



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

January 23, 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 Source IDs 101, 102, 103 Combustion Turbine/Duct Burner Units #1, #2, #3 NOx and CO Emissions Malfunction Report, December 21 - 28, 2022

Dear Mr. Gorog,

Shell Chemical Appalachia LLC (“Shell”) is submitting this incident report to the Pennsylvania Department of Environmental Protection (PADEP).

- **Name and location of the facility**
Shell Polymers Monaca
300 Frankfort Road, Monaca PA, 15061
- **Nature and cause of the incident**
Beginning on December 21 at 12:00AM and continuing intermittently through December 28 at 10:00AM the Combustion Turbines/Duct Burners (Cogen) Units #1, #2, and #3 experienced elevated CO emissions (above 2 ppmvd @ 15% O₂). The direct cause of elevated CO emissions is under investigation but correlates with abnormally low ambient temperatures. The majority of sustained elevated CO emissions was between December 23 and December 26 when ambient temperatures ranged between 1 °F and 20 °F as recorded by the on site meteorological station.

CEMS analyzers were validated with calibration gas direct to analyzer and through the sample system during the event and found no faults. Previous diagnostic testing of the Cogen CO emissions upstream of the CO catalyst had determined the Units to be operating within design specifications. However, testing was not able to be performed upstream of the CO catalyst while also experiencing elevated CO emissions at the stack (above 2 ppmvd @ 15% O₂). Shell intends to contract temporary CEMS to be operated upstream of the CO catalyst during the next predicted low temperature conditions in order to evaluate direct combustion turbine and duct burner CO emissions and engage with turbine and duct burner manufacturer’s for long term corrective actions.

On December 23 at ~1:15PM the Combustion Turbine/Duct Burner (Cogen) Unit #3 SCR Heater A tripped offline and initiated a switch to SCR Heater B. This caused a

temporary interruption to ammonia injection while SCR Heater B increased temperature to its design setpoint. This resulted in elevated NOx emissions (above 2 ppmvd @ 15% O2) while the heater was switched and ammonia injection restored.

Cause of the trip was determined to be freezing due to a sudden ambient temperature drop down to ~2 °F at the time of trip. SCR Heater A was restored at 5:00PM on the same day and has operated successfully since this time. Sitewide winterization procedures and techniques are under evaluation for improvements.

On December 24 at ~11:38AM the Cogen Unit #2 lost boiler feed water and tripped offline. A hot restart was initiated at ~2:07PM. This was considered an abnormal startup due to the circumstances of the trip and restart. Following the startup sequence recommended by Amec Foster Wheeler, the Unit was restarted slowly and maintained at a lower load for a longer period of time than a normal restart. A Unit under low load operates in lean-lean primary firing mode for a more stable operating condition. This resulted in elevated NOx emissions (above 2 ppmvd @ 15% O2) while the restart procedure was followed, Unit load increased, and the combustion turbine was able to be placed into low-NOx premix steady state firing.

Cause of the loss of boiler feedwater was sustained abnormally low temperatures, and cause of operation in low load lean-lean primary firing was following the manufacturer recommendations for a stable startup. Operations followed startup procedures and were able to return to full load operation by ~3:25PM. Sitewide winterization procedures and techniques are under evaluation for improvements to Unit stability.

On December 24 at ~5:50AM the Cogen Unit #1 lost boiler feed water and tripped offline. A cold restart was initiated on December 25 at ~7:50AM. This was considered an abnormal startup due to the circumstances of the trip and restart. Following the startup sequence recommended by Amec Foster Wheeler, the Unit was restarted slowly and maintained at a lower load for a longer period of time than a normal restart. A Unit under low load operates in lean-lean primary firing mode for a more stable operating condition. Additionally, the ammonia vaporizer experienced temperature fluctuations and instability during the restart. This resulted in elevated NOx emissions (above 2 ppmvd @ 15% O2) while the restart procedure was followed, Unit load increased, the combustion turbine was able to be placed into low-NOx premix steady state firing, and ammonia vaporizer temperatures were stabilized.

Cause of the loss of boiler feedwater and ammonia vaporizer temperature instability was sustained abnormally low temperatures, and cause of operation in low load lean-lean primary firing was following the manufacturer recommendations for a stable startup. Operations followed startup procedures and were able to return to full load operation by ~11:00AM. Operations took manual control of the ammonia system to balance ammonia injection against the vaporizer outlet temperature to maintain operation and not trip the SCR. Sitewide winterization procedures and techniques are under evaluation for improvements to Unit stability.

- **Time when the incident was first observed, and duration of excess emissions**
December 21 at 12:00AM through December 28 at 10:00AM

Source ID	Name	NOx Duration (hrs)	CO Duration (hrs)
101	Combustion Turbine/Duct Burner Unit #1	3	65
102	Combustion Turbine/Duct Burner Unit #2	1	50
103	Combustion Turbine/Duct Burner Unit #3	5	6

- **Estimated rate of excess emissions^a**

Source ID	Name	NOx (lbs)	NOx (tons)	CO (lbs)	CO (tons)
101	Combustion Turbine/Duct Burner Unit #1	50.5	0.03	198.8	0.10
102	Combustion Turbine/Duct Burner Unit #2	10.4	0.01	147.6	0.07
103	Combustion Turbine/Duct Burner Unit #3	45.7	0.02	41.5	0.02
Total		106.6	0.05	387.9	0.19

^a Mass emissions in excess of 2 ppmvd @ 15% O2 applicable limit

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