.89679	2.89679	0	0	2.8505
8 : N-PENTANE	2.32523	2.32523	0	0	2.28807
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	1.86958	1.86958	0	0	1.8397
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.075904	0.075904	0	0	0.07469
38 : CYCLOHEXANE	0.127233	0.127233	0	0	0.125199
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.699132	0.699132	0	0	0.687959
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.110332	0.110332	0	0	0.108569
12 : N-OCTANE	0.175515	0.175515	0	0	0.172711
45 : ETHYL BENZENE	0.01376	0.01376	0	0	0.01354
43 : M-XYLENE	0.054818	0.054818	0	0	0.053941
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.034686	0.034686	0	0	0.034132
14 : N-DECANE	0.058172	0.058172	0	0	0.057243
62 : WATER	2.5098	2.5098	0	0	2.46969
Total	101.624	101.624	0	0	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	5.57651	5.57651	0	0	5.54477
49 : CARBON DIOXIDE	0.639252	0.639252	0	0	0.635613
2 : METHANE	39.3789	39.3789	0	0	39.1547
3 : ETHANE	17.4745	17.4745	0	0	17.375
4 : PROPANE	14.5105	14.5105	0	0	14.4279
5 : ISOBUTANE	4.64828	4.64828	0	0	4.62182
6 : N-BUTANE	7.50688	7.50688	0	0	7.46415
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	2.86682	2.86682	0	0	2.8505
8 : N-PENTANE	2.30117	2.30117	0	0	2.28807
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	1.85023	1.85023	0	0	1.8397
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.075118	0.075118	0	0	0.07469
38 : CYCLOHEXANE	0.125916	0.125916	0	0	0.125199
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.691898	0.691898	0	0	0.687959
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.10919	0.10919	0	0	0.108569
12 : N-OCTANE	0.173699	0.173699	0	0	0.172711
45 : ETHYL BENZENE	0.013617	0.013617	0	0	0.01354
43 : M-XYLENE	0.05425	0.05425	0	0	0.053941
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.034327	0.034327	0	0	0.034132
14 : N-DECANE	0.05757	0.05757	0	0	0.057243
62 : WATER	2.48383	2.48383	0	0	2.46969
Total	100.572	100.572	0	0	100

Properties

Temperature	F	70	
Pressure	psia	14.7	
Enthalpy	Btu/hr	130.6847	
Entropy	Btu/hr/R	1.266858	
Vapor Fraction		1	
		Total	Vapor
Flowrate	lbmol/hr	0.265025	0.265025
Flowrate	lb/hr	8.9604	8.9604
Mole Fraction		1	1
Mass Fraction		1	1
Molecular Weight		33.8098	33.8098
Enthalpy	Btu/lbmol	493.1038	493.1038
Enthalpy	Btu/lb	14.5846	14.5846
Entropy	Btu/lbmol/R	4.7801	4.7801
Entropy	Btu/lb/R	0.141383	0.141383
Cp	Btu/lbmol/R		14.1053
Cp	Btu/lb/R		0.4172
Cv	Btu/lbmol/R		12.0543
Cv	Btu/lb/R		0.3565
Cp/Cv			1.1701
Density	lb/ft3		0.088172
Z-Factor			0.991796
Flowrate (T-P)	ft3/s		0.028229
Flowrate (STP)	MMSCFD		0.002414
Viscosity	cP		0.009923
Thermal Conductivity	Btu/hr/ft/R		0.012902
Critical Temperature (Cubic E	F	179.2967	
Critical Pressure (Cubic EOS)	psia	1711.5679	
Dew Point Temperature	F	69.9999	
Bubble Point Temperature	F	-312.2838	
Water Dew Point	F	71.5353	
Stream Vapor Pressure	psia	1622.9363	
Vapor Sonic Velocity	ft/s	945.66	
CO2 Freeze Up		No	
Heating Value (gross)	Btu/SCF	1825.29	
Heating Value (net)	Btu/SCF	1673.32	
Wobbe Number	Btu/SCF	1680.83	
Average Hydrogen Atoms		6.0906	
Average Carbon Atoms		2.1248	
Hydrogen to Carbon Ratio		2.8665	

Details for Stream 3

Stream 3 (Produced Water)

Thermodynamic Methods	K-Value:	PENG-ROB	Enthalpy:	PENG-ROB	Density:	STD
	Liquid 1 Visc:	NBS81	Liquid 1 ThC:	NBS81	Liquid 1 Den:	STD
	Liquid 2 Visc:	STEAM	Liquid 2 ThC:	STEAM	Liquid 2 Den:	STD

Flowrates

Component Name	Total lbmol/hr	Vapor lbmol/hr	Liquid 1 lbmol/hr	Liquid 2 lbmol/hr	Total mole %	K-Value
46 : NITROGEN	0.0005	0	0.000294	0.000205	0.000166	
49 : CARBON DIOXIDE	0.001578	0	0.000295	0.001283	0.000523	
2 : METHANE	0.008241	0	0.005497	0.002744	0.00273	
3 : ETHANE	0.017418	0	0.01606	0.001358	0.005771	
4 : PROPANE	0.052809	0	0.051373	0.001436	0.017497	
5 : ISOBUTANE	0.042427	0	0.042313	0.000114	0.014057	
6 : N-BUTANE	0.094434	0	0.09425	0.000184	0.031289	
9 : 2,2-DIMETHYLPROP	0	0	0	0	0	
7 : ISOPENTANE	0.102039	0	0.101969	0.00007044	0.033809	
8 : N-PENTANE	0.105252	0	0.105195	0.00005654	0.034873	
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0	
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0	
52 : 2-METHYLPENTANE	0	0	0	0	0	
53 : 3-METHYLPENTANE	0	0	0	0	0	
10 : N-HEXANE	0.28953	0	0.289484	0.00004546	0.09593	
37 : METHYLCYCLOPENTA	0	0	0	0	0	
40 : BENZENE	0.012459	0	0.012457	0.000001846	0.004128	
38 : CYCLOHEXANE	0.02604	0	0.026037	0.000003094	0.008628	
79 : 2-METHYLHEXANE	0	0	0	0	0	
80 : 3-METHYLHEXANE	0	0	0	0	0	
11 : N-HEPTANE	0.358073	0	0.358056	0.000017	0.118641	
39 : METHYLCYCLOHEXAN	0	0	0	0	0	
41 : TOLUENE	0.071305	0	0.071302	0.000002683	0.023625	
12 : N-OCTANE	0.290051	0	0.290047	0.000004268	0.096103	
45 : ETHYL BENZENE	0.023738	0	0.023737	3.346E-07	0.007865	
43 : M-XYLENE	0.112955	0	0.112954	0.000001333	0.037426	
42 : O-XYLENE	0	0	0	0	0	
13 : N-NONANE	0.180915	0	0.180914	8.435E-07	0.059943	
14 : N-DECANE	0.972541	0	0.972539	0.000001415	0.322232	
62 : WATER	299.051	0	0.00179	299.049	99.0848	
Total	301.813	0	2.75656	299.057	100	

Flowrates

Component Name	Total lb/hr	Vapor lb/hr	Liquid 1 lb/hr	Liquid 2 lb/hr	Total mass %
46 : NITROGEN	0.013993	0	0.008245	0.005748	0.000246
49 : CARBON DIOXIDE	0.069442	0	0.012985	0.056457	0.00122
2 : METHANE	0.132209	0	0.088191	0.044019	0.002322
3 : ETHANE	0.523739	0	0.482901	0.040838	0.009199
4 : PROPANE	2.32855	0	2.26524	0.063315	0.0409
5 : ISOBUTANE	2.46587	0	2.45923	0.006638	0.043312
6 : N-BUTANE	5.4885	0	5.47778	0.01072	0.096404
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	7.36174	0	7.35666	0.005082	0.129306
8 : N-PENTANE	7.59351	0	7.58943	0.004079	0.133377
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	24.9494	0	24.9455	0.003918	0.438227
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.973158	0	0.973014	0.000144	0.017093
38 : CYCLOHEXANE	2.19139	0	2.19113	0.00026	0.038491
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	35.8782	0	35.8765	0.001703	0.630187
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	6.5696	0	6.56935	0.000247	0.115393
12 : N-OCTANE	33.1308	0	33.1303	0.000487	0.58193
45 : ETHYL BENZENE	2.51999	0	2.51996	0.00003552	0.044263
43 : M-XYLENE	11.9913	0	11.9912	0.000142	0.210623
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	23.2023	0	23.2022	0.000108	0.40754
14 : N-DECANE	138.369	0	138.369	0.000201	2.4304
62 : WATER	5387.51	0	0.032243	5387.47	94.6296
Total	5693.26	0	305.541	5387.72	100

Flowrates

Component Name	Total ft3/hr	Vapor ft3/hr	Liquid 1 ft3/hr	Liquid 2 ft3/hr	Total volume %
46 : NITROGEN	0.0008	0	0.000741	0.00005933	0.000856
49 : CARBON DIOXIDE	0.001113	0	0.000742	0.000371	0.001192
2 : METHANE	0.014625	0	0.013832	0.000793	0.015657
3 : ETHANE	0.040804	0	0.040411	0.000393	0.043682
4 : PROPANE	0.12968	0	0.129265	0.000415	0.138827
5 : ISOBUTANE	0.106501	0	0.106468	0.00003303	0.114013
6 : N-BUTANE	0.237205	0	0.237152	0.00005334	0.253936
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.256596	0	0.256575	0.00002037	0.274694
8 : N-PENTANE	0.26471	0	0.264694	0.00001635	0.283381
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.728417	0	0.728403	0.00001315	0.779794
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.031346	0	0.031345	5.337E-07	0.033557
38 : CYCLOHEXANE	0.065514	0	0.065513	8.946E-07	0.070135
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.900948	0	0.900944	0.000004916	0.964495
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.179412	0	0.179411	7.758E-07	0.192066
12 : N-OCTANE	0.72982	0	0.729818	0.000001234	0.781296
45 : ETHYL BENZENE	0.059728	0	0.059728	9.675E-08	0.063941
43 : M-XYLENE	0.284216	0	0.284216	3.854E-07	0.304262
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.455218	0	0.455218	2.439E-07	0.487326
14 : N-DECANE	2.44711	0	2.44711	0.000000409	2.61971
62 : WATER	86.4776	0	0.004503	86.4731	92.5772
Total	93.4114	0	6.93609	86.4753	100

Flowrates

Component Name	Total SCF/hr	Vapor SCF/hr	Liquid 1 SCF/hr	Liquid 2 SCF/hr	Total std vol %
46 : NITROGEN	0.000278	0	0.000164	0.000114	0.000298
49 : CARBON DIOXIDE	0.001355	0	0.000253	0.001101	0.001452
2 : METHANE	0.00707	0	0.004716	0.002354	0.00758
3 : ETHANE	0.023562	0	0.021725	0.001837	0.025264
4 : PROPANE	0.073588	0	0.071587	0.002001	0.078902
5 : ISOBUTANE	0.070238	0	0.070049	0.000189	0.07531
6 : N-BUTANE	0.15068	0	0.150386	0.000294	0.16156
9 : 2,2-DIMETHYLPROP	0	0	0	0	0
7 : ISOPENTANE	0.188992	0	0.188861	0.00013	0.202639
8 : N-PENTANE	0.19293	0	0.192826	0.000104	0.206861
54 : 2,2-DIMETHYLBUTA	0	0	0	0	0
55 : 2,3-DIMETHYLBUTA	0	0	0	0	0
52 : 2-METHYLPENTANE	0	0	0	0	0
53 : 3-METHYLPENTANE	0	0	0	0	0
10 : N-HEXANE	0.602474	0	0.60238	0.0000946	0.645979
37 : METHYLCYCLOPENTA	0	0	0	0	0
40 : BENZENE	0.017641	0	0.017639	0.000002613	0.018915
38 : CYCLOHEXANE	0.044849	0	0.044844	0.000005329	0.048088
79 : 2-METHYLHEXANE	0	0	0	0	0
80 : 3-METHYLHEXANE	0	0	0	0	0
11 : N-HEPTANE	0.835956	0	0.835916	0.00003969	0.89632
39 : METHYLCYCLOHEXAN	0	0	0	0	0
41 : TOLUENE	0.120829	0	0.120824	0.000004546	0.129554
12 : N-OCTANE	0.751444	0	0.751433	0.00001106	0.805705
45 : ETHYL BENZENE	0.046355	0	0.046354	6.534E-07	0.049702
43 : M-XYLENE	0.221319	0	0.221317	0.000002612	0.237301
42 : O-XYLENE	0	0	0	0	0
13 : N-NONANE	0.515402	0	0.5154	0.000002403	0.552619
14 : N-DECANE	3.0226	0	3.02259	0.000004396	3.24086
62 : WATER	86.3778	0	0.000517	86.3772	92.6151
Total	93.2653	0	6.87978	86.3855	100

Properties

Temperature	F	70		
Pressure	psia	14.7		
Enthalpy	Btu/hr	-5630270		
Entropy	Btu/hr/R	-8985.918		
Vapor Fraction		0		
		Total	Liquid 1	Liquid 2
Flowrate	lbmol/hr	301.8133	2.7566	299.0567
Flowrate	lb/hr	5693.2587	305.541	5387.7177
Mole Fraction		1	0.009133	0.990867
Mass Fraction		1	0.053667	0.946333
Molecular Weight		18.8635	110.8412	18.0157
Enthalpy	Btu/lbmol	-18654.8094	-15517.6774	-18683.726
Enthalpy	Btu/lb	-988.9362	-139.9991	-1037.08
Entropy	Btu/lbmol/R	-29.7731	-17.1362	-29.8896
Entropy	Btu/lb/R	-1.5783	-0.154601	-1.6591
Cp	Btu/lbmol/R		54.8253	17.9991
Cp	Btu/lb/R		0.4946	0.9991
Cv	Btu/lbmol/R		47.9578	17.8638
Cv	Btu/lb/R		0.4327	0.9916
Cp/Cv			1.1432	1.0076
Density	lb/ft3		44.0509	62.3035
Z-Factor			0.006508	0.0007479
Flowrate (T-P)	gal/min		0.864815	10.782
Flowrate (STP)	gal/min		0.857739	10.7701
Specific Gravity	GPA STP		0.712103	1
Viscosity	cP		0.534828	0.975963
Thermal Conductivity	Btu/hr/ft/R		0.066922	0.346918
Surface Tension	dyne/cm		21.0546	72.5713
Reid Vapor Pressure (ASTM-A)		unconverged		
True Vapor Pressure at 100 F	psia		19.88	
Critical Temperature (Cubic E	F	695.5809		
Critical Pressure (Cubic EOS)	psia	3218.1068		
Dew Point Temperature	F	211.5687		
Bubble Point Temperature	F	70.2894		
Water Dew Point Temperature could not be calculated				
Liquid 2 Freezing Point	F	31.986		
Stream Vapor Pressure	psia	14.7		
Latent Heat of Vaporization (N	Btu/lb	929.236		
Latent Heat of Vaporization (F	Btu/lb	1067.19		
CO2 Freeze Up		No		
Heating Value (gross)	Btu/SCF	55		
Heating Value (net)	Btu/SCF	51.1		
Wobbe Number	Btu/SCF	67.59		
Average Hydrogen Atoms		2.1366		
Average Carbon Atoms		0.0713		
Hydrogen to Carbon Ratio		29.954		