



Shell Chemical Appalachia LLC
300 Frankfort Rd
Monaca, PA 15061

April 11, 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 March 18, 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 18, 2024, beginning at 15:00, Ethane Cracking Furnace #3 stack’s NOx emissions exceeded the permit limit of 31.1 lb/hr during the transition from Startup mode to 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**

March 18, 2024 at 15:16

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

Started on March 17, 2024, at 10:30 and ended on March 18, 2024, at 15:59.

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

0.964 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 15:00

hour exceeding 31.1 lb/hr) minus (NOx permit limit of 31.1 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 low 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 31.1 lb/hr limit and communicated with Shell's Process Automation, Control and Optimization team to investigate the loss of ammonia injection.

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

On March 17, 2024, 23:30 while Furnace 3 was operating in Normal mode it tripped to "Pilot Burner Stand By" due to a failed fuel gas valve. During the time required for the valve repair, the furnace cooled down to 350 °C coil outlet temperature (COT) and that switched the furnace from Normal mode to Startup mode. On March 18, 2024, after the fuel gas valve repair was completed, the ECU Console Operator reintroduced fuel gas and began bringing the furnace temperature back up to switch Furnace 3 from Startup to Hot Steam Standby mode. The ammonia master flow controller started to increase ammonia flow to the furnace but the furnace convection section temperature was too low and did not reach the required permissive temperature for opening the inlet switch valve 103KSV-201. This prevented ammonia from actually being injected into the Furnace 3 flue gas before exceeding the Startup NOx limit of 31.1 lb/hr.

- **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**

ECU Operations established an updated Standard Operating Procedure (SOP) with instructions that if any furnace is tripped to Pilot Burner Stand By while in Normal mode the ECU Operators need to switch the furnace over to routing steam to the fire box instead of the quench tower. This will increase the volume of flue gas allowing the 10xKSV-201 (x=1 to 7) permissive temperature to be satisfied prior to the furnace Mode switching to Hot Steam Standby.

- **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 is final to eliminate the risk of subsequent NOx exceedances due to this cause. ECU Operators are trained to execute SOP "F10x01-Furnace-Hot Steam Standby in the Quench Tower to HSSB to the Firebox" when a furnace trips to Pilot Burner Stand By from Normal mode. The procedure was effective since April 5, 2024.

April 10, 2024

If you have any questions regarding this matter, please contact me at william.watson@shell.com

Sincerely,

A handwritten signature in black ink, appearing to read 'W. Watson', written in a cursive style.

William Watson
Operations Manager

CC:

Scott Beaudway, Air Quality Specialist
Beth Speicher, Environmental Group Manager

Attachment A

Furnace #3 NOx mass Excess Emissions, lb/h

Data Summary Report

Company: Pennsylvania Chemicals
300 Frankfort Road
Monaca, PA 15061

Data Group: F3>1-Hr Calcs

Report Name: No Title

Start of Report: 03/18/2024 00:00

End of Report: 03/18/2024 23:59

Validation: All Available Data

Group#-Channel#	G95-C23	G95-C24	G95-C45
Long Descrip.	3>NOx Rat	3>NOx Mas	3>Oper Mo
Short Descrip.	NOx Rate	NOx Mass	OperMode
Units	lb/mmBtu	lb/hr	Value
Range	0-2	0-1000	0-10
03/18/2024 00:00	0.000 d	0.000 d	0
03/18/2024 01:00	0.090	0.202	8
03/18/2024 02:00	0.160	1.856	8
03/18/2024 03:00	0.067	0.269	8
03/18/2024 04:00	0.061	0.261	8
03/18/2024 05:00	0.157	0.633	7
03/18/2024 06:00	0.184	0.739	7
03/18/2024 07:00	0.212	0.851	7
03/18/2024 08:00	0.257	1.032	7
03/18/2024 09:00	0.264	1.060	7
03/18/2024 10:00	0.252	7.088	8
03/18/2024 11:00	0.269	15.047	1
03/18/2024 12:00	0.287	18.736	1
03/18/2024 13:00	0.312	22.355	1
03/18/2024 14:00	0.344	27.326	1
03/18/2024 15:00	0.358	32.064	1
03/18/2024 16:00	0.030	2.972	2
03/18/2024 17:00	0.016	1.567	2
03/18/2024 18:00	0.032	3.206	2
03/18/2024 19:00	0.032	3.245	2
03/18/2024 20:00	0.031	3.139	2
03/18/2024 21:00	0.012	1.265	5
03/18/2024 22:00	0.013	2.076	2
03/18/2024 23:00	0.027	3.835	2
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Period Average =	0.151	6.558	4
Period Max Value =	0.358	32.064	8
Period Min Value =	0.012	0.202	1
Period Totals =	3.4670E+0	1.5082E+2	9.9000E+1
Period % Recovery=	100.0	100.0	100.0
