



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

October 7, 2022

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-04-00740A & C Source IDs 201 Ethylene Manufacturing Line and 205 High Pressure (HP) Header System Excess Emissions Malfunction Report – Demethanizer Feed Train Low Temperature Drum Manway Leak

Dear Mr. Gorog,

Shell Chemical Appalachia LLC (“Shell”) is submitting this Malfunction Report to the Pennsylvania Department of Environmental Protection (PADEP) for a vapor leak from the demethanizer feed train (DMFT) low temperature drum 3 (V-14033) which occurred on September 8, 2022, during the start-up of the Ethane Cracking Unit (ECU).

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

On September 8, 2022, when Shell started up the demethanizer in the ECU for the first time, resulting in cold liquid (approximately minus 80 degrees C) entering in the demethanizer feed train low temperature drum 3 (V-14033). A manway flange was observed to be leaking with signs of vapor coming from under the insulation on the low temperature drum 3 (V-14033). Due to the safety concern presented, Operations responded and additional start-up activities of the ECU were paused until the drum could be warmed up, the liquid level in the drum reduced to minimize leakage, and the manway flange inspected. Based on the inspection and discussions regarding the leak repair, it was determined that increased torque on the manway bolts would have a high likelihood of stopping further leakage. The flange bolts were tightened to the new recommended torque values and the manway was determined to be tight. The vessel was put back into service in preparation to continue start-up. During the time from the initial trip and repair of the drum, demethanizer feed was directed to the high-pressure ground flares (HPGF) and high-pressure elevated flare to control the resulting emissions.

Based on the operational conditions experienced in the drum at the time of the leak, the likely cause was determined to be the sudden introduction of the cold process liquid into the drum for the first time. Due to permanent platform access to the manway, safely removing the insulation and applying increased torque to the manway bolts corrected the issue quickly and resulted in minimizing the emissions from this event.

- **Time when the incident was first observed, and duration of excess emissions**
The incident occurred on September 8, 2022, beginning at 2:25 pm, and the flange on the manway was repaired by 11:50 PM on September 8, 2022. The ethylene refrigerant compressor tripped at approximately 10:45 PM beginning a separate event.
- **Estimated rate of excess emissions**
 - The incident resulted in use of the HP elevated flare for approximately 9.5 minutes and with visible emissions from the high-pressure elevated flare for approximately 3 minutes and sporadic brownish visible emissions from the high-pressure ground flare during that period as observed by the flare camera and Method 22 observation.
 - Estimated direct emissions from the manway flange leak:
 - VOC (Ethylene): 0.10 tons
 - C₂H₆ (Ethane): 0.02 tons
 - CH₄: 0.13 tons
 - CO_{2e}: 3.15 tons
 - Estimated excess emissions flared at the HPGFs and HPEF until 10:45 PM when the ethylene refrigerant compressor tripped beginning a separate event. Emission estimates are based on the HP header vent gas flow meter and gas chromatograph composition readings:
 - VOC: 8.53 tons
 - HAP: 0.08 tons
 - NO_x: 2.81 tons
 - CO: 11.57 tons
 - PM₁₀: 0.31 tons
 - PM_{2.5}: 0.31 tons
 - CO_{2e}: 5,151 tons

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
Anna Hensel, District Supervisor