Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

October 11, 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 – Ethylene Refrigeration Compressor Vibration Trip and Cracked Gas Compressor Trip

Dear Mr. Gorog,

Shell Chemical Appalachia LLC ("Shell") is submitting this Malfunction Report to the Pennsylvania Department of Environmental Protection (PADEP) relating to excess emissions to the HP Flares following an attempted restart of the Ethylene Refrigeration Compressor (ERC) on September 10, 2022.

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

- **Nature and cause of the incident**

  On September 10, 2022, Shell attempted to re-start the ERC at approximately 09:26 following the earlier unit shut-down experienced on September 8th. Feed was going into the ECU in accordance with the start-up procedures. The ERC tripped on the high vibration setting while restarting on steam to slowly spin the turbine shaft manually to transition to where the automatic governor takes over to ramp up the turbine to the required speeds. The vibration setting is required to set allowable levels of vibration in the shaft to protect the turbine and compressor from physical damage caused by excess vibration if the set point is exceeded. The ERC trip resulted in the acetylene reactor minimum flow valve (141FC174) closing, cascading into a trip of the upstream Cracked Gas Compressor (CGC). ECU feed was directed to the HP Flare System and to de-inventory systems in the ECU.

  The vibration trip of the ERC was investigated to understand any potential cause or needed revision to start-up procedures even though the ERC had been started on a prior occasion without the elevated vibration trip. An adjustment in the oil accumulator bladder pressure was made to avoid a future trip of the CGC if similar start-up conditions occur with that unit. By the next evening, the unit was ready to proceed with re-starting.

- **Time when the incident was first observed, and duration of excess emissions**
  The incident occurred on September 10, 2022, beginning at 09:26 and concluded when the unit was ready to restart the evening of September 11, 2022 at approximately 22:40.

  Emissions were reduced by quickly trouble shooting the cause of the ECU unit trips, making necessary adjustments to control equipment, and maintaining furnace feed at minimal levels to proceed with restarting the units when ready.

- **Estimated rate of excess emissions**
  - The incident resulted in use of the HP elevated flare for approximately 2 minutes and with visible emissions from the high-pressure elevated flare for approximately 17 seconds**.** Method 22 observation was also completed by environmental staff who was outside at the Control Room when the event occurred.

  - Preliminary estimated excess emissions flared at the HP Flares during this event until the restart of the ethylene refrigeration compressor. Note this estimate does not account for emissions associated with ECU repeated start-up steps to get back to the original ECU start-up progression. Emission estimates are based on the HP header vent gas flow meter and gas chromatograph composition readings:

    - VOC: 22.18 tons
    - HAP: 0.20 tons
    - NOx: 7.41 tons
    - CO: 30.79 tons
    - SO2: 0.0 tons
    - PM10.2.5: 0.81 tons
    - CO2e: 13,669.8 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