



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

February 9, 2023

Mark Gorog P.E., Regional Manager Air Quality
Program Pennsylvania Department of Environmental
Protection Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

RE: PA-04-00740C Spent Caustic Vent Incinerator (Source ID C206) and Storage Tanks (Recovered Oil, Equalization Wastewater, and Spent Caustic) (Source IDs 401 and 402) Excess Emissions Malfunction Report

Dear Mr. Gorog,

Shell Chemical Appalachia LLC (“Shell”) is submitting this malfunction report to the Pennsylvania Department of Environmental Protection (PADEP) for excess emissions from the flow equalization and oil removal (FEOR) A and B, recovered oil, and spent caustic storage tanks between January 4 and January 10, 2023.

- **Name and location of the facility**
Shell Polymers Monaca
300 Frankfort Road, Monaca PA, 15061
- **Nature and cause of the incident**

On January 4, 2023 at ~20:38, the Spent Caustic Thermal Oxidizer¹ (SCTO) tripped offline due to low fuel pressure. Operations initiated troubleshooting of the process control indicators and equipment and attempted multiple restarts of the SCTO. These restarts were not successful and the low fuel pressure condition continued, tripping the SCTO offline after each restart attempt. It was decided to cease restart attempts and escalate troubleshooting to maintenance and investigation of the natural gas fuel system (including pressure transmitters, strainer, and flow control valve) leading up to the SCTO. Cause of the low fuel pressure was determined to be due to a bad fuel pressure regulator.

The SCTO controls overhead vapors collected in a closed vent system from the FEOR A and B, recovered oil, and spent caustic storage tanks; as well as the spent caustic oxidation system². Each storage tank is additionally controlled by internal floating roof (IFR) and a nitrogen blanket which normally would flow to the SCTO. When the SCTO trips offline the spent caustic oxidation system is isolated from the spent caustic storage tank and any generated spent caustic accumulates in the storage tank buffer.

¹ Identified as Spent Caustic Vent Incinerator (Source ID C206) in PA-04-00740C

² Identified as the Spent Caustic Vent Header System (Source ID 206) in PA-04-00740C

The ethane cracking unit (ECU) had been offline since December 24, 2022 and not generating process-contaminated spent caustic prior to this event. Therefore any existing contamination of hydrocarbons within the spent caustic was minimal.

Corrective action included replacement of the bad fuel pressure regulator with an equivalent properly functioning regulator and returning the SCTO to service.

- Time when the incident was first observed, and duration of excess emissions**
 January 4, 2023 beginning at 20:38 and ending on January 10, 2023 at ~12:00 when the SCTO was returned to service, combustion zone temperature reached the target temperature for introduction of waste gas, and isolations from the storage tanks and spent caustic oxidation system were removed. Excess emissions occurred from the storage tanks while overhead tank vapors could not be routed to the SCTO. Excess emissions did not occur from the spent caustic oxidation system as there was sufficient buffer storage capacity in the spent caustic storage tank to not operate the spent caustic oxidation system for the duration of the outage.

- Estimated rate of excess emissions**

Emissions were minimized through the isolation and shutdown of the spent caustic oxidation system during the SCTO outage and utilizing the spent caustic storage tank to accumulate spent caustic. Emissions were also minimized through design and operation of the storage tank IFRs and nitrogen blanket. Lastly, emissions were also minimized by the escalation of prioritization of finding and installing a replacement fuel pressure regulator before the spent caustic storage tank filled to its high level and necessitated use of the spent caustic oxidation system.

Excess emissions from the IFR-controlled storage tanks during this outage were modeled using Pro-Max equations of state for flashing, breathing, and working losses. Inputs to the model include the storage tank and IFR physical characteristics, measured liquid throughputs using liquid level indicators, measured tank liquid temperatures, pressure of input liquid streams, and storage tank content sample results for speciated volatile organics and HAPs. Samples were taken from the FEOR tanks A & B and spent caustic tank were taken on January 10, 2023 prior to placing the SCTO back into service. The average of the FEOR tank samples was applied to the recovered oil tank as representative surrogate for the model inputs.

Pro-Max model outputs, inputs from sample results speciation, and inputs design parameters have been included as Attachment A.

Pollutant	Emission Rate (lbs) ³
VOC	0.26
HAP (Total)	0.26
Benzene	0.12
Toluene	0.13

³ Note that while the SCTO was offline this actually resulted in a reduction of product of combustion emissions NOx, CO, CO2, etc. during this same time period.

If you have any questions regarding this matter, please contact me at (724) 709-2467 or kimberly.kaal@shell.com.

Sincerely,

Kimberly Kaal

Kimberly Kaal
Environmental Manager, Attorney-in-Fact

CC:
Scott Beaudway, Air Quality Specialist
Beth Speicher, Environmental Group Manager

Attachment A
Pro-Max Model Ouputs and Inputs

Table 1 Internal Floating Roof Tank Emissions Calculations, ProMax Input Summary
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Timeframe of Analysis

Timeframe start 1/4/2023 20:38 Tank Throughput Calculator FEOR ROT and SC.xlsx
 Timeframe end 1/10/2023 9:40 Tank Throughput Calculator FEOR ROT and SC.xlsx
 Time 157 hours
 9,422 minutes

Tank Data/Sample Data

Tank Name	Tank ID	Contents	Length/ Height (ft)	Diameter (ft)	Temp (C)	Pressure (barg)	Throughput (gal)	Flow Rate (gpm)	Sample ID
Spent Caustic Tank	T-53501	2% Spent Caustic	48	35	34	0.01	141,565.06	15.02	29044/180-150329-1
FEOR B Tank	T-59707B	Waste Water, sheen of oil	47.9	55.8	24	0.01	409,492.95	43.46	29034/180-150329-2 "DL"
FEOR A Tank	T-59707A	Waste Water, sheen of oil	47.9	55.8	25	0.01	807,137.05	85.67	29033/180-150329-3
Recovered Oil Tank	T-59708	Slop Oil/water mixture	48	43	12	0.01	56,556.60	6.00	Assumed Avg of FEORs
Data source/ assumption			2/2/23 email	2/2/23 email	1/31/2023 email Temp range given, midpoint used	2/1/2023 email	Tank Throughput Calculator FEOR ROT and SC.xlsx		J150329-1 UDS Level 2 Report Final Report.pdf

Sample Data

Constituent	29044/180-150329-1		29034/180-150329-2 "DL"		29033/180-150329-3		Average of FEORs
	mg/L	%	mg/L	%	mg/L	%	%
Benzene	15	0.0015	13	0.0013	1.2	0.00012	0.00071
Toluene	11	0.0011	8.3	0.00083	0.93	0.000093	0.0004615
Acenaphthene		0	0.15	0.000015	0.0056	0.00000056	0.00000778
Acenaphthylene	1	0.0001	0.048	0.0000048	0.0019	0.00000019	0.000002495
Anthracene		0	0.017	0.0000017		0	0.00000085
Fluorene		0	0.098	0.0000098	0.0043	0.00000043	0.000005115
Naphthalene	0.15	0.000015	4.5	0.00045	0.27	0.000027	0.0002385
Phenanthrene		0	0.13	0.000013	0.0043	0.00000043	0.000006715
Phenol		0		0	0.026	0.0000026	0.0000013
Pyrene		0	0.032	0.0000032	0.00071	0.000000071	1.6355E-06
Water	Balance	99.997285	Balance	99.9973725	Balance	99.99975572	99.99856411

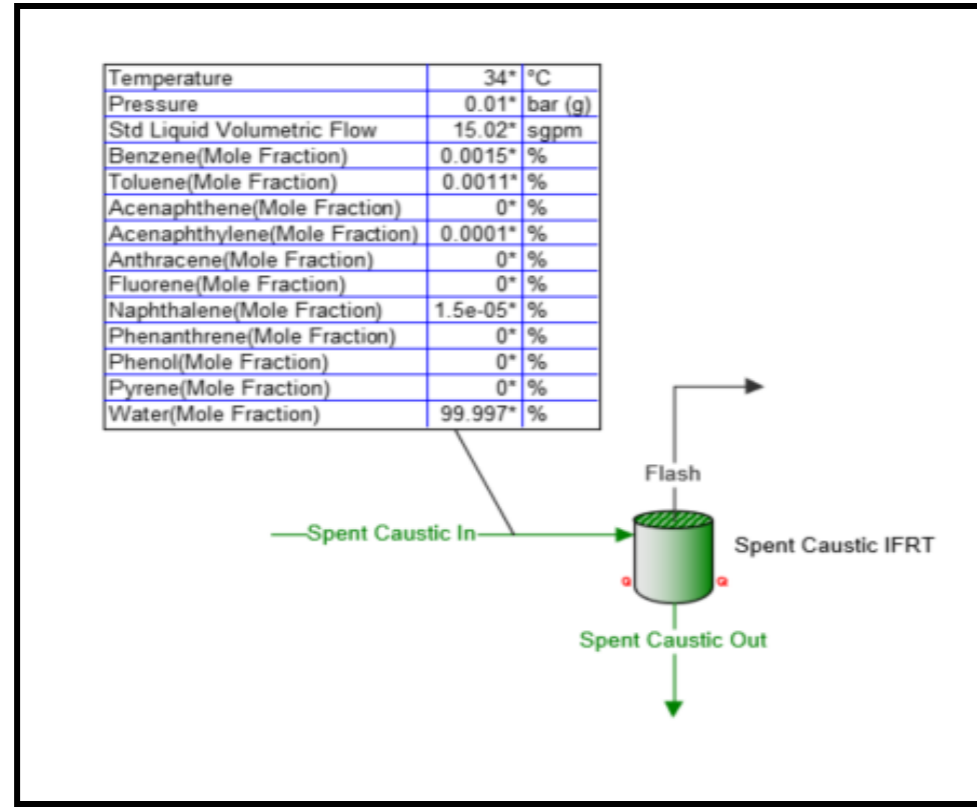
Table 2 Internal Floating Roof Tank Emissions Calculations, Emissions Calculations
Shell Chemical Appalachia LLC, Shell Polymers Monaca

	Spent Caustic Tank Emissions (lb/h)					FEOR A Tank Emissions (lb/h)					FEOR B Tank Emissions (lb/h)					Recovered Oil Tank Emissions (lb/h)					Total (4 Tanks)
	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)	
Total VOC	3.762E-04	1.925E-04	0.000E+00	9.427E-07	5.696E-04	5.665E-05	2.049E-05	0.000E+00	3.138E-07	7.745E-05	4.759E-04	1.721E-04	0.000E+00	1.769E-06	6.498E-04	2.103E-04	1.346E-04	0.000E+00	1.727E-07	3.451E-04	1.642E-03
Benzene	1.723E-04	8.820E-05	0.000E+00	4.687E-07	2.610E-04	2.202E-05	7.962E-06	0.000E+00	1.342E-07	3.012E-05	2.358E-04	8.528E-05	0.000E+00	7.372E-07	3.218E-04	9.980E-05	6.386E-05	0.000E+00	7.214E-08	1.637E-04	7.766E-04
Toluene	2.013E-04	1.031E-04	0.000E+00	4.054E-07	3.048E-04	2.719E-05	9.834E-06	0.000E+00	1.226E-07	3.715E-05	2.285E-04	8.262E-05	0.000E+00	5.552E-07	3.117E-04	1.011E-04	6.471E-05	0.000E+00	5.531E-08	1.659E-04	8.195E-04
Acenaphthene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.619E-07	5.856E-08	0.000E+00	1.236E-09	2.217E-07	1.649E-08	5.965E-09	0.000E+00	1.679E-08	3.925E-08	1.455E-08	9.308E-09	0.000E+00	1.561E-09	2.542E-08	2.864E-07
Acenaphthylene	1.004E-12	5.140E-13	0.000E+00	6.088E-08	6.088E-08	3.056E-15	1.105E-15	0.000E+00	4.139E-10	4.139E-10	7.718E-14	2.791E-14	0.000E+00	5.304E-09	5.304E-09	3.084E-14	1.974E-14	0.000E+00	4.939E-10	4.940E-10	6.709E-08
Anthracene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.437E-10	1.243E-10	0.000E+00	2.200E-09	2.668E-09	2.981E-10	1.907E-10	0.000E+00	1.971E-10	6.859E-10	3.354E-09
Fluorene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.251E-15	1.176E-15	0.000E+00	1.023E-09	1.023E-09	7.410E-14	2.680E-14	0.000E+00	1.183E-08	1.183E-08	2.974E-14	1.903E-14	0.000E+00	1.106E-09	1.106E-09	1.396E-08
Naphthalene	2.552E-06	1.291E-06	0.000E+00	7.691E-09	3.851E-06	7.252E-06	2.623E-06	0.000E+00	4.953E-08	9.925E-06	1.157E-05	4.184E-06	0.000E+00	4.187E-07	1.617E-05	9.375E-06	5.999E-06	0.000E+00	3.976E-08	1.541E-05	4.536E-05
Phenanthrene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.269E-08	4.591E-09	0.000E+00	1.097E-09	1.838E-08	9.788E-10	3.540E-10	0.000E+00	1.682E-08	1.815E-08	8.704E-10	5.569E-10	0.000E+00	1.557E-09	2.984E-09	3.952E-08
Phenol	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.021E-10	3.693E-11	0.000E+00	3.502E-09	3.641E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.930E-11	2.515E-11	0.000E+00	1.591E-10	2.236E-10	3.865E-09
Pyrene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.361E-08	4.921E-09	0.000E+00	2.055E-10	1.874E-08	1.648E-11	5.960E-12	0.000E+00	4.699E-09	4.721E-09	1.470E-11	9.407E-12	0.000E+00	4.303E-10	4.544E-10	2.391E-08

	Spent Caustic Tank Emissions (lb/event)					FEOR A Tank Emissions (lb/h)					FEOR B Tank Emissions (lb/h)					Recovered Oil Tank Emissions (lb/h)					Total (4 Tanks)
	Rim Seal Losses (lb/event)	Deck Fitting Losses (lb/event)	Deck Seam Losses (lb/event)	Withdrawal Losses (lb/event)	Total Losses (lb/event)	Rim Seal Losses (lb/event)	Deck Fitting Losses (lb/event)	Deck Seam Losses (lb/event)	Withdrawal Losses (lb/event)	Total Losses (lb/event)	Rim Seal Losses (lb/event)	Deck Fitting Losses (lb/event)	Deck Seam Losses (lb/event)	Withdrawal Losses (lb/event)	Total Losses (lb/event)	Rim Seal Losses (lb/event)	Deck Fitting Losses (lb/event)	Deck Seam Losses (lb/event)	Withdrawal Losses (lb/event)	Total Losses (lb/event)	
Total VOC	5.908E-02	3.023E-02	0.000E+00	1.480E-04	8.945E-02	8.896E-03	3.218E-03	0.000E+00	4.928E-05	1.216E-02	7.473E-02	2.703E-02	0.000E+00	2.778E-04	1.020E-01	3.302E-02	2.114E-02	0.000E+00	2.712E-05	5.419E-02	2.578E-01
Benzene	2.706E-02	1.385E-02	0.000E+00	7.360E-05	4.098E-02	3.458E-03	1.250E-03	0.000E+00	2.107E-05	4.729E-03	3.703E-02	1.339E-02	0.000E+00	1.158E-04	5.054E-02	1.567E-02	1.003E-02	0.000E+00	1.133E-05	2.571E-02	1.220E-01
Toluene	3.161E-02	1.619E-02	0.000E+00	6.366E-05	4.786E-02	4.270E-03	1.544E-03	0.000E+00	1.925E-05	5.833E-03	3.588E-02	1.297E-02	0.000E+00	8.719E-05	4.894E-02	1.588E-02	1.016E-02	0.000E+00	8.686E-06	2.605E-02	1.287E-01
Acenaphthene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.542E-05	9.196E-06	0.000E+00	1.941E-07	3.481E-05	2.589E-06	9.367E-07	0.000E+00	2.637E-06	6.163E-06	2.285E-06	1.462E-06	0.000E+00	2.451E-07	3.992E-06	4.497E-05
Acenaphthylene	1.577E-10	8.072E-11	0.000E+00	9.560E-06	9.560E-06	4.799E-13	1.735E-13	0.000E+00	6.500E-08	6.500E-08	1.212E-11	4.383E-12	0.000E+00	8.329E-07	8.329E-07	4.843E-12	3.100E-12	0.000E+00	7.756E-08	7.757E-08	1.054E-05
Anthracene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.397E-08	1.952E-08	0.000E+00	3.455E-07	4.190E-07	4.681E-08	2.995E-08	0.000E+00	3.095E-08	1.077E-07	5.267E-07
Fluorene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.105E-13	1.847E-13	0.000E+00	1.606E-07	1.606E-07	1.164E-11	4.208E-12	0.000E+00	1.858E-06	1.858E-06	4.670E-12	2.988E-12	0.000E+00	1.737E-07	1.737E-07	2.192E-06
Naphthalene	4.007E-04	2.027E-04	0.000E+00	1.208E-06	6.047E-04	1.139E-03	4.119E-04	0.000E+00	7.778E-06	1.558E-03	1.817E-03	6.570E-04	0.000E+00	6.575E-05	2.540E-03	1.472E-03	9.420E-04	0.000E+00	6.244E-06	2.420E-03	7.123E-03
Phenanthrene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.993E-06	7.209E-07	0.000E+00	1.723E-07	2.886E-06	1.537E-07	5.559E-08	0.000E+00	2.641E-06	2.851E-06	1.367E-07	8.745E-08	0.000E+00	2.445E-07	4.686E-07	6.205E-06
Phenol	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.603E-08	5.799E-09	0.000E+00	5.499E-07	5.718E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.171E-09	3.949E-09	0.000E+00	2.498E-08	3.510E-08	6.069E-07
Pyrene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.137E-06	7.728E-07	0.000E+00	3.227E-08	2.942E-06	2.588E-09	9.359E-10	0.000E+00	7.379E-07	7.414E-07	2.308E-09	1.477E-09	0.000E+00	6.757E-08	7.136E-08	3.755E-06

Table 3 Internal Floating Roof Tank Emissions Calculations, ProMax Inputs, Spent Caustic Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Spent Caustic Tank



Working and Breathing Parameters

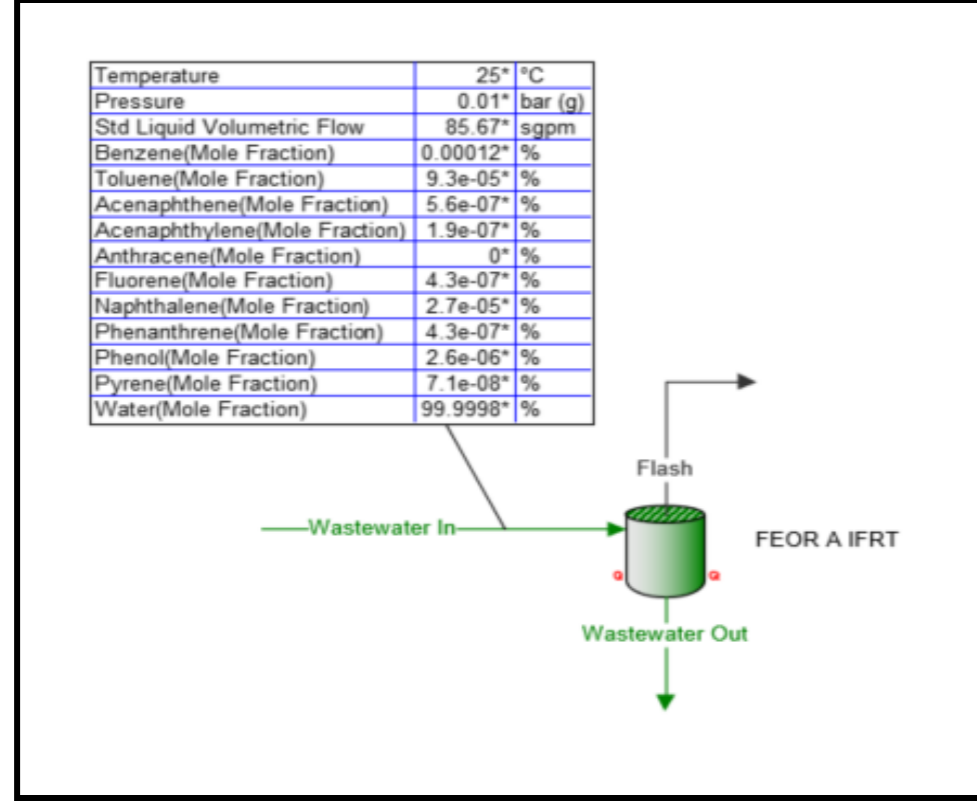
Property	Value	Units
Process Stream	Spent Caustic In	
Tank Geometry	Internal Floating Roof Tank	
Shell Length	48	ft
Shell Diameter	35	ft
Number of Storage Tanks Employed	1	
Location	Pittsburgh, PA	
Time Frame	January	
Report Components	Non-exempt VOC	
Set Bulk Temperature to Stream Temperature?	<input type="checkbox"/>	
Use A42 Raoult's Vapor Pressure?	<input type="checkbox"/>	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Minimum Fraction Fill of Tank	10	%
Material Category	Light Organics	
Insulation	Uninsulated	
Tank Color	White	
Tank Condition	Light Rust	
Shell Paint Condition	Average	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof		ft
Slope of Coned Roof	0.0625	
Roof Color	White	
Roof Paint Condition	Average	
Flashing Temperature	33.35	°F
Maximum Average Temperature	36.2	°F
Minimum Average Temperature	22.2	°F
Average Absolute Pressure	14.1	psia
Daily Solar Insolation	520	Btu/ft ² /day
Average Wind Speed	9.4	mi/h
Underground Tank?	<input type="checkbox"/>	
Bolted or Riveted Construction?	<input type="checkbox"/>	
Known Sum of Increases in Liquid Level?	<input type="checkbox"/>	
Sum of Increases in Liquid Level		ft/yr
Vapor Balanced Tank?	<input type="checkbox"/>	
Calculate Loading Losses?	<input type="checkbox"/>	
Output Loading Losses?	<input type="checkbox"/>	
Output Flashing Losses?	<input checked="" type="checkbox"/>	
Output Working/Breathing Losses?	<input checked="" type="checkbox"/>	

Floating Roof Fittings

Property	Value
Floating Roof Type	Pontoon
Tank Construction	Welded
Primary Seal	Mechanical Shoe
Secondary Seal Type #1	None
Secondary Seal Type #2	None
Seal Fitting Tightness	Tight
Self Supported Roof?	<input checked="" type="checkbox"/>
Deck Construction	Sheet
Construction Type for Continuous Sheet Style Deck	5 feet wide
Construction Type for Panel Style Deck	5 x 7.5 feet
Number of Columns	0
Effective Column Diameter	Default
Construction Type of Internal Floating Roof Tank	Welded
Access hatch type	Bolted cover, gasketed
Access hatch quantity	1
Fixed roof support column well type	N/A
Fixed roof support column well quantity	0
Unslotted guide-pole and well type	N/A
Unslotted guide-pole and well quantity	0
Slotted guide-pole/sample well type	Gasketed sliding cover, with pole sleeve
Slotted guide-pole/sample well quantity	2
Gauge-float well type	Bolted cover, gasketed
Gauge-float well quantity	1
Gauge-hatch/sample port type	Weighted mechanical actuation, gasketed
Gauge-hatch/sample port quantity	1
Vacuum breaker type	Weighted mechanical actuation, gasketed
Vacuum breaker quantity	0
Deck drain type	N/A
Deck drain quantity	0
Stub drain quantity	0
Center Deck leg type	N/A
Center Deck leg quantity	11
Pontoon Deck leg type	N/A
Pontoon Deck leg quantity	0
Rim vent type	N/A
Rim vent quantity	0
Ladder well type	N/A
Ladder well quantity	0
Ladder-slotted guidepole combination well type	N/A
Ladder well quantity	0
Reset fittings to defaults	<input type="checkbox"/>

Table 4 Internal Floating Roof Tank Emissions Calculations, ProMax Inputs, FEOR A Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

FEOR A Tank



Working and Breathing Parameters

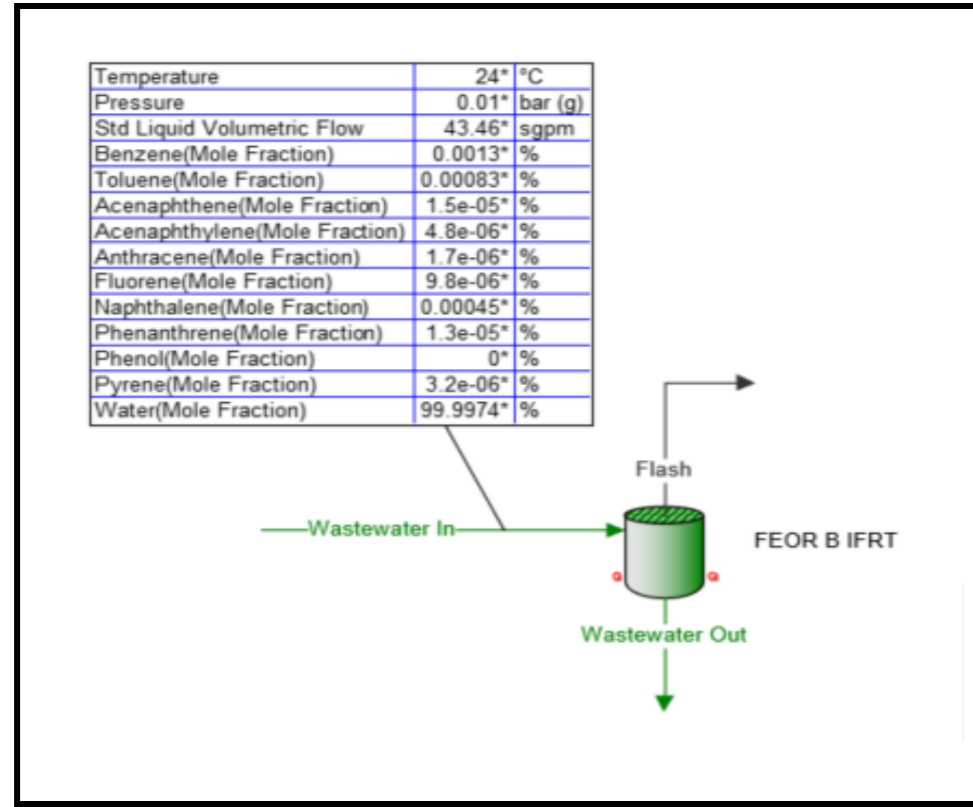
Property	Value	Units
Process Stream	Wastewater In	
Tank Geometry	Internal Floating Roof Tank	
Shell Length	47.9	ft
Shell Diameter	55.8	ft
Number of Storage Tanks Employed	1	
Location	Pittsburgh, PA	
Time Frame	January	
Report Components	Non-exempt VOC	
Set Bulk Temperature to Stream Temperature?	<input type="checkbox"/>	
Use AP42 Raoult's Vapor Pressure?	<input type="checkbox"/>	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Minimum Fraction Fill of Tank	10	%
Material Category	Light Organics	
Insulation	Uninsulated	
Tank Color	White	
Tank Condition	Light Rust	
Shell Paint Condition	Average	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof		ft
Slope of Coned Roof	0.0625	
Roof Color	White	
Roof Paint Condition	Average	
Flashing Temperature	33.27	°F
Maximum Average Temperature	36.2	°F
Minimum Average Temperature	22.2	°F
Average Absolute Pressure	14.1	psia
Daily Solar Insolation	520	Btu/ft ² /day
Average Wind Speed	9.4	mi/h
Underground Tank?	<input type="checkbox"/>	
Bolted or Riveted Construction?	<input type="checkbox"/>	
Known Sum of Increases in Liquid Level?	<input type="checkbox"/>	
Sum of Increases in Liquid Level		ft/yr
Vapor Balanced Tank?	<input type="checkbox"/>	
Calculate Loading Losses?	<input type="checkbox"/>	
Output Loading Losses?	<input type="checkbox"/>	
Output Flashing Losses?	<input checked="" type="checkbox"/>	
Output Working/Breathing Losses?	<input checked="" type="checkbox"/>	

Floating Roof Fittings

Property	Value
Floating Roof Type	Pontoon
Tank Construction	Welded
Primary Seal	Mechanical Shoe
Secondary Seal Type #1	None
Secondary Seal Type #2	None
Seal Fitting Tightness	Tight
Self Supported Roof?	<input checked="" type="checkbox"/>
Deck Construction	Sheet
Construction Type for Continuous Sheet Style Deck	5 feet wide
Construction Type for Panel Style Deck	5 x 7.5 feet
Number of Columns	0
Effective Column Diameter	Default
Construction Type of Internal Floating Roof Tank	Welded
Access hatch type	Bolted cover, gasketed
Access hatch quantity	1
Fixed roof support column well type	N/A
Fixed roof support column well quantity	0
Unslotted guide-pole and well type	N/A
Unslotted guide-pole and well quantity	0
Slotted guide-pole/sample well type	Gasketed sliding cover, with pole sleeve
Slotted guide-pole/sample well quantity	2
Gauge-float well type	N/A
Gauge-float well quantity	1
Gauge-hatch/sample port type	Weighted mechanical actuation, gasketed
Gauge-hatch/sample port quantity	1
Vacuum breaker type	Weighted mechanical actuation, gasketed
Vacuum breaker quantity	1
Deck drain type	N/A
Deck drain quantity	0
Stub drain quantity	0
Center Deck leg type	N/A
Center Deck leg quantity	16
Pontoon Deck leg type	N/A
Pontoon Deck leg quantity	0
Rim vent type	N/A
Rim vent quantity	0
Ladder well type	N/A
Ladder well quantity	0
Ladder-slotted guidepole combination well type	N/A
Ladder well quantity	0
Reset fittings to defaults	<input type="checkbox"/>

Table 5 Internal Floating Roof Tank Emissions Calculations, ProMax Inputs, FEOR B Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

FEOR B Tank



Working and Breathing Parameters

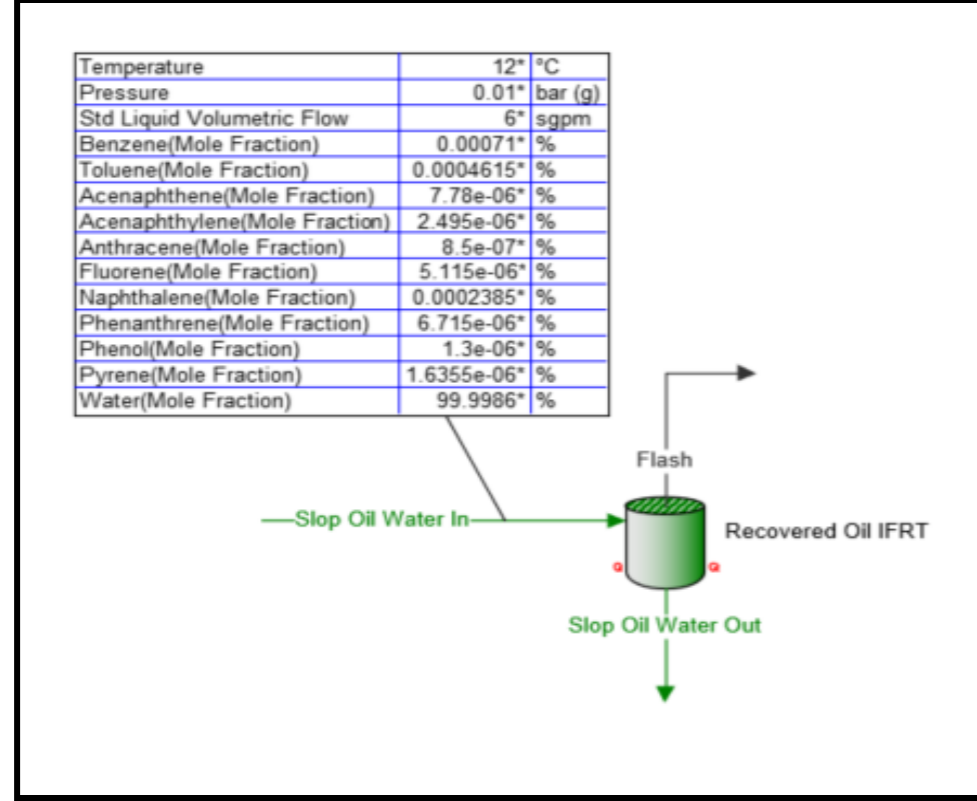
Property	Value	Units
Process Stream	Wastewater In	
Tank Geometry	Internal Floating Roof Tank	
Shell Length	47.9	ft
Shell Diameter	55.8	ft
Number of Storage Tanks Employed	1	
Location	Pittsburgh, PA	
Time Frame	January	
Report Components	Non-exempt VOC	
Set Bulk Temperature to Stream Temperature?	<input type="checkbox"/>	
Use AP42 Raoult's Vapor Pressure?	<input type="checkbox"/>	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Minimum Fraction Fill of Tank	10	%
Material Category	Light Organics	
Insulation	Uninsulated	
Tank Color	White	
Tank Condition	Light Rust	
Shell Paint Condition	Average	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof		ft
Slope of Coned Roof	0.0625	
Roof Color	White	
Roof Paint Condition	Average	
Flashing Temperature	33.27	°F
Maximum Average Temperature	36.2	°F
Minimum Average Temperature	22.2	°F
Average Absolute Pressure	14.1	psia
Daily Solar Insolation	520	Btu/ft ² /day
Average Wind Speed	9.4	mi/h
Underground Tank?	<input type="checkbox"/>	
Bolted or Riveted Construction?	<input type="checkbox"/>	
Known Sum of Increases in Liquid Level?	<input type="checkbox"/>	
Sum of Increases in Liquid Level		ft/yr
Vapor Balanced Tank?	<input type="checkbox"/>	
Calculate Loading Losses?	<input type="checkbox"/>	
Output Loading Losses?	<input type="checkbox"/>	
Output Flashing Losses?	<input checked="" type="checkbox"/>	
Output Working/Breathing Losses?	<input checked="" type="checkbox"/>	

Floating Roof Fittings

Property	Value
Floating Roof Type	Pontoon
Tank Construction	Welded
Primary Seal	Mechanical Shoe
Secondary Seal Type #1	None
Secondary Seal Type #2	None
Seal Fitting Tightness	Tight
Self Supported Roof?	<input checked="" type="checkbox"/>
Deck Construction	Sheet
Construction Type for Continuous Sheet Style Deck	5 feet wide
Construction Type for Panel Style Deck	5 x 7.5 feet
Number of Columns	0
Effective Column Diameter	Default
Construction Type of Internal Floating Roof Tank	Welded
Access hatch type	Bolted cover, gasketed
Access hatch quantity	1
Fixed roof support column well type	N/A
Fixed roof support column well quantity	0
Unslotted guide-pole and well type	N/A
Unslotted guide-pole and well quantity	0
Slotted guide-pole/sample well type	Gasketed sliding cover, with pole sleeve
Slotted guide-pole/sample well quantity	2
Gauge-float well type	N/A
Gauge-float well quantity	1
Gauge-hatch/sample port type	Weighted mechanical actuation, gasketed
Gauge-hatch/sample port quantity	1
Vacuum breaker type	Weighted mechanical actuation, gasketed
Vacuum breaker quantity	1
Deck drain type	N/A
Deck drain quantity	0
Stub drain quantity	0
Center Deck leg type	N/A
Center Deck leg quantity	10
Pontoon Deck leg type	N/A
Pontoon Deck leg quantity	0
Rim vent type	N/A
Rim vent quantity	0
Ladder well type	N/A
Ladder well quantity	0
Ladder-slotted guidepole combination well type	N/A
Ladder well quantity	0
Reset fittings to defaults	<input type="checkbox"/>

Table 6 Internal Floating Roof Tank Emissions Calculations, ProMax Inputs, Recovered Oil Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Recovered Oil Tank



Working and Breathing Parameters

Property	Value	Units
Process Stream	Slop Oil Water In	
Tank Geometry	Internal Floating Roof Tank	
Shell Length	48	ft
Shell Diameter	43	ft
Number of Storage Tanks Employed	1	
Location	Pittsburgh, PA	
Time Frame	January	
Report Components	Non-exempt VOC	
Set Bulk Temperature to Stream Temperature?	<input type="checkbox"/>	
Use AP42 Raoult's Vapor Pressure?	<input type="checkbox"/>	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Minimum Fraction Fill of Tank	10	%
Material Category	Light Organics	
Insulation	Uninsulated	
Tank Color	White	
Tank Condition	Light Rust	
Shell Paint Condition	Average	
Operating Pressure	0	psig
Breather Vent Pressure	0.03	psig
Breather Vacuum Pressure	-0.03	psig
Roof Type	Dome	
Radius of Domed Roof		ft
Slope of Coned Roof	0.0625	
Roof Color	White	
Roof Paint Condition	Average	
Flashing Temperature	33.32	°F
Maximum Average Temperature	36.2	°F
Minimum Average Temperature	22.2	°F
Average Absolute Pressure	14.1	psia
Daily Solar Insolation	520	Btu/ft ² /day
Average Wind Speed	9.4	mi/h
Underground Tank?	<input type="checkbox"/>	
Bolted or Riveted Construction?	<input type="checkbox"/>	
Known Sum of Increases in Liquid Level?	<input type="checkbox"/>	
Sum of Increases in Liquid Level		ft/yr
Vapor Balanced Tank?	<input type="checkbox"/>	
Calculate Loading Losses?	<input type="checkbox"/>	
Output Loading Losses?	<input type="checkbox"/>	
Output Flashing Losses?	<input checked="" type="checkbox"/>	
Output Working/Breathing Losses?	<input checked="" type="checkbox"/>	

Floating Roof Fittings

Property	Value
Floating Roof Type	Pontoon
Tank Construction	Welded
Primary Seal	Mechanical Shoe
Secondary Seal Type #1	None
Secondary Seal Type #2	None
Seal Fitting Tightness	Tight
Self Supported Roof?	<input checked="" type="checkbox"/>
Deck Construction	Sheet
Construction Type for Continuous Sheet Style Deck	5 feet wide
Construction Type for Panel Style Deck	5 x 7.5 feet
Number of Columns	0
Effective Column Diameter	Default
Construction Type of Internal Floating Roof Tank	Welded
Access hatch type	Bolted cover, gasketed
Access hatch quantity	1
Fixed roof support column well type	N/A
Fixed roof support column well quantity	0
Unslotted guide-pole and well type	N/A
Unslotted guide-pole and well quantity	0
Slotted guide-pole/sample well type	Gasketed sliding cover, with pole sleeve
Slotted guide-pole/sample well quantity	3
Gauge-float well type	N/A
Gauge-float well quantity	1
Gauge-hatch/sample port type	Weighted mechanical actuation, gasketed
Gauge-hatch/sample port quantity	1
Vacuum breaker type	Weighted mechanical actuation, gasketed
Vacuum breaker quantity	1
Deck drain type	N/A
Deck drain quantity	0
Stub drain quantity	0
Center Deck leg type	N/A
Center Deck leg quantity	13
Pontoon Deck leg type	N/A
Pontoon Deck leg quantity	0
Rim vent type	N/A
Rim vent quantity	0
Ladder well type	N/A
Ladder well quantity	0
Ladder-slotted guidepole combination well type	N/A
Ladder well quantity	0
Reset fittings to defaults	<input type="checkbox"/>

Table 7 Internal Floating Roof Tank Emissions Calculations, ProMax Outputs, Spent Caustic Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Property	Value	Units
Atmospheric Pressure	-0.04109	bar (g)
True Vapor Pressure at Average Temperature	-1.005	bar (g)
Average Liquid Surface Temperature	-1.162	°C
Maximum Liquid Surface Temperature	0.7515	°C
Bulk Liquid Temperature	-1.339	°C
Annual Tank Turnover Rate		
Flashing Losses	0	lb/h
Loading Losses	0	lb/h
Maximum Hourly Loading Loss	0	lb/h
Total W/B Losses	0.0005697	lb/h
Working Losses per Tank	0	lb/h
Standing Losses per Tank	0	lb/h
Rim Seal Losses per Tank	0.0003762	lb/h
Withdrawal Loss per Tank	9.427E-07	lb/h
Deck Fitting Losses per Tank	0.0001925	lb/h
Deck Seam Losses per Tank	0	lb/h

ProMax AP-42 Emissions Report
January Emissions
Internal Floating Roof Tank

Components	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)
Mixture	0.0003762	0.0001925	0	9.427E-07	0.0005697
Benzene	0.0001723	8.820E-05	0	4.687E-07	0.0002611
Toluene	0.0002013	0.0001031	0	4.054E-07	0.0003048
Acenaphthene	0	0	0	0	0
Acenaphthylene	1.004E-12	5.140E-13	0	6.088E-08	6.088E-08
Anthracene	0	0	0	0	0
Fluorene	0	0	0	0	0
Naphthalene	2.522E-06	1.291E-06	0	7.691E-09	3.820E-06
Phenanthrene	0	0	0	0	0
Phenol	0	0	0	0	0
Pyrene	0	0	0	0	0

Table 8 Internal Floating Roof Tank Emissions Calculations, ProMax Outputs, FEOR A Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Property	Value	Units
Atmospheric Pressure	-0.04109	bar (g)
True Vapor Pressure at Average Temperature	-1.007	bar (g)
Average Liquid Surface Temperature	-1.137	°C
Maximum Liquid Surface Temperature	0.7036	°C
Bulk Liquid Temperature	-1.339	°C
Annual Tank Turnover Rate		
Flashing Losses	0	lb/h
Loading Losses	0	lb/h
Maximum Hourly Loading Loss	0	lb/h
Total W/B Losses	7.745E-05	lb/h
Working Losses per Tank	0	lb/h
Standing Losses per Tank	0	lb/h
Rim Seal Losses per Tank	5.665E-05	lb/h
Withdrawal Losses per Tank	3.138E-07	lb/h
Deck Fitting Losses per Tank	2.049E-05	lb/h
Deck Seam Losses per Tank	0	lb/h

ProMax AP-42 Emissions Report					
January Emissions					
Internal Floating Roof Tank					
Components	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)
Mixture	5.665E-05	2.049E-05	0	3.138E-07	7.745E-05
Benzene	2.202E-05	7.962E-06	0	1.342E-07	3.011E-05
Toluene	2.719E-05	5.834E-06	0	1.226E-07	3.715E-05
Acenaphthene	1.619E-07	5.856E-08	0	1.236E-09	2.217E-07
Acenaphthylene	3.056E-15	1.105E-15	0	4.139E-10	4.139E-10
Anthracene	0	0	0	0	0
Fluorene	3.251E-15	1.176E-15	0	1.023E-09	1.023E-09
Naphthalene	7.252E-06	2.623E-06	0	4.953E-08	9.924E-06
Phenanthrene	1.269E-08	4.591E-09	0	1.097E-09	1.838E-08
Phenol	1.021E-10	3.693E-11	0	3.502E-09	3.641E-09
Pyrene	1.361E-08	4.521E-09	0	2.055E-10	1.873E-08

Table 9 Internal Floating Roof Tank Emissions Calculations, ProMax Outputs, FEOR B Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Property	Value	Units
Atmospheric Pressure	-0.04109	bar (g)
True Vapor Pressure at Average Temperature	-1.005	bar (g)
Average Liquid Surface Temperature	-1.137	°C
Maximum Liquid Surface Temperature	0.7036	°C
Bulk Liquid Temperature	-1.339	°C
Annual Tank Turnover Rate		
Flashing Losses	0	lb/h
Loading Losses	0	lb/h
Maximum Hourly Loading Loss	0	lb/h
Total W/B Losses	0.0006497	lb/h
Working Losses per Tank	0	lb/h
Standing Losses per Tank	0	lb/h
Rim Seal Losses per Tank	0.0004759	lb/h
Withdrawal Loss per Tank	1.769E-06	lb/h
Deck Fitting Losses per Tank	0.0001721	lb/h
Deck Seam Losses per Tank	0	lb/h

ProMax AP-42 Emissions Report					
January Emissions					
Internal Floating Roof Tank					
Components	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)
Mixture	0.0004759	0.0001721	0	1.769E-06	0.0006497
Benzene	0.0002358	8.52E-05	0	7.372E-07	0.0003218
Toluene	0.0002285	8.262E-05	0	5.552E-07	0.0003116
Acenaphthene	1.649E-08	5.965E-09	0	1.679E-08	3.925E-08
Acenaphthylene	7.718E-14	2.791E-14	0	5.304E-09	5.304E-09
Anthracene	3.437E-10	1.243E-10	0	2.200E-09	2.668E-09
Fluorene	7.410E-14	2.680E-14	0	1.183E-08	1.183E-08
Naphthalene	1.157E-05	4.184E-06	0	4.187E-07	1.617E-05
Phenanthrene	5.788E-10	3.540E-10	0	1.682E-08	1.815E-08
Phenol	0	0	0	0	0
Pyrene	1.648E-11	5.960E-12	0	4.699E-09	4.721E-09

Table 10 Internal Floating Roof Tank Emissions Calculations, ProMax Outputs, Recovered Oil Tank
Shell Chemical Appalachia LLC, Shell Polymers Monaca

Property	Value	Units
Atmospheric Pressure	-0.04109	bar (g)
True Vapor Pressure at Average Temperature	-1.006	bar (g)
Average Liquid Surface Temperature	-1.151	°C
Maximum Liquid Surface Temperature	0.7307	°C
Bulk Liquid Temperature	-1.339	°C
Annual Tank Turnover Rate		
Flashing Losses	0	lb/h
Loading Losses	0	lb/h
Maximum Hourly Loading Loss	0	lb/h
Total W/B Losses	0.0003451	lb/h
Working Losses per Tank	0	lb/h
Standing Losses per Tank	0	lb/h
Rim Seal Losses per Tank	0.0002103	lb/h
Withdrawal Losses per Tank	1.727E-07	lb/h
Deck Fitting Losses per Tank	0.0001346	lb/h
Deck Seam Losses per Tank	0	lb/h

ProMax AP-42 Emissions Report					
January Emissions					
Internal Floating Roof Tank					
Components	Rim Seal Losses (lb/h)	Deck Fitting Losses (lb/h)	Deck Seam Losses (lb/h)	Withdrawal Losses (lb/h)	Total Losses (lb/h)
Mixture	0.0002103	0.0001346	0	1.727E-07	0.0003451
Benzene	9.980E-05	6.386E-05	0	7.214E-08	0.0001637
Toluene	0.0001011	6.471E-05	0	5.511E-08	0.0001659
Acenaphthene	1.455E-08	9.308E-09	0	1.561E-09	2.540E-08
Acenaphthylene	3.084E-14	1.974E-14	0	4.939E-10	4.940E-10
Anthracene	2.991E-10	1.907E-10	0	1.971E-10	6.859E-10
Fluorene	2.974E-14	1.903E-14	0	1.106E-09	1.106E-09
Naphthalene	5.375E-06	5.959E-06	0	3.976E-08	1.541E-05
Phenanthrene	8.704E-10	5.569E-10	0	1.557E-09	2.984E-09
Phenol	3.930E-11	2.515E-11	0	1.591E-10	2.236E-10
Pyrene	1.470E-11	9.407E-12	0	4.303E-10	4.544E-10