



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

March 28, 2024

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

**RE: PA-04-00740C LP Multipoint Ground Flare (C204B) Visible and 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 flaring visible and excess emissions from the LP Multipoint Ground Flare on March 4, 2024.

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 March 4, 2024, starting at approximately 20:44, visible emissions (VE) were present at the Multipoint Ground Flare (MPGF) shortly following an unplanned shutdown of PE3. This was deemed a malfunction due to the VE exceeding 5 minutes in a consecutive 2-hour period per Method 22 field observations.

The cause of the VE was inadequate combustion air supplied to the flare header. This will be detailed in a later section of the report.

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

VE started on March 4, 2024, at 20:44.

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

VE started on March 4, 2024, at 20:44 and ended on March 4, 2024, at 20:52 per Method 22 observations.

The PE3 shutdown flaring to the MPGF that preceded the VE started on March 4, 2024, at 20:44 and ended on March 4, 2024, at 22:37.

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

MPGF emissions due to the PE3 shutdown are captured below.

Pollutant	Emissions (tons)
CO ₂ e	39.5901
CO	0.0967
NO _x	0.0212
PM (filt)	0.0006
PM 10	0.0023
PM 2.5	0.0023
VOC	0.0360
HAP (total)	0.0001

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

Excess emissions from the flaring event were based on measured flow rates, measured vent gas compositions, application of accepted hydrocarbon destruction efficiencies, and the use of emission factors for products of combustion. See Attachment A for gas composition and flow data used for these calculations.

Method 22 observations began approximately 1 minute after the VE started and are included as Attachment B. Note that subsequent review of the camera footage by environmental staff concluded that the VE was less than 5 minutes at 2 minutes and 17 seconds.

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

The MPGF air fan's automatic control response increased the fan speed to maximum when flow was directed to the flare header. The response, however, was not fast enough to avoid VE, which is detailed below.

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

On March 4, 2024, at approximately 20:40, there was a shutdown of the PE3 reactor system due to issues with the resin extruder. This shutdown resulted in an increase in PE3 vent gas routed to the Continuous Vent Thermal Oxidizer (CVTO). The change in both CVTO flow and composition caused the combustion air fan to ramp up to supply more air; however, the CVTO tripped minutes later on low air header pressure due to the combustion air supply not being able to match the demand during the transition to steady state conditions.

Immediately following the CVTO trip, vent gas was routed to the MPGF through the pressure control valve that separates the two systems. Due to delays in responses of the pressure control valve and the MPGF vent gas flow meter, the MPGF perimeter assist air fan's response lagged, resulting in a period of inadequate combustion conditions and visible emissions.

- **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 CVTO shutdown logic has been updated to lower the combustion air header pressure trip setpoint. This will help avoid future similar trips of the CVTO while steady state conditions are being established.
- 2.) The response of the pressure control valve that separates the CVTO and the MPGF has been updated to smooth out the transition of flow between the two systems when there is a CVTO trip. This will improve the MPGF air fan's response and help mitigate the potential for inadequate combustion conditions.

- **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**

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follow-up report will be submitted

No follow up report is anticipated.

- **Corrective action is final or timeline for implementation**
Corrective actions are complete.

If you have any questions regarding this matter, please contact me at (724) 709-2825 or william.watson@shell.com.

Sincerely,

A handwritten signature in black ink, appearing to read "W. Watson". The signature is fluid and cursive, with a long horizontal stroke at the end.

William Watson
Operations Manager

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

Attachment A- MPGF Flow and Composition Data

Shell Polymers LP Flare System GC Hourly Average Wt % Compositions, Flow, and NHV

Date and Time	Elemental Hydrogen % wt	Nitrogen % wt	Methane % wt	Ethane % wt	Acetylene % wt	Ethylene % wt	C3 % wt	C4 % wt	C4 Olefins % wt	C5 % wt	C6+ % wt	Total % wt	Flow Rate m3/hr	Flow Temp C	Flow Pres Barg	Specific Gravity	Flow Rate kg/hr	NHVcz Btu/scf
04-Mar-24 20:00:00	0.41	62.85	11.80	2.47	0.00	11.81	0.15	7.89	0.34	2.18	0.09	100.00	2.833	16.06	0.0039	0.90	2,789	566.00
04-Mar-24 21:00:00	0.18	30.56	53.48	6.22	0.00	5.37	0.25	2.43	0.20	1.26	0.05	100.00	11.658	12.31	0.0108	0.69	10,152	785.55
04-Mar-24 22:00:00	0.28	37.56	44.93	5.48	0.00	8.01	0.20	1.28	0.28	1.91	0.07	100.00	7.556	12.13	0.0062	0.72	6,385	743.99

Shell Polymers LP Flare System GC Hourly Average Mol % Compositions

Date and Time	Elemental Hydrogen % mol	Nitrogen % mol	Methane % mol	Ethane % mol	Acetylene % mol	Ethylene % mol	C3 % mol	C4 % mol	C4 Olefins % mol	C5 % mol	C6+ % mol	Total % mol
04-Mar-24 20:00:00	5.21	58.12	19.06	2.13	0.00	10.90	0.09	3.52	0.16	0.78	0.03	100.00
04-Mar-24 21:00:00	1.83	21.89	66.90	4.15	0.00	3.84	0.11	0.84	0.07	0.35	0.01	100.00
04-Mar-24 22:00:00	2.91	27.89	58.25	3.79	0.00	5.94	0.10	0.46	0.11	0.55	0.02	100.00

Constants

Property	Hydrogen (H2)	Nitrogen (N2)	Methane (CH4)	Ethane (C2H6)	Acetylene (C2H2)	Ethylene (C2H4)	C3	C4	C4 Olefins	C5	C6+
NHV (Btu/scf)	1,212	0	896	1,404	1,477	1,595	2,281	2,968	2,826	3,655	3,655
MW (lb/lb-mol)	2.02	28.01	16.04	26.04	28.05	30.07	44.10	58.12	54.09	72.15	78.11


Attachment B- Method 22 Form

Shell Polymers Monaca
Method 22. Visible Emissions Observation Form SPM-HSE-FO-0003

Observer Name: Semrau
Observer Title: Field Operator
Date and Time (MM/DD/YY XX:XX): 3/4/24 20:45

Sky Conditions: Clear
Precipitation: None
Wind Direction (direction from): E
Wind Speed (m/s): 70.15

[Site MET Data \(Wind Direction 500QT-060A and Speed 500QT-050A\)](#)
Visible Emissions Source: Multipoint Ground Flare (A-59004)
Observation Location: A (MPGF/CVTC)
Observation Picture:



Observations

Begin	Clock Time	Observation Period (when you are actually looking at stack)	Emissions Observed (when you actually see smoke)
3/4/2024 20:45	20:45		20:45:00
			0:00:00
			0:00:00
			0:00:00
			0:00:00
			0:00:00
			0:00:00
			20:50:00
End	3/4/2024 20:50		
Compliant? (Y/N)	N		

General Notes

Total observations totaled 8 minutes and 20 seconds. Smoking event put the flare out of compliance.

