Division of Air Quality

May 12, 2020

MEMORANDUM

To: Heather Carter, Fayetteville Regional Supervisor

From: Gary L. Saunders, Stationary Source Compliance Branch Supervisor

Subject: The Chemours Company – Fayetteville Works
Fayetteville, Bladen County, North Carolina
Facility ID. No. 0900009, Permit No. 03735T47
Performance Testing for Destruction Removal Efficiency of the Thermal Oxidizer on February 28-29, 2020 by Weston Solutions, Inc.
Tracking No. 2020-105ST

Summary

On February 28 and 29, 2020, the Chemours Fayetteville Works conducted performance testing on the Thermal Oxidizer (TO) system installed to destroy fluorinated compounds produced and released from production areas at the site. The purpose of the performance testing was to demonstrate compliance with the 99.99% control (destruction) of the fluorinated compound emissions required by a Consent Order signed and filed with the Bladen County Superior Court on February 25, 2019. The facility's air emissions permit also requires 99.99% control through the TO system.

Gases from the monomers and polymers areas of the Chemours Fayetteville Works are conveyed through separate vent systems to the TO for thermal destruction and control. After introduction into the thermal oxidizer through the separate systems, the fluorinated organic compounds are thermally decomposed in the high temperature zone of the TO and converted to inorganic hydrogen fluoride (HF). The gases from the TO are then quenched with a liquid hydrofluoric acid stream. The HF rich gas stream passes through a multi-stage packed bed scrubber for absorption of HF before being exhausted from the TO stack. The HF captured by the scrubber system is neutralized by a slaked lime (calcium hydroxide) system to produce a calcium fluoride (CaF2) solid material that is filtered, recovered, and currently shipped to an out-of-state landfill.

Performance Test Methods

Two emission test methods were used to measure a number of specific fluorinated compounds. These include the initial compound of concern noted as GenX (HFPO C3 Dimer Acid) and other compounds that can be captured and measured by the test methods developed since late 2017. The control of this suite of fluorinated compounds are a representation (surrogate) for all fluorinated compounds that are being fed to the TO.

The original test method developed for sampling HFPO C3 Dimer Acid was a modified SW-843 Method 0010. This test method has been used to measure HFPO C3 Dimer Acid and HFPO C3 Dimer Acid Fluoride emissions from various processes and process areas. However, over the past two years, it was determined that the Method 0010 was not suitable for higher concentrations of these two compounds that would be expected at the TO inlet. The second method was a modified Method 18 dry-ice chilled methanol impinger method. The temperature of this chilled impinger method is sufficiently low to condense certain vapor phase fluorinated compounds into liquid in the impingers as well as capturing any semi-volatile fluorinated organic compound. This method works by allowing those fluorinated compounds to react with the methanol in order to produce extractable and measurable derivative fluorinated compounds that can be related back to original compounds entering the sampling system. Although the method was originally developed to capture and quantify hexafluoro propylene oxide (HFPO) emissions, it was determined that it would be a suitable method for certain other fluorinated compounds of interest in a limited suite of target compounds. Through the testing program since 2018, it was also determined that this method was better suited to measuring higher concentrations of HFPO C3 Dimer Acid and Dimer Acid Fluoride than the Method 0010.

The inlet stream from the monomers and polymers areas were both sampled using the modified Method 18 sampling systems. These are single point proportional sampling methods where the sample was extracted from permanent single point probes inserted into each gas stream. The outlet from the TO and scrubber control system was sampled using both the modified method 18 (for target compounds other than the HFPO C3 Dimer Acid) and the modified Method 0010 (for HFPO C3 Dimer Acid). Since the outlet emission rates were expected to be very low, the minimum sample times and sample volumes of the modified Method 0010 of the original method (3-hours sample time per run and 3.0 cubic meters of sample volume per run) were used to increase the sensitivity of the method. The modified Method 0010 was operated as a standard multi-point traverse, isokinetic sample train while the modified Method 18 was operated as a single point proportional flow train during the testing. All test runs were observed by NC DAQ personnel over the two-day testing period.

Sampling Results

The sample train results for each location are shown in the following tables. A review of the test results indicated that there were no issues associated with the sampling and analysis and that QA/QC data quality objectives appear to have been met during the testing and laboratory analysis.

It should be noted that analytical results for the outlet of the TO/scrubber combination were non-detectable by the analytical method for modified Method 18. The results from the Method 0010 for the HFPO C3 Dimer Acid were above detection threshold for the method and several orders of magnitude lower than observed in prior testing under the previous control technologies. Therefore, the results from the outlet testing and analytical methods are shown as being less than the method detection level (MDL) and the MDL value is used in the mathematical calculation for the destruction removal efficiency as if the non-detectable value was just below the MDL. This is the most conservative approach for handling non-detect values from the sampling and analytical process. Non-detects at the inlet are not included in the calculation and represent a more conservative calculation approach in determining the performance of the TO system.

Table 1. Summary of Monomer Inlet Test MM18 Target Compounds

Pollutant	Run 1 (lb/hr)	Run 2 (lb/hr)	Run 3 (lb/hr)
HFPO-DAF	<1.97E-01	<3.68E-01	<6.71E-02
HFPO Monomer	2.54E+00	1.60E+00	1.57E+00
HFPO-DA	3.22E-03	7.24E-03	7.25E-03
Fluoroether E-1	<2.04E-01	<2.63E-02	<6.95E-02
Carbonyl Fluoride	8.80E+01	6.39E+01	7.55E+01

Table 2. Summary of Polymer Inlet Test MM18 Target Compounds

Pollutant	Run 1 (lb/hr)	Run 2 (lb/hr)	Run 3 (lb/hr)
HFPO-DAF	8.09E-04	<2.18E-04	4.10E-04
HFPO Monomer	<3.35E-04	<3.47E-04	<2.62E-04
HFPO-DA	1.51E-04	1.29E-04	1.72E-04
Fluoroether E-1	2.65E-03	4.81E-04	2.04E-03
Carbonyl Fluoride	<1.13E-03	<1.17E-03	<8.76E-04

Table 3. Summary of TO Stack Test MM18 and MM0010 Target Compounds

Pollutant	Run 1 (lb/hr)	Run 2 (lb/hr)	Run 3 (lb/hr)
HFPO-DAF	<3.88E-05	<4.80E-05	<3.22E-05
HFPO Monomer	<1.75E-06	<2.18E-06	<1.46-06
HFPO-DA	1.20E-06*	9.60E-07*	6.90E-07*
Fluoroether E-1	<2.01E-06	<2.49E-06	<1.67E-06
Carbonyl Fluoride	<1.18E-04	<1.46E-04	<9.79E-05

*Results from Modified Method 0010

Table 4. Summary of TO Stack Results for Destruction Removal Efficiency (DRE)

	Inlet	Stack	Control Efficiency
	Lb/hr	Lb/hr	%
Run 1	9.06E+01	≤1.62E-04	≥99.99982
Run 2	7.83E+01	≤2.00E-04	≥99.99974
Run 3	9.55E+01	≤1.34E-04	≥99.99986
Average	8.81E+01	≤1.65E-04	≥99.99981

During the test runs, the thermal oxidizer was held at a nominal 1050°C while the processes in the HFPO VEN, VES, and polymers areas operated in normal representative modes for their areas. During the test, VES was producing perfluoro methyl vinyl ether (PMVE) and perfluoro ethyl vinyl ether (PEVE), VEN was producing perfluoro sulfonyl ethoxy propyl vinyl ether (PSEPVE). The polymers production area was producing the polymer designated as SR. As a practical matter, each area can operate more or less independently of the other, but all were placed in operation during the performance test to provide the maximal load to the TO and scrubber system.

Summary and Conclusions

NC DAQ staff members were on site during each day that source testing occurred. DAQ staff observed the source test teams, the sample recovery and the process operations. Based upon the onsite observation of the testing and review of the test report, NC DAQ concludes that the testing was conducted in accordance to the modified testing protocol submitted by Chemours and that the analytical results appear representative of the stack conditions and process operations during the testing.

In summary, as shown in Table 4, the test results indicate that the TO and associated scrubber system have met the minimum requirements specified in the Consent Order (99.99%) as well as the requirements in the Title V permit. If you have any questions concerning these results, please feel free to contact me at gary.saunders@ncdenr.gov or at (919) 707-8413.

Cc: Central Files – Bladen County
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