



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

November 21, 2023

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

U.S. EPA Office of Emergency Management
Ariel Rios Building (51404A)
1200 Pennsylvania Avenue, NW
Washington, DC, 20460

RE: PA-04-00740C Spent Caustic Vent Incinerator (Source ID C206), Storage Tanks (Recovered Oil, Equalization Wastewater, and Spent Caustic) (Source IDs 401 and 402), and WEMCO Depurator (Source ID 505) Excess Emissions Malfunction Report and NRC Incident ID #1384863

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, spent caustic storage tanks, and temporary WEMCO Depurator between October 19 and October 22, 2023. This event triggered notification to the following agencies, in addition to PADEP: The National Response Center and PA Emergency Management (Incident ID #1384863).

This malfunction did not pose an imminent and substantial danger to the public health and safety or the environment.

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

- **Nature and cause of the incident**
On October 19, 2023 at 20:42, the Spent Caustic Thermal Oxidizer¹ (SCTO) was manually tripped offline. The reason for the manual trip was that operations had discovered that the combustion air blower had tripped offline at 20:02, thus reducing the amount of air flowing to oxidizer. Due to concerns with the fuel rich conditions within the combustion chamber, the decision was made to trip the SCTO. Note that, at the time of the SCTO trip, the spent caustic oxidation system was out of service as well as the Flow Equalization and Oil Removal (FEOR) tank and Spent Caustic tank blowers. This will be detailed in later sections of the report.

For the last ~5 hours of the SCTO downtime, the wastewater treatment plant (WWTP) had a slug of hydrocarbon from the Ethane Cracking Unit (ECU). There was inadvertent hydrocarbon carryover from one of their separator vessels while the unit was down for Cracked Gas Compressor (CGC) maintenance. During this time, the WEMCO Depurator vent gas became

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

highly concentrated in VOC, which was not being destructed in the SCTO. This 5-hour period contributes to the bulk of malfunction emissions.

- **Time when the malfunction or breakdown was first observed**

October 19, 2023 at 20:02

- **The date and time that the malfunction started and ended**

Start on October 19, 2023 at 20:02 and ended on October 22, 2023 at 2:57 when the SCTO was back online and target combustion temperature achieved.

- **An estimate of the emissions associated with the malfunction**

Pollutant	Emissions (lbs)
Total VOC	155
Benzene	106
Toluene	28
1,3 Butadiene	3
HAP (Total)	137

- **The calculations that were used to determine that quantity**

For reference, 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 and a nitrogen blanket which normally would flow to the SCTO. When the SCTO trips offline or the tank blowers are taken out of service, the Spent Caustic, FEOR, and Recovered Oil tanks periodically vent to atmosphere through relief valves. Similarly, the WEMCO also vents through the tank relieve valves when the FEOR/Recovered Oil blower is offline as it ties into the blower suction line.

Excess emissions from the internal floating roof-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 internal floating roof physical characteristics, measured liquid throughputs using liquid level indicators, measured tank liquid temperatures, pressure of input liquid streams, and representative tank sample data. Emissions from the WEMCO unit were calculated using existing Pro-II model output data and updating it to represent the WEMCO feed flow and composition data at the time of this malfunction. The WEMCO calculations were broken up into two discrete time periods: pre the WWTP upset and during the WWTP upset.

The emissions above also include estimated excess emissions from the biotreater tanks, which are based on the VOC, benzene, and 1,3 butadiene readings taken at the top of the tanks with a handheld meter during the upset condition.

- **The steps, if any, that the facility took to limit the duration and/or quantity of emissions associated with the malfunction**

The spent caustic oxidation system and ECU were both down during the SCTO downtime due a sitewide outage. Thus, no spent caustic was being generated nor offgas from the oxidation system.

The required maintenance to get the SCTO back in service was worked over the weekend as a high priority.

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

- **A detailed analysis that sets forth the Root Cause of the malfunction, to the extent determinable**

Leading up to the event, operations noted that the flame arrestors in the SCTO common vent gas line were starting to plug up. In order to address this and before it caused inadvertent blower trips due to back-pressure, the decision was made to take the upstream tank blowers offline in order to pull and clean the flame arrestors. This maintenance would have resulted in the FEOR A/B and Recovered Oil and Spent Caustic tanks and WEMCO Depurator intermittently venting to atmosphere through the relief valves and, by itself, would have been treated as a malfunction due to its unplanned nature.

When operations went to take the blowers offline ahead of the flame arrestor cleaning, the SCTO combustion air blower was inadvertently de-energized at 20:02 on October 19. This was discovered at 20:42 and, due to concerns with the fuel rich combustion condition in the oxidizer, the SCTO was manually tripped.

Note that there are two flame arrestors in the system and, in the current configuration, the SCTO vent gas is split between them before combining again into one line entering the burner chamber of the thermal oxidizer. Flame arrestors are safety devices and, in this case, and there to prevent the SCTO burner flame from backing into the vent gas line.

As documented in malfunction report *RE: PA-04-00740C Recovered Oil and Equalization Wastewater and Spent Caustic Storage Tanks (Source IDs 401 and 402) and WEMCO Depurator (Source ID 505) Excess Emissions Malfunction Report*, submitted to the department on November 6, 2023, the flame arrestors were cleaned between October 6-8. An improved cleaning technique was used for the October 19-22 downtime to avoid another near-term downtime.

- **An analysis of the measures, if any, that are available to reduce the likelihood of a recurrence of a malfunction resulting from the same Root Cause or contributing causes in the future**

1. The site is evaluating potential long-term solutions to the flame arrestor lineup arrangement and/or how to manage/mitigate pipe scale buildup in the line. One consideration is to run through just 1 flame arrestor at a time and have the other one available to swap flow to in the event of plugging of the in-service arrestor.
2. In regards to inadvertent hydrocarbon carryover from ECU and resultant elevated emissions, the site is evaluating both procedural and other potential improvements to avoid future similar events.

- **To the extent that investigations of the causes and/or possible corrective action(s) still are underway on the due date of the report, a statement of the anticipated date by which a follow-up report will be submitted**

A follow up report will be submitted to the department on or before February 15, 2024 to provide an update on item #2 above.

- **Corrective action is final or timeline for implementation**

Follow up report will be submitted on or before February 15, 2024.

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

Sincerely,

Kimberly Kaal
Environmental Manager, Attorney-in-Fact

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

Attachment A

Pro-Max Model Inputs and Outputs

Table 1 SCTO Downtime Internal Floating Roof Tank Emissions Calculations, ProMax Input Summary
Shell Chemical Appalachia LLC, Monaca Cracker Plant

Timeframe of Analysis

Timeframe start 10/19/2023 20:02
 Timeframe end 10/22/2023 2:57
 Time 54.9 hours
 3,295 minutes

Tank Data/Sample Data

Tank Name	Tank ID	Contents	Length/ Height (ft)	Diameter (ft)	Temp (C)	Pressure (barg)	Throughput (gal)	Flow Rate (gpm)	Samples Used
Spent Caustic Tank	T-53501	2% Spent Caustic	48	35	33.79	0.01	1,088.18	0.33	Average of 9/26/2023, 10/3/2023, 10/10/2023, Balance Water
FEOR B Tank	T-59707B	Waste Water, sheen of oil	47.9	55.8	24.20	0.01	458,719.42	139.22	Average of 10/17/2023, 10/24/2023, 10/31/2023, Balance Water
FEOR A Tank	T-59707A	Waste Water, sheen of oil	47.9	55.8	28.53	0.01	873.09	0.26	Average of 10/10/2023, 10/17/2023, 10/31/2023, Balance Water
Recovered Oil Tank	T-59708	Slop Oil/Water mixture	48	43	24.42	0.01	98,848.64	30.00	5/24/2023, Balance Water

Sample Data

Constituent	9/26/2023 Spent Caustic		10/3/2023 Spent Caustic		10/10/2023 Spent Caustic		Average Spent Caustic Tank		10/17/2023 FEOR B		10/24/2023 FEOR B		10/31/2023 FEOR B		Average FEOR B		10/10/2023 FEOR A		10/17/2023 FEOR A		10/31/2023 FEOR A		Average FEOR A		5/24/2023 Recovered Oil Tank					
	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%	mg/L	%		
Benzene	180	0.018	32	0.032	53	0.053	0.0885333	0.12	0.000012	17	0.0017	17	0.0017	0.0011733	0.54	0.000054	0.000097	130	0.013	0.0143867	24.2	0.00242	0.00242	0.00242	32	0.0032	0.0032	32	0.0032	
Ethylbenzene	0	0	0	0	0	0	0.00000000	0	0	0.31	0.000031	0	0	0.00001033	0.62	0.000062	0.000078	0	0	0.0004667	0	0	0	0	0	0	0	0	0	
Styrene	5.7	0.00057	0	0	0	0	0.00019000	0	0	0.66	0.000066	0	0	0.00002200	0	0	0.000049	0.49	0.000049	3.2	0.00032	0.00012300	19.2	0.00192	0.00192	19.2	0.00192	19.2	0.00192	
Toluene	38	0.0038	11	0.0011	15	0.0015	0.00213333	0.22	0.000022	5.2	0.000052	3.8	0.00038	0.00007033	3	0.0003	0.000033	3.3	0.00033	36	0.0036	0.000141000	181	0.0181	0.0181	181	0.0181	181	0.0181	
Xylenes	0	0	0	0	0	0	0.00000000	0	0	0.31	0.000031	0	0	0.00001033	0	0	0.000058	0.58	0.000058	0	0	0.00001933	25.51	0.002551	0.002551	25.51	0.002551	25.51	0.002551	
1,2,4-Trimethylbenzene	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0	0.00000000	1.16	0.000116	0.000116	1.16	0.000116	1.16	0.000116	
n-Propyl Benzene	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0	0.00000000	16	0.0016	0.0016	16	0.0016	16	0.0016	
Butylbenzene	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0	0.00000000	1.85	0.000185	0.000185	1.85	0.000185	1.85	0.000185	
2-Methylnaphthalene	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0	0.00000000	10.7	0.00107	0.00107	10.7	0.00107	10.7	0.00107	
Acenaphthene	0	0.0059	0.0000059	0	0	0	0.00000020	0.01	0.000001	0.035	0.0000035	0.0036	0.00000036	0.00000162	0.0031	0.00000031	0.0068	0.0000068	0.038	0.0000038	0.0000160	0	0	0	0	0	0	0	0	0
Acenaphthylene	0	0	0	0	0	0	0.00000000	0.019	0.0000019	0.029	0.0000029	0.0035	0.00000035	0.00000172	0.0033	0.00000033	0.0072	0.0000072	0.038	0.0000038	0.0000162	0	0	0	0	0	0	0	0	0
Anthracene	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0.00000000	0	0	0	0	0	0	0	0.00000000	0.0866	0.00000866	0.00000866	0.0866	0.00000866	0.0866	0.00000866	
Fluoranthene	0	0	0	0	0	0	0.00000000	0.0046	0.00000046	0	0	0	0	0.00000015	0	0	0	0	0	0	0	0.00000000	0.14	0.000014	0.000014	0.14	0.000014	0.14	0.000014	
Fluorene	0	0	0	0	0	0	0.00000000	0.013	0.0000013	0.03	0.000003	0.0032	0.00000032	0.00000154	0.004	0.00000036	0.0067	0.0000067	0.036	0.0000036	0.00000154	0.529	0.0000529	0.0000529	0.529	0.0000529	0.529	0.0000529		
Naphthalene	0.28	0.000028	0.31	0.000031	0.15	0.000015	0.00002467	0.026	0.0000026	1.2	0.000012	0.14	0.0000014	0.0000453	0.22	0.000022	0.39	0.000039	1.5	0.00015	0.00007033	25.4	0.00254	0.00254	25.4	0.00254	25.4	0.00254		
Phenanthrene	0	0	0	0	0	0	0.00000000	0.029	0.0000029	0.034	0.0000034	0.0045	0.00000045	0.00000225	0.0063	0.00000063	0.0092	0.0000092	0.05	0.000005	0.0000218	0.77	0.000077	0.000077	0.77	0.000077	0.77	0.000077		
Phenol	0.074	0.0000074	0.069	0.0000069	0.03	0.000003	0.00000577	0	0	0.053	0.0000053	0	0	0.00000177	0	0	0.062	0.0000062	0.089	0.0000089	0.00000503	0	0	0	0	0	0	0	0	
Pyrene	0	0	0	0	0	0	0.00000000	0.0086	0.00000086	0	0	0.00083	0.00000083	0.00000031	0	0	0	0	0	0	0.00000000	0.21	0.000021	0.000021	0.21	0.000021	0.21	0.000021		
Water	Balance	99.9775946	Balance	99.99566151	Balance	99.993182	99.98881270	Balance	99.9995498	Balance	99.9975192	Balance	99.99789847	99.99845755	Balance	99.99956037	Balance	99.99933981	Balance	99.9829049	99.99393503	Balance	99.96612444	Balance	99.96612444	Balance	99.96612444	Balance	99.96612444	

Table 2 SCTO Downtime Internal Floating Roof Tank Emissions Calculations, Emissions Calculations
Shell Chemical Appalachia LLC, Monaca Cracker Plant

	Spent Caustic Tank Emissions (lb/event)					FEOR A Tank Emissions (lb/event)					FEOR B Tank Emissions (lb/event)					Recovered Oil Tank Emissions (lb/event)					Total (4 Tanks) (lb/event)	tons/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)	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	3.313E-02	1.695E-02	0.000E+00	9.753E-07	5.008E-02	2.896E-02	1.047E-02	0.000E+00	2.613E-07	3.943E-02	7.249E-03	2.622E-03	0.000E+00	3.558E-05	9.906E-03	9.402E-02	6.013E-02	0.000E+00	2.185E-04	1.544E-01	0.25379	0.00012689
Benzene	2.484E-02	1.271E-02	0.000E+00	7.699E-07	3.755E-02	1.968E-02	7.117E-03	0.000E+00	1.888E-07	2.880E-02	5.104E-03	1.846E-03	0.000E+00	2.623E-05	6.976E-03	7.990E-03	5.112E-03	0.000E+00	1.561E-05	1.312E-02	0.08445	4.2223E-05
Ethylbenzene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.839E-04	1.027E-04	0.000E+00	2.010E-09	3.866E-04	6.282E-05	2.272E-05	0.000E+00	2.383E-07	8.78E-05	8.369E-03	5.356E-03	0.000E+00	2.064E-05	1.375E-02	0.01422	7.1092E-06
Styrene	2.131E-04	1.091E-04	0.000E+00	1.656E-08	3.223E-04	2.205E-04	7.974E-05	0.000E+00	5.298E-09	3.002E-04	3.942E-05	1.426E-05	0.000E+00	5.075E-07	5.419E-05	1.953E-03	1.250E-03	0.000E+00	1.238E-05	3.216E-03	0.00389	1.9462E-06
Toluene	8.023E-03	4.105E-03	0.000E+00	1.859E-07	1.211E-02	8.463E-03	3.062E-03	0.000E+00	6.074E-08	1.152E-02	1.845E-03	6.072E-04	0.000E+00	7.890E-06	2.539E-03	6.766E-02	4.330E-02	0.000E+00	1.168E-04	1.111E-01	0.13725	6.8624E-05
Xylenes	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.051E-05	2.911E-05	0.000E+00	8.325E-10	1.096E-04	4.300E-05	1.555E-05	0.000E+00	2.383E-07	5.879E-05	4.874E-03	3.119E-03	0.000E+00	1.645E-05	8.009E-03	0.00818	4.0887E-06
1,2,4-Trimethylbenzene	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	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.155E-04	7.386E-05	0.000E+00	7.480E-07	1.901E-04	0.00019	9.505E-08
n-Propyl Benzene	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	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.487E-03	1.591E-03	0.000E+00	1.032E-05	4.089E-03	0.00409	2.0445E-06
Butylbenzene	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	1.476E-06	5.337E-07	0.000E+00	5.075E-09	2.014E-06	1.107E-04	7.084E-05	0.000E+00	1.193E-06	1.827E-04	0.00038	9.2381E-08
2-Methylnaphthalene	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	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.465E-05	2.860E-05	0.000E+00	6.803E-06	8.019E-05	0.00008	4.0095E-08
Acenaphthene	4.901E-07	2.509E-07	0.000E+00	1.743E-11	7.410E-07	6.266E-06	2.266E-06	0.000E+00	6.892E-11	8.532E-06	6.348E-06	2.295E-06	0.000E+00	3.737E-08	8.681E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.00002	8.9771E-09
Acenaphthylene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.551E-13	3.091E-13	0.000E+00	6.988E-11	7.096E-11	9.072E-13	3.281E-13	0.000E+00	3.967E-08	3.967E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.00000	1.9872E-11
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	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.034E-09	3.221E-09	0.000E+00	5.585E-08	6.411E-08	0.00000	3.2053E-11
Fluoranthene	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	4.750E-06	1.718E-06	0.000E+00	3.460E-09	6.471E-06	8.704E-10	5.569E-10	0.000E+00	9.028E-08	9.171E-08	0.00001	3.2814E-09
Fluorene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.584E-13	1.662E-13	0.000E+00	6.634E-11	6.696E-11	4.591E-13	1.666E-13	0.000E+00	3.552E-08	3.552E-08	1.216E-11	7.776E-12	0.000E+00	3.412E-07	3.412E-07	0.00000	1.884E-10
Naphthalene	4.834E-05	2.474E-05	0.000E+00	2.151E-09	7.309E-05	2.199E-04	7.952E-05	0.000E+00	3.038E-09	2.959E-04	1.424E-04	5.149E-05	0.000E+00	1.150E-06	1.949E-04	3.737E-04	2.391E-04	0.000E+00	1.638E-05	6.292E-04	0.00010	5.9834E-07
Phenanthrene	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.658E-07	2.696E-07	0.000E+00	9.391E-11	1.016E-06	7.699E-07	2.784E-07	0.000E+00	5.350E-08	1.100E-06	1.779E-08	1.138E-08	0.000E+00	4.967E-07	5.238E-07	0.00000	1.3208E-09
Phenol	3.395E-09	1.738E-09	0.000E+00	5.029E-10	5.636E-09	4.726E-09	1.709E-09	0.000E+00	2.167E-10	6.652E-09	1.662E-09	6.008E-10	0.000E+00	4.083E-08	4.309E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.00000	2.7688E-11
Pyrene	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	4.411E-07	1.595E-07	0.000E+00	7.150E-09	6.078E-07	2.060E-10	1.318E-10	0.000E+00	1.354E-07	1.358E-07	0.00000	3.7177E-10
Total POM (minus Naphthalene)	4.901E-07	2.509E-07	0.000E+00	1.743E-11	7.410E-07	7.012E-06	2.538E-06	0.000E+00	2.998E-10	9.548E-06	1.231E-05	4.451E-06	0.000E+00	1.751E-07	4.472E-05	4.472E-05	3.261E-05	0.000E+00	8.023E-06	8.135E-05	0.00011	5.4286E-08
Total HAP	3.312E-02	1.695E-02	0.000E+00	9.751E-07	5.008E-02	2.896E-02	1.047E-02	0.000E+00	2.613E-07	3.943E-02	7.249E-03	2.621E-03	0.000E+00	3.557E-05	9.906E-03	9.126E-02	5.841E-02	0.000E+00	2.062E-04	1.499E-01	0.24920	0.00012464

Table 4 SCTO Downtime Internal Floating Roof Tank Emissions Calculations, ProMix Inputs, FEOR A Tank
Shell Chemical Appalachia LLC, Monaca Cracker Plant

FEOR A Tank	
Temperature	58.551 °C
Pressure	0.0317 bar (g)
SOI Level/Vaporize Freq	0.267 (gpm)
Benzene/Mass Fraction	0.0046371 %
Biphenylene/Mass Fraction	0.000264 %
Styrene/Mass Fraction	0.000221 %
Toluene/Mass Fraction	0.004451 %
O-Xylenes/Mass Fraction	0.004451 %
T,X-4-Tetrahydrobenzo/Mass Fraction	0 %
Isophenylene/Mass Fraction	0 %
Biphenylene/Mass Fraction	0 %
2-Alkylnaphthalene/Mass Fraction	0 %
Acenaphthene/Mass Fraction	0.000264 %
Fluorene/Mass Fraction	0.000264 %
Indeno(1,2,3-cd)pyrene/Mass Fraction	0.000264 %
Fluoranthene/Mass Fraction	0 %
Phenanthrene/Mass Fraction	0.000264 %
Benzo(a)pyrene/Mass Fraction	0.000264 %
Phenol/Mass Fraction	0.000264 %
Water/Mass Fraction	0 %
Water/Mass Fraction	58.551 %

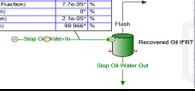


Working and Breathing Parameters		Value	Units
Process Stream	Wastewater In		
Tank Geometry	Internal Floating Roof Tank		
Shell Length		47.9	ft
Shell Diameter		55.0	ft
Number of Storage Tanks Employed		1	
Location	Pittsburgh, PA		
Time Frame	October		
Report Components	Non-exempt VOC		
Set E&B Temperature to Stream Temperature?	<input type="checkbox"/>		
Use AP-42 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 Dished Roof			ft
Slope of Conical Roof	0.0625		
Roof Color	White		
Roof Paint Condition	Average		
Flashing Temperature		58.55	°F
Massive Average Temperature	62.4		°F
Minimum Average Temperature	43.4		°F
Average Absolute Pressure	14.1		psig
Daily Solar Irradiation	9.19		hr-ft ² /day
Average Wind Speed	6.9		mi/hr
Underground Tank?	<input type="checkbox"/>		
Radius of Horizontal Combustion?	<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"/>		

Roofing Roof Fittings		Value
Property		
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	1	
Gauge-float well type	N/A	
Gauge-float well quantity	0	
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	0	
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 SCTO Downtime Internal Floating Roof Tank Emissions Calculations, ProMax Inputs, Recovered Oil Tank
Shell Chemical Appalachia LLC, Monaca Cracker Plant

Recovered Oil Tank	
Temperature	24.40°F (5)
Butane Mass Fraction	0.01166%
Octane Mass Fraction	0.00020%
Benzene Mass Fraction	0.00020%
Dibenzene Mass Fraction	0.00020%
Styrene Mass Fraction	0.00020%
Toluene Mass Fraction	0.00020%
Diethylbenzene Mass Fraction	0.00020%
Triethylbenzene Mass Fraction	0.00020%
Hexane Mass Fraction	0.00020%
Heptane Mass Fraction	0.00020%
Octane Mass Fraction	0.00020%
Nonane Mass Fraction	0.00020%
Decane Mass Fraction	0.00020%
Undecane Mass Fraction	0.00020%
Dodecane Mass Fraction	0.00020%
Tridecane Mass Fraction	0.00020%
Tetradecane Mass Fraction	0.00020%
Pentadecane Mass Fraction	0.00020%
Hexadecane Mass Fraction	0.00020%
Heptadecane Mass Fraction	0.00020%
Octadecane Mass Fraction	0.00020%
Nonadecane Mass Fraction	0.00020%
Eicosane Mass Fraction	0.00020%
Water Mass Fraction	98.999%



Working and Breathing Parameters	Value	Units
Process Stream	Slop Oil Water In	
Tank Geometry	Internal Floating Roof Tank	
Shell Length	40	ft
Shell Diameter	40	ft
Number of Storage Tanks Employed	1	
Location	Pittsburgh, PA	
Time Frame	October	
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	%
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 Coved Roof	0.0625	
Roof Color	White	
Roof Paint Condition	Average	
Fading Temperature	59	°F
Maximum Average Temperature	62.4	°F
Minimum Average Temperature	43.4	°F
Average Absolute Pressure	14.1	psia
Daily Solar Irradiation	9.0	BTU/ft ² -day
Average Wind Speed	6.9	mi/h
Underground Tank?	<input type="checkbox"/>	
Insulated or Insulated Combination?	<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"/>	

Roofing Roof fittings	Value
Roofing 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	1
Gauge-roof well type	N/A
Gauge-roof well quantity	0
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	1
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-slotted guidepole combination well quantity	0
Reset fittings to defaults	<input type="checkbox"/>

Attachment B
WEMCO Calculation Data

Component	Run 1- Normal WWTP conditions			Run 2- WWTP upset conditions			Total Wemco Emissions for Event (lbs)
	Wemco Feed Concentration Sample Result (mg/L)	Flow (lb/hr)	Time weighted mass out of WEMCO vent- Emissions (lbs)	Wemco Feed Concentration Sample Result (mg/L)	Flow (lb/hr)	Time weighted mass out of WEMCO vent- Emissions (lbs)	
Benzene	0.16	0.040654322	2.021197354	97.77	22.91683579	96.63265759	98.65385494
Phenol	0.0067	0.0017024	0.084637639	0.0565	0.015399231	0.064933424	0.149571063
Toluene	0.32	0.081308643	4.042394708	21	5.723607989	24.13454702	28.17694173
Ethylbenzene	0.025	0.006352238	0.315812087	0.7442	0.202833765	0.855282376	1.171094462
Total Xylenes	0.059	0.014991281	0.745316524	0.688	0.1875163	0.790693731	1.536010255
Styrene	0.042	0.010671759	0.530564305	1.2519	0.341208802	1.438763782	1.969328087
Dibutyl Phthalate	0.0093	0.002363032	0.117482096	0.0036	0.00098119	0.004137351	0.121619447
Naphthalene	0.0038	0.00096554	0.048003437	0.9294	0.253310536	1.068126095	1.116129532
Acenaphthene	0.0029	0.00073686	0.036634202	0.004	0.001090211	0.004597057	0.041231259
Acenaphthylene	0.0047	0.001194221	0.059372672	0.0036	0.00098119	0.004137351	0.063510023
Fluorene	0.0037	0.000940131	0.046740189	0.003	0.000817658	0.003447792	0.050187981
Anthracene	0.0009	0.000228681	0.011369235	0	0	0	0.011369235
Phenanthrene	0.0079	0.002007307	0.099796619	0.003	0.000817658	0.003447792	0.103244412
Fluoranthene	0.0011	0.000279498	0.013895732	0	0	0	0.013895732
Pyrene	0.002	0.000508179	0.025264967	0	0	0	0.025264967
Chrysene	0	0	0	0	0	0	0