Division of Air Quality

April 6, 2018

MEMORANDUM

To: Mike Abraczinskas, Director
Heather Carter, Fayetteville Regional Supervisor

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

Subject: The Chemours Company – Fayetteville Works
Fayetteville, Bladen County, North Carolina
Facility ID. No. 0900009, Permit No. 03735T43
Performance Testing for HFPO Dimer Acid (GenX) Conducted on January 22-25, 2018 at Vinyl Ethers North (Division Stack) and Polymer Processing Aid (PPA) Stacks by Weston Solutions, Inc.
Tracking No. 2018-083ST

Summary of GenX Test Program

Sources Tested

During the week of January 22, 2018, emissions testing was conducted on two process area stacks. The first series of test runs was conducted on the Division Stack located at the Vinyl Ethers North (VEN) process area. The Division Stack is a common stack through which emissions from VEN Waste Gas Scrubber (WGS) are combined with fugitive emissions collected from the enclosed areas of VEN (sometimes referred to as "room air"). Gases from various reaction vessels and unit operations in the hexafluoropropylene oxide (HFPO) and VEN processes are vented through the WGS, a caustic scrubber which reduces emissions of GenX (HFPO Dimer Acid) and its precursors (HFPO Dimer Acid Fluoride). During the testing, the HFPO process was operating and the VEN process was producing perfluoropropyl vinyl ether (PPVE).

The second process area tested was the Polymer Processing Aid (PPA) area. HFPO Dimer Acid Fluoride (HFPO DAF) produced in the VEN process is used to produce HFPO dimer acid (also known as GenX). There are a number of products that may be produced at PPA depending upon the raw materials and the final product needs. Process gases pass through the PPA scrubber which is a pH controlled packed bed scrubber. Fugitive emissions from enclosed areas of the PPA process (i.e., room air) are also vented through the PPA stack though, similar to the Division Stack at VEN, it does not pass through the scrubber.

Sampling Method

Testing was conducted using a modified EPA Method 0010 found in the SW-846 compendium of *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*. This sampling train is a variation of the EPA Reference Method 5 found in 40 CFR 60, Appendix A. The Method 0010 train extracts a sample isokinetically from the gas stream, passes the sample through a temperature-controlled filter, through a temperature-controlled condenser and into a series of XAD-2 resin "traps" and impingers to capture and

collect the materials that passed through the filter. The test method is designed to capture certain particulate and condensable materials for later recovery and analysis.

After sample recovery, the samples were sent to Chemours' contractor, Test America's laboratory in Denver, Colorado. GenX was extracted from the resin traps. The DAQ required split samples after extraction to be submitted to the DAQ for independent analysis. The split samples were sent to the EPA laboratory in Athens, Georgia. This summary of results only addresses the results provided by Test America for Chemours. Laboratory analysis and quantification was performed using a liquid chromatography column and a dual mass spectrometer (LC/MS/MS).

Preliminary "Shakedown" Tests

Since this was the first time that GenX had ever been measured from a Chemours stack, the facility proposed a series of preliminary or "shakedown" tests to determine if the testing and analytical procedures worked acceptably and to make modifications to test procedures to address any issues before actual testing began on all identified sources of GenX and HFPO DAF.

GenX preliminary testing was conducted during the week of January 9, 2018. The testing revealed that several modifications were needed with regard to stack access on the Division Stack and sampling and analysis procedures for quantification of the GenX at both VEN and PPA.

During analysis of the sample from the preliminary test, it was found that the concentration of GenX in the recovered sample was higher than initially anticipated. The higher concentrations required higher dilution rates on some samples to bring the target analytes into the proper calibration range of the instrumentation. A sampling time of 90-minutes per run was set as a way to reduce the total sample while still assuring that certain batch cycle characteristics were sampled in each process area. The test results discussed in this review reflect the 90-minute sampling run time.

Test Results

The reported GenX test results reflect corrected emission rates accounting for dilution and spike recovery values. Although presented on a per run basis, average emission rates are presented as the average of three runs per method procedures. Run to run emissions indicate the need for additional testing and source emissions characterization.

Division Stack/Vinyl Ethers North Test Results

GenX emissions testing of the Division Stack was conducted on January 22 (Run 1) and 23 (Runs 2 and 3), 2018 while producing PPVE. Production operations were considered normal and representative during the sampling runs. Each sampling run was 90 minutes in length. The emission rate is the combination of the process gases through the scrubber and the room air emissions because of the current stack configuration. The sample analysis data indicated the sampling train captured most of GenX before the second XAD-2 trap. The per run emission rate and average for all three runs is displayed in the table below.

Table 1. Summary of Division Stack Test Results

Test Method	Run Number	GenX Emission Rate	
		lb/hr	g/sec
Modified Method 0010	1	0.246	0.0310
	2	0.404	0.0509
	3	0.238	0.0300
	Average	0.296	0.0373

PPA Area Test Results

GenX emissions testing of the PPA Area Stack was conducted on January 24 (Runs 1 and 2) and 25 (Run 3), 2018 while the PPA process was producing GenX. Each sampling run was 90 minutes in length. The emission rate is the combination of the process gases through the scrubber and the room air emissions. An additional run was conducted to measure GenX from the room air portion of the effluent. The sample analysis data indicated the sampling train captured most of GenX before the second XAD-2 trap. The per run emission rate and average for all three runs is displayed in the table below.

Table 2. Summary of PPA Area Test Results

Test Method	Run Number	GenX Emission Rate	
		lb/hr	g/sec
Modified Method 0010	1	0.0258	0.00325
	2	0.715	0.0900
	3	0.0252	0.00317
	Average	0.2553	0.03214
	Room Air Test Run	0.0058	0.00073

As shown in Table 2, the reported emissions from Run 2, are higher than the emissions from Runs 1 and 3. The test report from Chemours indicates that Run 2 was conducted under different process conditions. However, NC DAQ's assessment is that the operations and emissions captured by Run 2 represent routine and normal operations for this process and there were no upsets or malfunction conditions that should void consideration of the run. Rather, the operations that were measured during the test are characteristic of normal unit operations that include batch operations. NC DAQ required that emissions testing be conducted such that emissions from both continuous and batch operations

were captured and characterized and believes that this test (including all three runs) met this requirement. Therefore, the average emission rate presented in Table 2 is from all 3 runs.

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. DAQ required Chemours to develop test and analysis methodology within less than a four-month window. The test methodology is still under review for accuracy and appropriateness at all Chemours sources. 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. The test results indicate that additional testing of the PPA area stack may be needed to further characterize the emissions profile during normal operations of the process. Additional PPA tests were conducted during the week of February 26, 2018 and will be reviewed separately.

Cc: Central Files – Bladen County
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