Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

January 17, 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 Ethane Cracking Furnace #3 (Source ID 033) NOx 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 excess emissions from Ethane Cracking Furnace #3 on December 18, 2023.

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 December 18, 2023, beginning at 06:00, Ethane Cracking Furnace #3 stack's NOx emissions exceeded the permit limit of 6.20 lb/hr while in warm hot steam standby for approximately 1 hour.

  The cause of the NOx mass emissions exceedance was determined to be a temporary loss of ammonia injection.

- **Time when the malfunction or breakdown was first observed**
  December 18, at 06:16

- **The date and time that the malfunction started and ended**
  Started on December 18, 2023, at 06:16 and ended on December 18, at 07:12

- **An estimate of the emissions associated with the malfunction**
  7.766 lb of excess NOx emissions over the duration of the event

- **The calculations that were used to determine that quantity**
  The calculation is based on the ECU Furnace 3 CEMs analyzer readings over the period of the malfunction window.

  NOx (mass) excess emissions were calculated as follows: (Sum NOx lb/hr emission rates for 06:00

hour exceeding 6.20 lb/hr) minus (NOx permit limit of 6.20 lb/hr).

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

  Once the zero flow condition of the ammonia injection system was discovered, the ECU Console Operator restored the ammonia flow to bring the NOx back under control below the 6.2 lb/hr limit and communicated with Shell's Process Automation, Control and Optimization team to investigate the loss of communications. A firewall issue was identified as the root cause of the loss of communications. This issue was resolved and the communications were restored. Proper response and functionality of the controls during a daily validation were verified.

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

  Following the event, the cause of the Furnace 3 NOx control system malfunction was investigated by the process control team and found to be related to loss of communications associated with execution of the ECU Furnace 7 CEMS PLC upgrade project. A firewall issue was identified as the root cause of the loss of communications. This issue was resolved and the communications were restored. Proper response and functionality of the controls is checked through a daily validation of the analyzers. The findings and learnings were logged by the project team to protect against repeat events during the remaining PLC upgrades in Furnaces (1 through 6) where there will be a step to check and restore the communications with the other CEMS analyzers, so the ammonia dosing control does not stop working.

- **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. Immediate: Instrumentation and Analyzer (I&A) team restored lost daily validation signal communications with Furnace CEMs analyzers for the remaining ECU Furnaces CEMs PLCs upgrade executions. CEMS PLC Upgrade project team has improved awareness and is performing enhanced monitoring during installation activities.

  2. Long Term: Shell's Process Automation, Control and Optimization team has identified that NOx control raw signals are affected by loss of communications and that can be improved by a more robust approach such as hardwiring them to the DCS (Distributed Control System) which provides a more reliable connection than soft communications protocols and that will be incorporated into the future ECU Furnaces Retube Plan strategy Opportunity.

- **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**

  No follow-up report is anticipated.

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

  Corrective action to restore lost daily validation signal communications with ECU Furnace CEMs analyzers is complete. Remaining PLCs upgrade executions are to be carried out during the weeks of March 4, and March 11, 2024, with communications monitored and restored as part of the planned project. Long term measures are in development and to be determined.

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

Sincerely,

Kimberly Kaal

Digitally signed by Kimberly Kaal
DN: cn=Kimberly Kaal
Date: 2024.01.17 16:16:50 -05'00'

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

Furnace #3 NOx mass Excess Emissions, lb/h

Data Summary Report

Company: Pennsylvania Chemicals
300 Frankfort Road
Monaca, PA 15061

Source:

Data Group: F3>1-Hr Calcs

Report Name: F3 NOx 1hr validation

Start of Report: 12/18/2023 00:00 **End of Report:** 12/18/2023 18:00 **Validation:** All Available Data

Group#-Channel#	G95-C24
Long Descrip.	3>NOx Mas
Short Descrip.	NOx Mass
Units	lb/hr
Range	0-1000

12/18/2023 00:00	3.587
12/18/2023 01:00	3.580
12/18/2023 02:00	3.578
12/18/2023 03:00	3.569
12/18/2023 04:00	3.574
12/18/2023 05:00	3.590
12/18/2023 06:00	13.966 <
12/18/2023 07:00	5.443
12/18/2023 08:00	3.572
12/18/2023 09:00	3.594
12/18/2023 10:00	3.586
12/18/2023 11:00	3.545
12/18/2023 12:00	3.538
12/18/2023 13:00	3.548
12/18/2023 14:00	3.590
12/18/2023 15:00	3.581
12/18/2023 16:00	3.574
12/18/2023 17:00	3.546
12/18/2023 18:00	3.557

Group#-Channel#	G95-C24
Long Descrip.	3>NOx Mas
Short Descrip.	NOx Mass
Units	lb/hr
Range	0-1000

Period Average=	4.217
Period Max Value=	13.966
Period Min Value=	3.538
Period Totals=	8.0118E+1
Period%Recovery=	100.0