FLUOROMONOMERS
MANUFACTURING PROCESS
VINYL ETHERS NORTH CARBON BED
REMOVAL EFFICIENCY AND
DIVISION STACK EMISSIONS TEST REPORT
TEST DATES: 17 AND 18 APRIL 2019

THE CHEMOURS COMPANY
FAYETTEVILLE, NORTH CAROLINA

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1. INTRODUCTION

1.1 FACILITY AND BACKGROUND INFORMATION

The Chemours Fayetteville Works (Chemours) is located in Bladen County, North Carolina, approximately 10 miles south of the city of Fayetteville. Chemours operating areas on the site include the Fluoromonomers, IXM and Polymers Processing Aid (PPA) manufacturing areas, Wastewater Treatment, and Powerhouse.

Chemours contracted Weston Solutions, Inc. (Weston) to perform HFPO Dimer Acid Fluoride, captured as HFPO Dimer Acid, emission testing on the Vinyl Ethers North (VEN) Carbon Bed and Division stack at the facility. Testing was performed on 17 and 18 April 2019 and generally followed the "Emission Test Protocol" reviewed and approved by the North Carolina Department of Environmental Quality (NCDEQ). This report provides the results from the emission test program.

1.2 TEST OBJECTIVES

The specific objectives for this test program were as follows:

- Measure the emissions concentrations and mass emissions rates of HFPO Dimer Acid Fluoride from the Carbon Bed inlet and outlet and Division stack which are located in the Fluoromonomers process area.
- Calculate the Carbon Bed removal efficiency for HFPO Dimer Acid.
- Monitor and record process and emissions control data in conjunction with the test program.
- Provide representative emissions data.

1.3 TEST PROGRAM OVERVIEW

During the emissions test program, the concentrations and mass emissions rates of HFPO Dimer Acid were measured at three locations.

Tables 1-1 and 1-2 provide a summary of the test locations and the parameters that were measured along with the sampling/analytical procedures that were followed.

Section 2 provides a summary of test results. A description of the processes is provided in Section 3. Section 4 provides a description of the test locations. The sampling and analytical procedures are provided in Section 5. Detailed test results and discussion are provided in Section 6.

Appendix C includes the summary reports for the laboratory analytical results. The full laboratory data packages are provided in electronic format and on CD with each hard copy.

Table 1-1
Sampling Plan for VEN Carbon Bed Testing

Sampling Point & Location	**VEN Carbon Bed**				
Number of Tests:	6 (3 Carbon Bed inlet, 3 Carbon Bed outlet)				
Parameters To Be Tested:	HFPO Dimer Acid (HFPO-DA)	Volumetric Flow Rate and Gas Velocity	Carbon Dioxide	Oxygen	Water Content
Sampling or Monitoring Method	EPA M-0010	EPA M1, M2, M3A, and M4 in conjunction with M-0010 tests	EPA M3/3A		EPA M4 in conjunction with M-0010 tests
Sample Extraction/ Analysis Method(s):	LC/MS/MS	NA[6]	NA		NA
Sample Size	$\geq 1.5 m^3$	NA	NA	NA	NA
Total Number of Samples Collected[1]	6	6	3	3	6
Reagent Blanks (Solvents, Resins)[1]	1 set	0	0	0	0
Field Blank Trains[1]	1 per source	0	0	0	0
Proof Blanks[1]	1 per train	0	0	0	0
Trip Blanks[1,2]	1 set	0	0	0	
Lab Blanks	1 per fraction[3]	0	0	0	0
Laboratory or Batch Control Spike Samples (LCS)	1 per fraction[3]	0	0	0	0
Laboratory or Batch Control Spike Sample Duplicate (LCSD)	1 per fraction[3]	0	0	0	0
Media Blanks	1 set[4]	0	0	0	0
Isotope Dilution Internal Standard Spikes	Each sample	0	0	0	0
Total No. of Samples	10[5]	6	3	3	6

Key:

[1] Sample collected in field.

[2] Trip blanks include one XAD-2 resin module and one methanol sample per sample shipment.

[3] Lab blank and LCS/LCSD includes one set per analytical fraction (front half, back half and condensate).

[4] One set of media blank archived at laboratory at media preparation.

[5] Actual number of samples collected in field.

[6] Not applicable.

Table 1-2
Sampling Plan for Division Stack

Sampling Point & Location	**Division Stack**				
Number of Tests:	3 (3 Division Stack)				
Parameters To Be Tested:	HFPO Dimer Acid (HFPO-DA)	Volumetric Flow Rate and Gas Velocity	Carbon Dioxide	Oxygen	Water Content
Sampling or Monitoring Method	EPA M-0010	EPA M1, M2, M3A, and M4 in conjunction with M-0010 tests	EPA M3/3A		EPA M4 in conjunction with M-0010 tests
Sample Extraction/ Analysis Method(s):	LC/MS/MS	NA[6]	NA		NA
Sample Size	≥ 1.5m^3	NA	NA	NA	NA
Total Number of Samples Collected[1]	3	3	3	3	3
Reagent Blanks (Solvents, Resins)[1]	0 sets	0	0	0	0
Field Blank Trains[1]	0 per source	0	0	0	0
Proof Blanks[1]	0 per train	0	0	0	0
Trip Blanks[1,2]	0 sets	0	0	0	0
Lab Blanks	1 per fraction[3]	0	0	0	0
Laboratory or Batch Control Spike Samples (LCS)	1 per fraction[3]	0	0	0	0
Laboratory or Batch Control Spike Sample Duplicate (LCSD)	1 per fraction[3]	0	0	0	0
Media Blanks	1 set[4]	0	0	0	0
Isotope Dilution Internal Standard Spikes	Each sample	0	0	0	0
Total No. of Samples	3[5]	3	3	3	3

Key:

[1] Sample collected in field.

[2] Trip blanks include one XAD-2 resin module and one methanol sample per sample shipment.

[3] Lab blank and LCS/LCSD includes one set per analytical fraction (front half, back half and condensate).

[4] One set of media blank archived at laboratory at media preparation.

[5] Actual number of samples collected in field.

[6] Not applicable.

2. SUMMARY OF TEST RESULTS

A total of three test runs each were performed on the VEN Carbon Bed inlet and outlet and Division stack. Table 2-1 provides a summary of the HFPO Dimer Acid emissions test results and Carbon Bed removal efficiencies. Detailed test results summaries are provided in Section 6.

It is important to note that emphasis is being placed on the characterization of the emissions based on the stack test results. Research conducted in developing the protocol for stack testing HFPO Dimer Acid Fluoride, HFPO Dimer Acid Ammonium Salt and HFPO Dimer Acid realized that the resulting testing, including collection of the air samples and extraction of the various fraction of the sampling train, would result in all three compounds being expressed as simply the HFPO Dimer Acid. However, it should be understood that the total HFPO Dimer Acid results provided in Table 2-1 and in this report include a percentage of each of the three compounds.

Table 2-1
Summary of HFPO Dimer Acid VEN Carbon Bed and Division Stack Test Results

	Inlet		Outlet		Removal Efficiency	Division Stack	
	g/sec	lb/hr	g/sec	lb/hr	%	g/sec	lb/hr
R1	8.67E-04	6.89E-03	2.63E-04	2.09E-03	69.7	5.72E-04	4.55E-03
R2	2.49E-03	1.98E-02	2.51E-04	1.99E-03	90.0	1.85E-04	1.47E-03
R3	5.97E-04	4.74E-03	4.31E-04	3.42E-03	27.9	5.34E-04	4.24E-03
Average	1.32E-03	1.05E-02	3.15E-04	2.50E-03	62.5	4.31E-04	3.42E-03

3. PROCESS DESCRIPTIONS

The Fluoromonomers area is included in the scope of this test program.

3.1 FLUOROMONOMERS

These facilities produce a family of fluorocarbon compounds used to produce Chemours products such as Nafion®, Krytox®, and Viton®, as well as sales to outside customers.

Process emissions are vented to the Division waste gas scrubber system (which includes the secondary scrubber) and vents to the Carbon Bed and then onto the Division Stack. The VE North building air systems are vented to the Carbon Bed and then onto the Division Stack.

3.2 PROCESS OPERATIONS AND PARAMETERS

The following table is a summary of the operation and products from the specific areas tested.

Source	Operation/Product	Batch or Continuous
VE North	PSEPVE	Condensation is continuous. Agitated Bed Reactor and Refining are batch.

During the test program, the following parameters were monitored by Chemours and are included in Appendix A.

- Fluoromonomers Process
  - VEN Precurser Rate
  - VEN Condensation Rate
  - VEN ABR Rate

4. DESCRIPTION OF TEST LOCATIONS

4.1 DIVISION STACK

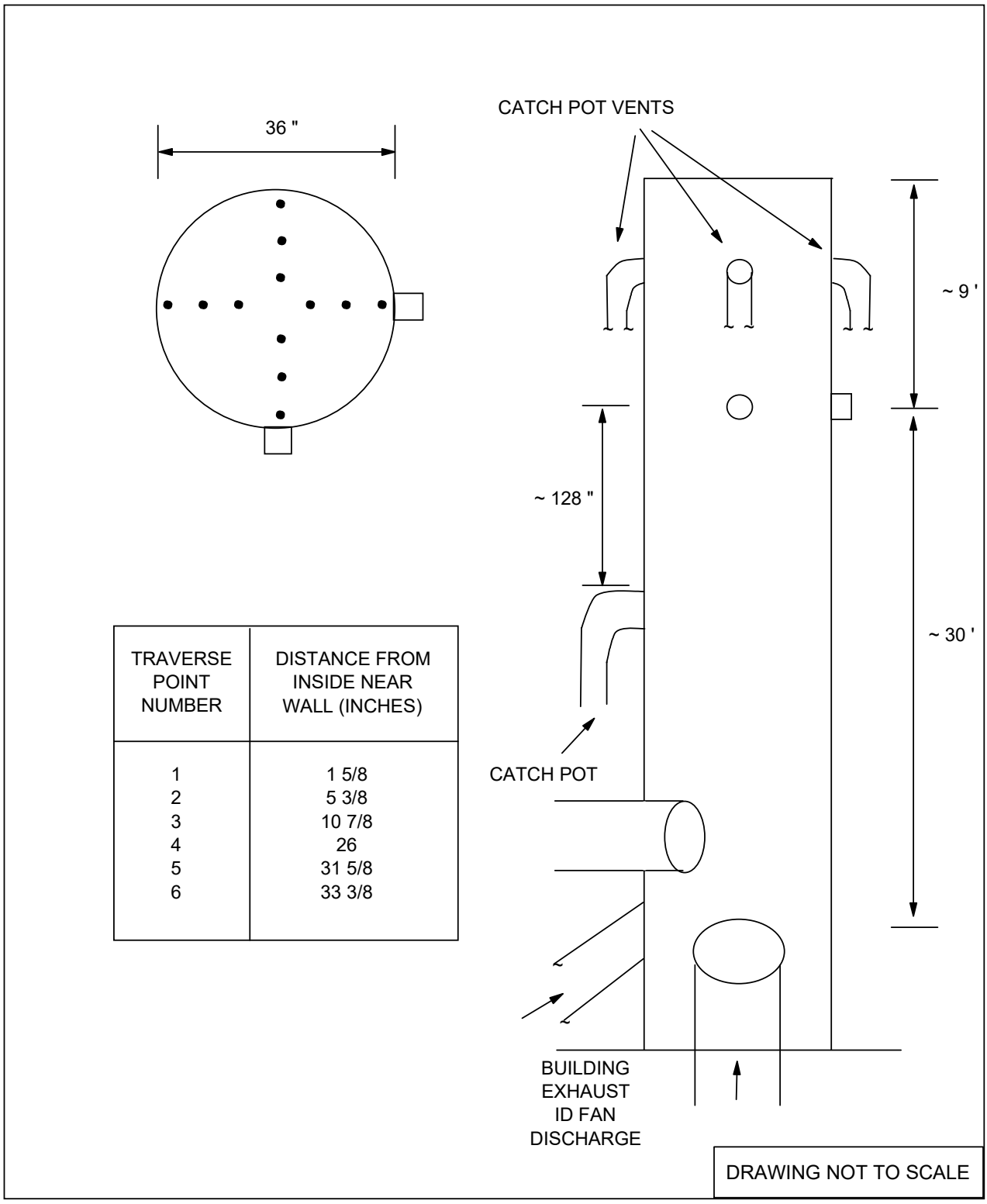
Two 6-inch ID test ports were installed on the 36-inch ID fiberglass stack as shown below. The four vents that enter the top of the stack and the one vent ~11 feet below are catch pots which, under normal process operations, do not discharge to the stack. They are used to vent process gas to the stack in the event of a process upset and are not considered a flow contributor or a disturbance.

Per EPA Method 1, a total of 12 traverse points (six per axis) were used for M-0010 isokinetic sampling. Figure 4-1 provides a schematic of the test ports and traverse point locations.

4.2 VINYL ETHERS NORTH CARBON BED INLET AND OUTLET

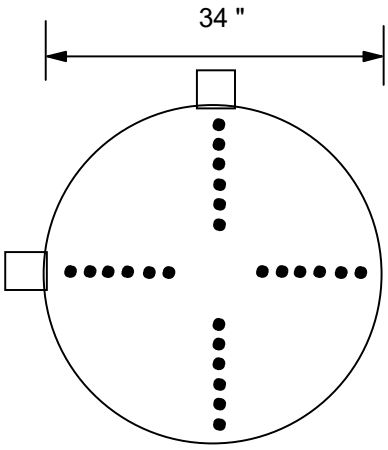
Each fiberglass reinforced plastic (FRP) duct at the inlet and outlet of the carbon bed is 34-inch ID. The test ports are located as shown below. Based on EPA Method 1, a total of 24 traverse points (12 per port) were required for HFPO Dimer Acid sampling at both locations. Figure 4-2 provides a schematic of the test port and traverse port locations.

Location	Distance from Flow Disturbance	
	Downstream (B)	Upstream (A)
Carbon Bed Inlet	67 inches > 1.9 duct diameters	61 inches > 1.8 duct diameters
Carbon Bed Outlet	58 inches > 1.7 duct diameters	57 inches > 1.5 duct diameters
Division Stack	30 feet > 10 duct diameters	9 feet > 3 diameters

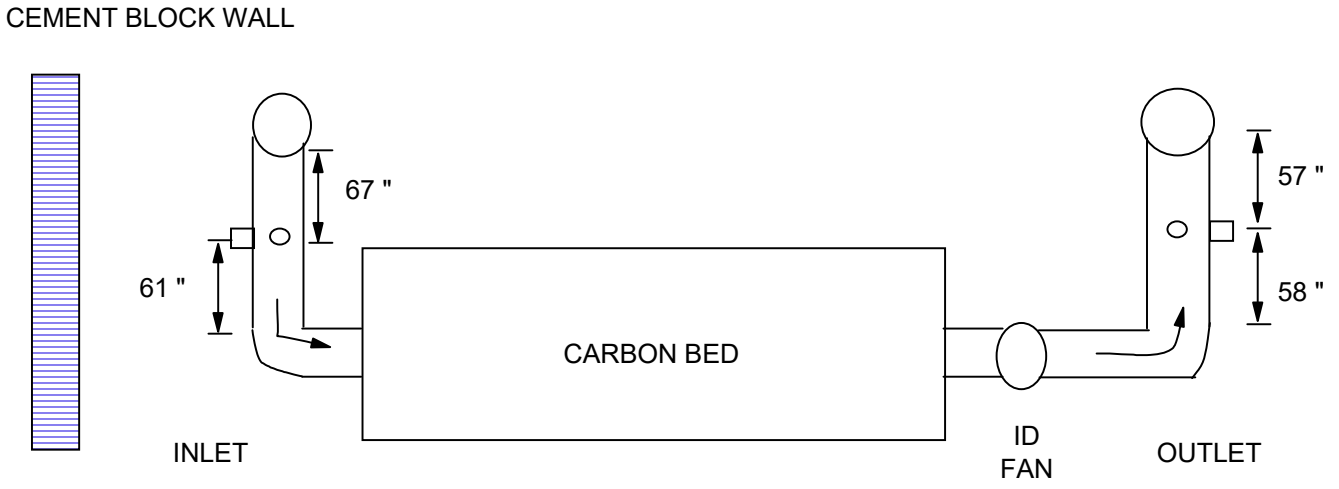


TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	1 5/8
2	5 3/8
3	10 7/8
4	26
5	31 5/8
6	33 3/8

FIGURE 4-1
DIVISION STACK TEST PORT
AND TRAVERSE POINT LOCATIONS



TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	3/4
2	2 1/4
3	4
4	6
5	8 1/2
6	12 1/8
7	21 5/8
8	25 1/2
9	28
10	30
11	31 3/4
12	33 1/4



DRAWING NOT TO SCALE

FIGURE 4-2
VE NORTH PROCESS CARBON BED INLET AND OUTLET SCHEMATIC

IASDATA\CHEMOURS\15418.002.012\FIGURE 4-2 VE NORTH PROCESS SCHEMATIC

5. SAMPLING AND ANALYTICAL METHODS

5.1 STACK GAS SAMPLING PROCEDURES

The purpose of this section is to describe the stack gas emissions sampling trains and to provide details of the stack sampling and analytical procedures utilized during the emissions test program.

5.1.1 Pre-Test Determinations

Preliminary test data were obtained at each test location. Stack geometry measurements were measured and recorded, and traverse point distances verified. A preliminary velocity traverse was performed utilizing a calibrated S-type pitot tube and an inclined manometer to determine velocity profiles. Flue gas temperatures were observed with a calibrated direct readout panel meter equipped with a chromel-alumel thermocouple. Preliminary water vapor content was estimated by wet bulb/dry bulb temperature measurements.

A check for the presence or absence of cyclonic flow was previously conducted at each test location. The cyclonic flow checks were negative (< 20°) verifying that the test locations were acceptable for testing.

Preliminary test data was used for nozzle sizing and sampling rate determinations for isokinetic sampling procedures.

Calibration of probe nozzles, pitot tubes, metering systems, and temperature measurement devices was performed as specified in Section 5 of EPA Method 5 test procedures.

5.2 STACK PARAMETERS

5.2.1 EPA Method 0010

The sampling train utilized to perform the HFPO Dimer Acid sampling at all three locations was an EPA Method 0010 train (see Figure 5-1). The Method 0010 consisted of a borosilicate nozzle that attached directly to a heated borosilicate probe. In order to minimize possible thermal degradation of the HFPO Dimer Acid, the probe and particulate filter were heated above stack temperature to minimize water vapor condensation before the filter. The probe was connected directly to a heated borosilicate filter holder containing a solvent extracted glass fiber filter.

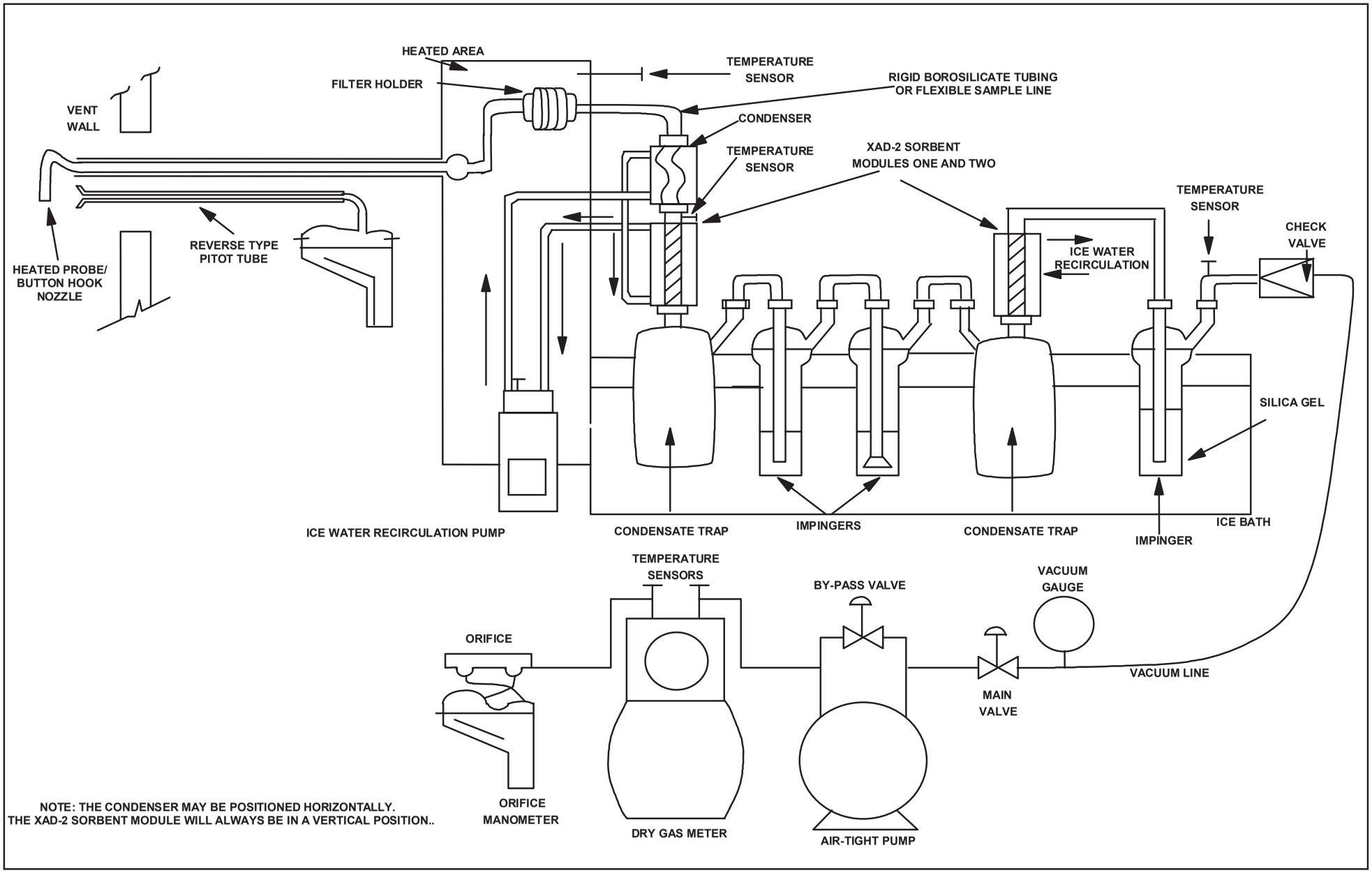


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

IASDATA\CHEMOURS\15418.002.012\FIGURE 5-1 METHOD 0010

A section of borosilicate glass or flexible polyethylene tubing connected the filter holder exit to a Grahm (spiral) type ice water-cooled condenser, an ice water-jacketed sorbent module containing approximately 40 grams of XAD-2 resin. The XAD-2 resin tube was equipped with an inlet temperature sensor. The XAD-2 resin trap was followed by a condensate knockout impinger and a series of two impingers that contained 100 mL of high-purity distilled water. The train also included a second XAD-2 resin trap behind the impinger section to evaluate possible sampling train breakthrough. Each XAD-2 resin trap was connected to a 1-liter condensate knockout trap. The final impinger contained 300 grams of dry pre-weighed silica gel. All impingers and the condensate traps were maintained in an ice bath. Ice water was continuously circulated in the condenser and the XAD-2 module to maintain method-required temperature. A control console with a leakless vacuum pump, a calibrated orifice, and dual inclined manometers was connected to the final impinger via an umbilical cord to complete the sample train.

HFPO Dimer Acid Fluoride (CAS No. 2062-98-8) that is present in the stack gas is expected to be captured in the sampling train along with HFPO Dimer Acid (CAS No. 13252-13-6). HFPO Dimer Acid Fluoride underwent hydrolysis instantaneously in water in the sampling train and during the sample recovery step, and was converted to HFPO Dimer Acid such that the amount of HFPO Dimer Acid emissions represented a combination of both HFPO Dimer Acid Fluoride and HFPO Dimer Acid.

During sampling, gas stream velocities were measured by attaching a calibrated S-type pitot tube into the gas stream adjacent to the sampling nozzle. The velocity pressure differential was observed immediately after positioning the nozzle at each traverse point, and the sampling rate adjusted to maintain isokineticity at 100% ± 10. Flue gas temperature was monitored at each point with a calibrated panel meter and thermocouple. Isokinetic test data was recorded at each traverse point during all test periods, as appropriate. Leak checks were performed on the sampling apparatus according to reference method instructions, prior to and following each run, component change (if required) or during midpoint port changes.

5.2.2 EPA Method 0010 Sample Recovery

At the conclusion of each test, the sampling train was dismantled, the openings sealed, and the components transported to the field laboratory trailer for recovery.

A consistent procedure was employed for sample recovery:

1. The two XAD-2 covered (to minimize light degradation) sorbent modules (1 and 2) were sealed and labeled.

2. The glass fiber filter(s) were removed from the holder with tweezers and placed in a polyethylene container along with any loose particulate and filter fragments.

3. The particulate adhering to the internal surfaces of the nozzle, probe and front half of the filter holder were rinsed with a solution of methanol and ammonium hydroxide into a polyethylene container while brushing a minimum of three times until no visible particulate remained. Particulate adhering to the brush was rinsed with methanol/ ammonium hydroxide into the same container. The container was sealed.

4. The volume of liquid collected in the first condensate trap was measured, the value recorded, and the contents poured into a polyethylene container.

5. All train components between the filter exit and the first condensate trap were rinsed with methanol/ammonium hydroxide. The solvent rinse was placed in a separate polyethylene container and sealed.

6. The volume of liquid in impingers one and two, and the second condensate trap, were measured, the values recorded, and the sample was placed in the same container as Step 4 above, then sealed.

7. The two impingers, condensate trap, and connectors were rinsed with methanol/ ammonium hydroxide. The solvent sample was placed in a separate polyethylene container and sealed.

8. The silica gel in the final impinger was weighed and the weight gain value recorded.

9. Site (reagent) blank samples of the methanol/ammonium hydroxide, XAD resin, filter and distilled water were retained for analysis.

Each container was labeled to clearly identify its contents. The height of the fluid level was marked on the container of each liquid sample to provide a reference point for a leakage check during transport. All samples were maintained cool.

During the Carbon Bed inlet and outlet test campaign, a Method 0010 blank train was set up near the test location, leak-checked and recovered along with the respective sample train. Following sample recovery, all samples were transported to TestAmerica Laboratories, Inc. (TestAmerica) for sample extraction and analysis.

See Figure 5-2 for a schematic of the Method 0010 sample recovery process.

5.2.3 EPA Method 0010 Sample Analysis

Method 0010 sampling trains resulted in four separate analytical fractions for HFPO Dimer Acid analysis according to SW-846 Method 3542:

- Front-half Composite—comprised of the particulate filter, and the probe, nozzle, and front-half of the filter holder solvent rinses;
- Back-half Composite—comprised of the first XAD-2 resin material and the back-half of the filter holder with connecting glassware solvent rinses;
- Condensate Composite—comprised of the aqueous condensates and the contents of impingers one and two with solvent rinses;
- Breakthrough XAD-2 Resin Tube—comprised of the resin tube behind the series of impingers.

The second XAD-2 resin material was analyzed separately to evaluate any possible sampling train HFPO-DA breakthrough.

The front-half and back-half composites and the second XAD-2 resin material were placed in polypropylene wide-mouth bottles and tumbled with methanol containing 5% NH_4OH for 18 hours. Portions of the extracts were processed analytically for the HFPO dimer acid by liquid chromatography and duel mass spectroscopy (HPLC/MS/MS). The condensate composite was concentrated onto a solid phase extraction (SPE) cartridge followed by desorption from the cartridge using methanol. Portions of those extracts were also processed analytically by HPLC/MS/MS.

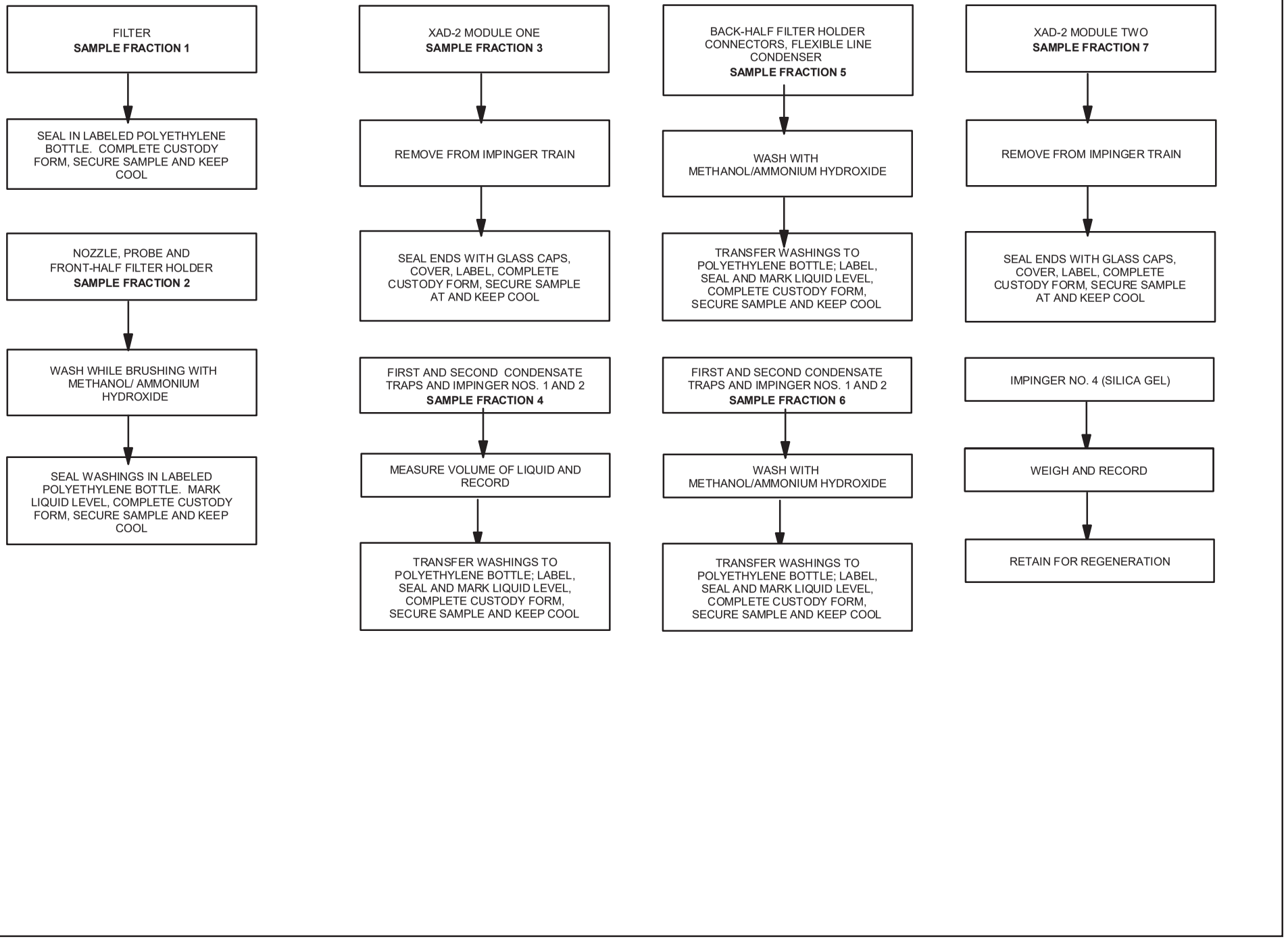


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.012\FIGURE 5-2 EPA 0010

Samples were spiked with isotope dilution internal standard (IDA) at the commencement of their preparation to provide accurate assessments of the analytical recoveries. Final data was corrected for IDA standard recoveries.

TestAmerica developed detailed procedures for the sample extraction and analysis for HFPO Dimer Acid. These procedures were incorporated into the test protocol.

5.3 GAS COMPOSITION

The Weston mobile laboratory equipped with instrumental analyzers was used to measure carbon dioxide (CO_2) and oxygen (O_2) concentrations. A diagram of the Weston sampling system is presented in Figure 5-3.

For the Division stack test campaign, the sample was collected at the exhaust of the Method 0010 sampling system. At the end of the line, a tee permitted the introduction of calibration gas. The sample was drawn through a heated Teflon® sample line to the sample conditioner. The output from the sampling system was recorded electronically, and one minute averages were recorded and displayed on a data logger.

Each analyzer was set up and calibrated internally by introduction of calibration gas standards directly to the analyzer from a calibration manifold. The calibration manifold is designed with an atmospheric vent to release excess calibration gas and maintained the calibration at ambient pressure. The direct calibration sequence consisted of alternate injections of zero and mid-range gases with appropriate adjustments until the desired responses were obtained. The high-range standards were then introduced in sequence without further adjustment.

The sample line integrity was verified by performing a bias test before and after each test period. The sampling system bias test consisted of introducing the zero gas and one up-range calibration standard in excess to the valve at the probe end when the system was sampling normally. The excess calibration gas flowed out through the probe to maintain ambient sampling system pressure. Calibration gas supply was regulated to maintain constant sampling rate and pressure. Instrument bias check response was compared to internal calibration responses to insure sample line integrity and to calculate a bias correction factor after each run using the ratio of the measured concentration of the bias gas certified by the calibration gas supplier.

The oxygen and carbon dioxide content of each stack gas was measured according to EPA Method 3A procedures which incorporate the latest updates of EPA Method 7E. A Servomex Model 4900 analyzer (or equivalent) was used to measure oxygen content. A Servomex Model 4900 analyzer (or equivalent) was used to measure carbon dioxide content of the stack gas. Both analyzers were calibrated with EPA Protocol gases prior to the start of the test program and performance was verified by sample bias checks before and after each test run.

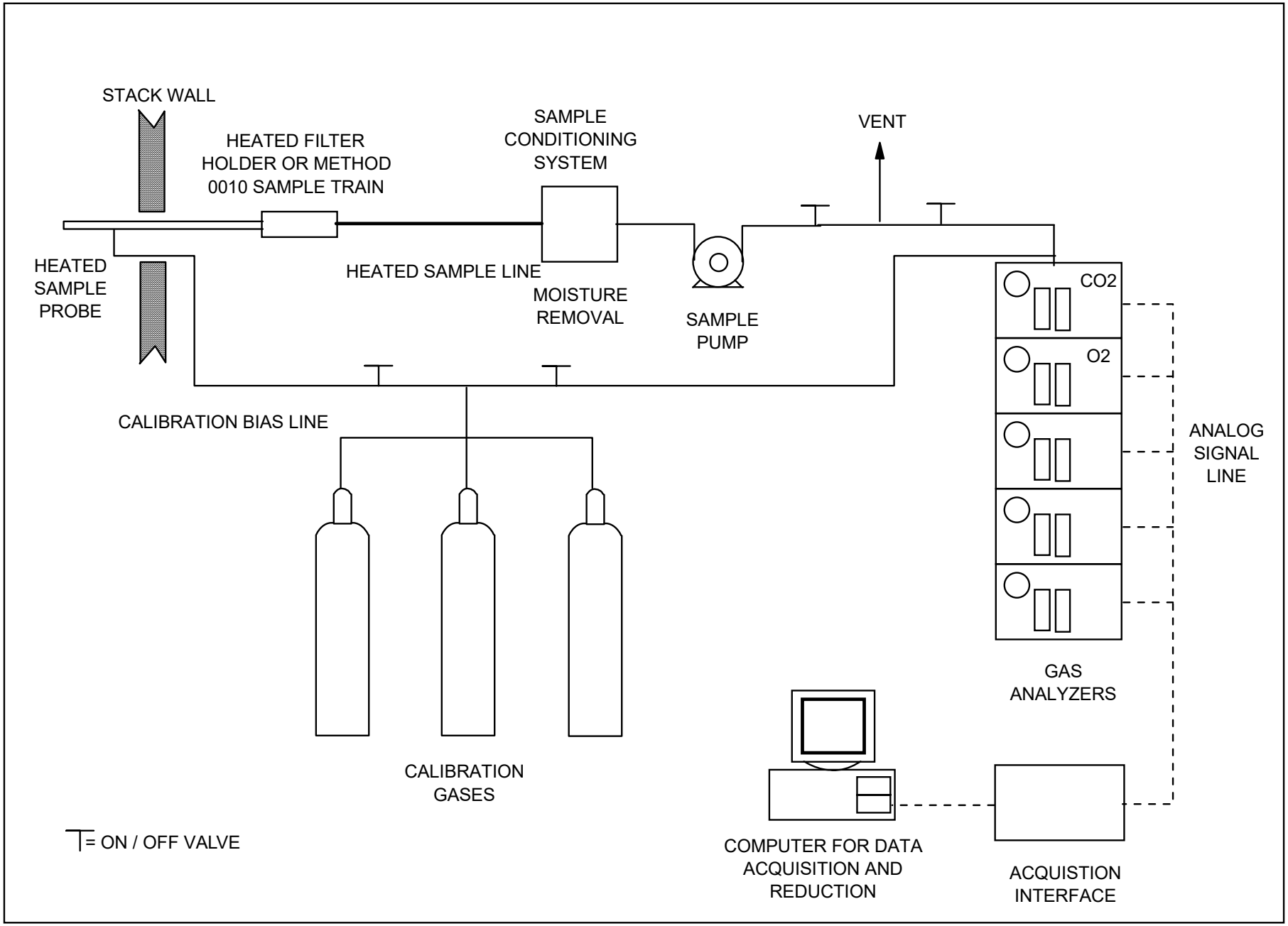


FIGURE 5-3
WESTON SAMPLING SYSTEM

IASDATA\CHEMOURS\15418.002.012\FIGURE 5-5 WESTON SAMPLING SYSTEM

6. DETAILED TEST RESULTS AND DISCUSSION

Each test was a minimum of 96 minutes in duration. A total of three test runs were performed at each location.

Tables 6-1 through 6-3 provide detailed test data and test results for the Carbon Bed inlet, the Carbon Bed outlet and the Division stack, respectively.

The Method 3A sampling on all sources indicated that the O_2 and CO_2 concentrations were at ambient air levels (20.9% O_2, 0% CO_2), therefore, 20.9% O_2 and 0% CO_2 values were used in all calculations.

The carbon bed removal efficiency was calculated based upon the HFPO Dimer Acid inlet and outlet mass emission rates in lb/hr.

During the April testing of the VEN Carbon Bed, the flowrates through the Carbon Bed were noticeably lower than previous testing. On average, the March 25 -26 testing data had an average inlet carbon bed flowrate of 13,825 dscf/min while the April 17-18 testing had an average inlet carbon bed flowrate of 8,962 dscf/min. It was also noted the dP across the bed was higher and more variable during the April testing. The March testing dP ranged between 0.65 and 0.75 in H_2O, whereas the April testing ranged between 6.0 and 7.0 in H_20. The carbon was changed on 1 May 2019 because of high dP.

TABLE 6-1
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
CARBON BED INLET

Test Data			
Run number	1	2	3
Location	CBed Inlet	CBed Inlet	CBed Inlet
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.215	0.215	0.215
Cross sectional nozzle area, sq.ft.	0.000252	0.000252	0.000252
Barometric pressure, in. Hg	30.17	30.13	30.08
Avg. orifice press. diff., in H_2O	0.45	0.56	0.32
Avg. dry gas meter temp., deg F	78.8	92.9	77.3
Avg. abs. dry gas meter temp., deg. R	539	553	537
Total liquid collected by train, ml	2.6	15.1	15.8
Std. vol. of H_2O vapor coll., cu.ft.	0.12	0.71	0.74
Dry gas meter calibration factor	1.0100	1.0100	1.0100
Sample vol. at meter cond., dcf	35.309	39.980	30.477
Sample vol. at std. cond., dscf [(1)]	35.267	38.868	30.421
Percent of isokinetic sampling	99.4	101.4	103.6
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.003	0.018	0.024
Mole fraction of dry gas	0.997	0.982	0.976
Molecular wt. of wet gas, lb/lb mole	28.80	28.64	28.58
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-2.80	-2.80	-2.80
Absolute pressure, in. Hg	29.96	29.92	29.87
Avg. temperature, deg. F	81	90	83
Avg. absolute temperature, deg.R	541	550	543
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	25.1	28.0	21.3
Stack/duct cross sectional area, sq.ft.	6.31	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	9487	10595	8073
Avg. gas stream volumetric flow, dscf/min.	9244	9992	7651

[(1)] Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 in Hg (760 mm Hg)

TABLE 6-1 (cont.)
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
CARBON BED INLET

TEST DATA			
Run number	1	2	3
Location	CBed Inlet	CBed Inlet	CBed Inlet
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	198.70	582.59	142.58
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	198.92	529.21	165.48
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	1.24E-08	3.30E-08	1.03E-08
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	6.89E-03	1.98E-02	4.74E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	8.67E-04	2.49E-03	5.97E-04

TABLE 6-2
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
CARBON BED OUTLET

Test Data			
Run number	1	2	3
Location	CBed Outlet	CBed Outlet	CBed Outlet
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.215	0.215	0.215
Cross sectional nozzle area, sq.ft.	0.000252	0.000252	0.000252
Barometric pressure, in. Hg	30.17	30.13	30.08
Avg. orifice press. diff., in H_2O	0.73	0.87	0.47
Avg. dry gas meter temp., deg F	75.5	97.7	77.6
Avg. abs. dry gas meter temp., deg. R	535	558	538
Total liquid collected by train, ml	7.4	21.5	16.9
Std. vol. of H_2O vapor coll., cu.ft.	0.3	1.0	0.8
Dry gas meter calibration factor	1.0107	1.0107	1.0107
Sample vol. at meter cond., dcf	42.462	46.423	34.509
Sample vol. at std. cond., dscf [(1)]	42.731	44.809	34.465
Percent of isokinetic sampling	105.0	101.0	106.2
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.008	0.022	0.023
Mole fraction of dry gas	0.992	0.978	0.977
Molecular wt. of wet gas, lb/lb mole	28.75	28.60	28.59
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	1.30	1.30	1.30
Absolute pressure, in. Hg	30.27	30.23	30.18
Avg. temperature, deg. F	89	96	93
Avg. absolute temperature, deg.R	549	556	553
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	29.1	32.6	23.8
Stack/duct cross sectional area, sq.ft.	6.31	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	10999	12321	8985
Avg. gas stream volumetric flow, dscf/min.	10606	11555	8457

[(1)] Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 in Hg (760 mm Hg)

TABLE 6-2 (cont.)
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
CARBON BED OUTLET

TEST DATA			
Run number	1	2	3
Location	CBed Outlet	CBed Outlet	CBed Outlet
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	63.709	58.21	105.48
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	52.64	45.86	108.06
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	3.29E-09	2.86E-09	6.75E-09
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	2.09E-03	1.99E-03	3.42E-03
HFPO Dimer Acid (From Inlet Data)	6.89E-03	1.98E-02	4.74E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	2.63E-04	2.51E-04	4.31E-04
Carbon Bed Removal Efficiency, %	69.7	90.0	27.9

TABLE 6-3
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
DIVISION STACK

Test Data			
Run number	1	2	3
Location	Divison Stack	Divison Stack	Divison Stack
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.160	0.160	0.160
Cross sectional nozzle area, sq.ft.	0.000140	0.000140	0.000140
Barometric pressure, in. Hg	30.08	30.06	29.98
Avg. orifice press. diff., in H_2O	0.82	0.81	0.70
Avg. dry gas meter temp., deg F	66.5	86.4	72.0
Avg. abs. dry gas meter temp., deg. R	526	546	532
Total liquid collected by train, ml	22.0	16.2	28.6
Std. vol. of H_2O vapor coll., cu.ft.	1.0	0.8	1.35
Dry gas meter calibration factor	1.0021	1.0021	1.0021
Sample vol. at meter cond., dcf	48.790	48.492	45.391
Sample vol. at std. cond., dscf [(1)]	49.377	47.250	45.294
Percent of isokinetic sampling	106.6	104.6	107.6
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.021	0.016	0.029
Mole fraction of dry gas	0.979	0.984	0.971
Molecular wt. of wet gas, lb/lb mole	28.61	28.66	28.52
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-0.65	-0.55	-0.55
Absolute pressure, in. Hg	30.03	30.02	29.94
Avg. temperature, deg. F	79	88	82
Avg. absolute temperature, deg.R	539	548	542
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	12	12	12
Avg. gas stream velocity, ft./sec.	59.8	59.1	55.3
Stack/duct cross sectional area, sq.ft.	7.07	7.07	7.07
Avg. gas stream volumetric flow, wacf/min.	25372	25067	23458
Avg. gas stream volumetric flow, dscf/min.	24427	23840	22208

[(1)] Standard conditions = 68 deg. F. (20 deg. C.) and 29.92 in Hg (760 mm Hg)

TABLE 6-3 (cont.)
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
DIVISION STACK

TEST DATA			
Run number	1	2	3
Location	Divison Stack	Divison Stack	Divison Stack
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	69.46	22.01	65.44
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	49.67	16.45	51.01
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	3.10E-09	1.03E-09	3.19E-09
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	4.55E-03	1.47E-03	4.24E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	5.72E-04	1.85E-04	5.34E-04

APPENDIX A
PROCESS OPERATIONS DATA

Date: 4/17/2019

Time	800				900			1000				1100			1200				1300			1400				1500				1600			
Stack Testing						RUN 1 - 0925-1148																Run 2 (1346-1547)										
HFPO																																
VEN Product	PSEPVE																															
VEN Precursor																																
VEN Condensation (HFPO)																																
VEN ABR																							Burnout									
VEN Refining																																
Stripper Column Vent																																
Division WGS Recirculation Flow	15000 kg/h																															
Division WGS Inlet Flow											100 kg/h							160 kg/h	130 kg/h	110 kg/h	130 kg/h		93 kg/h				70 kg/h					

Date: 4/18/2019

Time	800				900			1000				1100		
Stack Testing						Run 3 - 0922-1116								
HFPO														
VEN Product	PSEPVE													
VEN Precursor														
VEN Condensation (HFPO)														
VEN ABR														
VEN Refining														
Stripper Column Vent														
Division WGS Recirculation Flow	15000 kg/h													
Division WGS Inlet Flow	60 kg/h				91 kg/h								80 kg/h	

APPENDIX B
RAW AND REDUCED TEST DATA

INLET

Sample and Velocity Traverse Point Data Sheet - Method 1

Client Chemours
Loaction/Plant Fayetteville NC
Source VE North Carbon Inlet

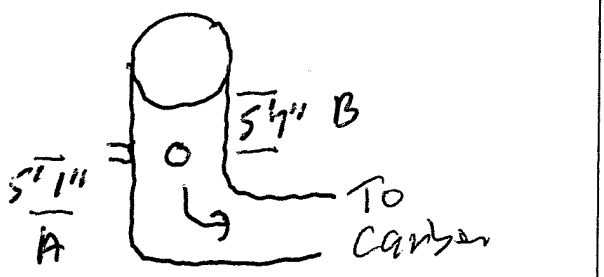
Operator AS
Date 6-13-18
W.O. Number

Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type	
Traverse Type	☑ Particulate Traverse	☐ Velocity Traverse		☐ CEM Traverse

Distance from far wall to outside of port (in.) = C	54 5/4"
Port Depth (in.) = D	20 5/8"
Depth of Duct, diameter (in.) = C-D	34"
Area of Duct (ft^2)	6.305
Total Traverse Points	24
Total Traverse Points per Port	12
Port Diameter (in.) ---(Flange-Threaded-Hole)	
Monorail Length	
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	
Equivalent Diameter = (2*L*W)/(L+W)	

Flow Disturbances	
Upstream - A (ft)	5' 7"
Downstream - B (ft)	3' 1"
Upstream - A (duct diameters)	1.97
Downstream - B (duct diameters)	1.80

Diagram of Stack



Traverse Point Locations

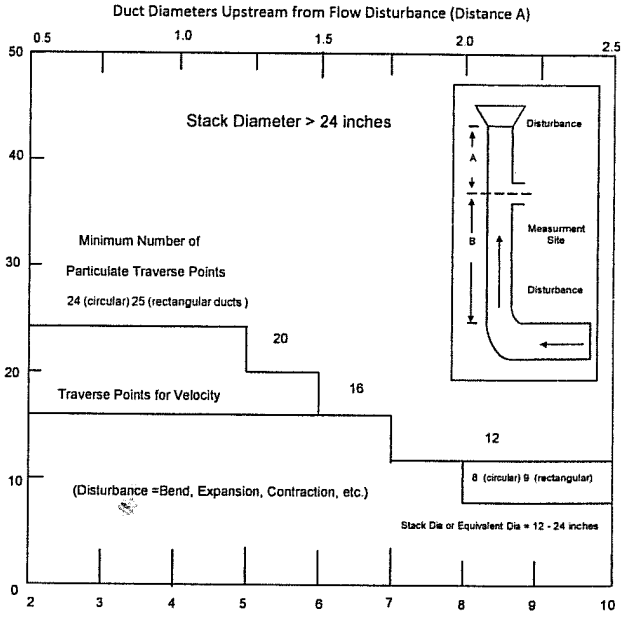
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.021	3/4	21 3/8
2	.067	2 1/4	22 7/8
3	.118	4	24 5/8
4	.177	6	26 5/8
5	.250	8 1/2	29 1/8
6	.356	12 1/8	32 3/4
7	.644	21 7/8	42 1/2
8	.750	25 1/2	46 1/8
9	.823	28	48 5/8
10	.882	30	50 5/8
11	.933	31 3/4	52 3/8
12	.979	33 1/4	53 7/8

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations

1	0.167		
2	0.50		
3	0.833		

Note: If stack dia < 12 inch use EPA Method 1A
(Sample port upstream of pitot port)
Note: If stack dia >24" then adjust traverse point to 1 inch from wall
If stack dia <24" then adjust traverse point to 0.5 inch from wall

Duct Diameters Upstream from Flow Disturbance (Distance A)



Duct Diameters Downstream from Flow Disturbance (Distance B)

Traverse Point Location Percent of Stack -Circular

Traverse Point / Number of Traverse Points	1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point / Number of Traverse Points	1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

WESTON MANAGERS DESIGNERS/CONSULTANTS

OUTLET

Sample and Velocity Traverse Point Data Sheet - Method 1

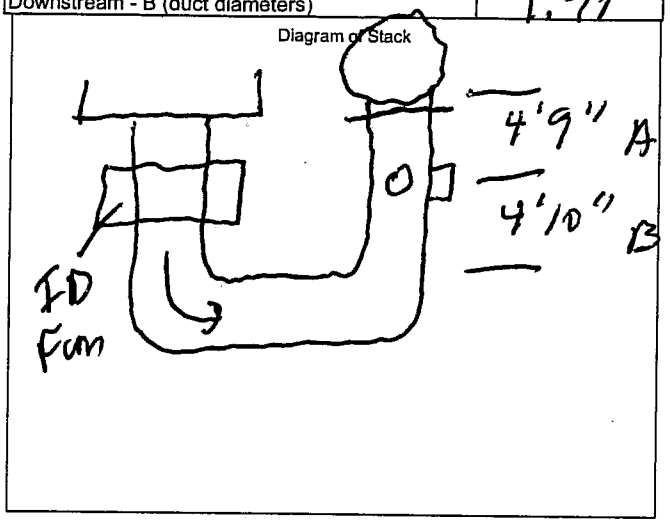
Client Chemours | Operator KG
Loaction/Plant Fayetteville NC | Date 6/13/18
Source VE North Carbon Outlet | W.O. Number

Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type	
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse		☐ CEM Traverse

Distance from far wall to outside of port (in.) = C	54 5/8
Port Depth (in.) = D	20 5/8
Depth of Duct, diameter (in.) = C-D	34
Area of Duct (ft²)	6.305
Total Traverse Points	24
Total Traverse Points per Port	12
Port Diameter (in.) ---(Flange-Threaded-Hole)	
Monorail Length	
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	
Equivalent Diameter = (2*L*W)/(L+W)	

Flow Disturbances	
Upstream - A (ft)	4' 4"
Downstream - B (ft)	4' 10"
Upstream - A (duct diameters)	1.53
Downstream - B (duct diameters)	1.71

Diagram of Stack



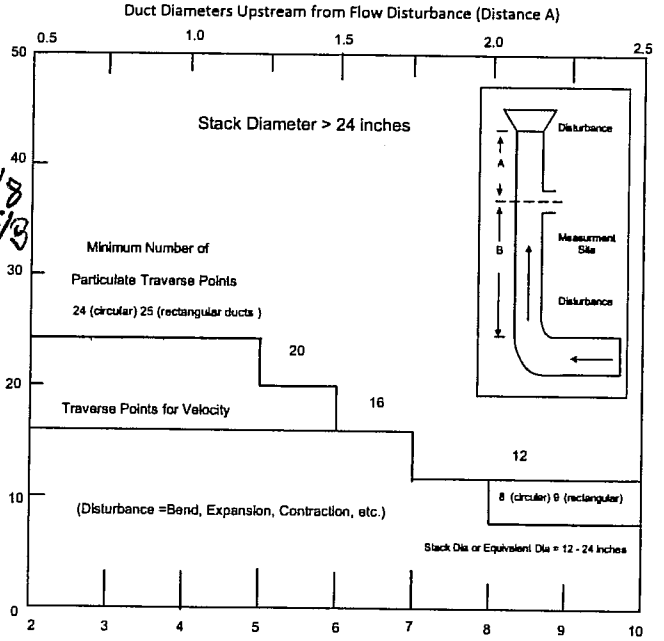
Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.021	3/4	21 3/8
2	.067	2 1/4	22 7/8
3	.118	4	24 5/8
4	.177	6	26 5/8
5	.250	8 1/2	29 1/8
6	.356	12 1/8	32 3/4
7	.644	21 5/8	42 1/2
8	.75	25 1/2	~~46 1/8~~ 46 1/8
9	.823	28	~~50 5/8~~ 48 5/8
10	.882	30	50 5/8
11	.933	31 3/4	52 3/8
12	.979	33 1/4	53 7/8

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations			
1	0.167		
2	0.50		
3	0.833		

Note: If stack dia < 12 inch use EPA Method 1A
(Sample port upstream of pitot port)
Note: If stack dia >24" then adjust traverse point to 1 inch from wall
If stack dia <24" then adjust traverse point to 0.5 inch from wall

Duct Diameters Upstream from Flow Disturbance (Distance A)



Duct Diameters Downstream from Flow Disturbance (Distance B)

Traverse Point Location Percent of Stack -Circular

Traverse Point \ Number of Traverse Points	1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point \ Number of Traverse Points	1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Sample and Velocity Traverse Point Data Sheet - Method 1

Client CHCMOUNS
Loaction/Plant Fayetteville, N.C.
Source Division Stack

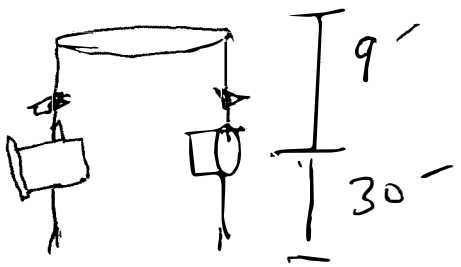
Operator MWKS
Date 11/22/12
W.O. Number 10418.00.002

Duct Type	☒ Circular	☐	Rectangular Duct	Indicate appropriate type	
Traverse Type	☒ Particulate Traverse	☐	Velocity Traverse	☐ CEM Traverse	

Distance from far wall to outside of port (in.) = C	5"
Port Depth (in.) = D	12.5
Depth of Duct, diameter (in.) = C-D	37
Area of Duct (ft²) 3/07/13 7.07	7.66
Total Traverse Points MD	12
Total Traverse Points per Port	6
Port Diameter (in.) —(Flange-Threaded-Hole)	4"
Monorail Length	8'
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	
Equivalent Diameter = (2*L*W)/(L+W)	

Flow Disturbances	
Upstream - A (ft)	12' 9'
Downstream - B (ft)	18' 30'
Upstream - A (duct diameters)	9.2
Downstream - B (duct diameters)	13.8

Diagram of Stack



Traverse Point Locations

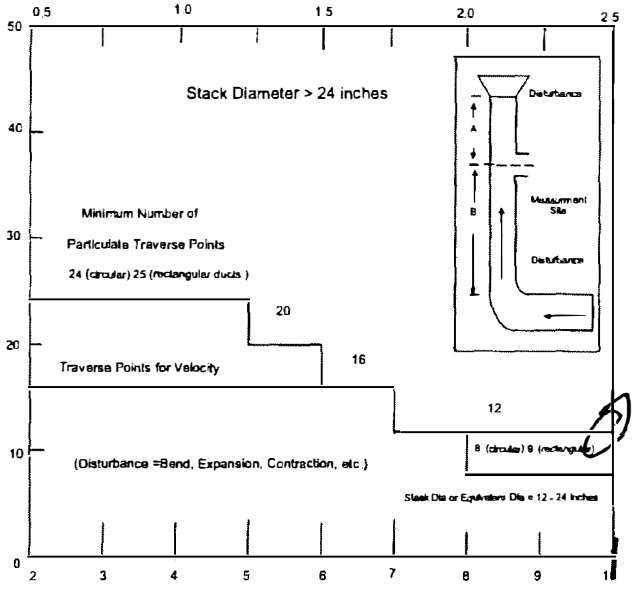
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	4.4	1.62	19 3/4	20 1/8
2	14.6	5.40	23 3/4	24 3/8
3	29.6	10.95	23 7/8	24 7/8
4	70.4	26.04	49.0	49
5	95.4	31.59	49 3/4	50 5/8
6	95.6	35.37	53 1/4	54 3/8
7				
8				
9				
10				
11				
12				

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations

1	0.167		
2	0.50		
3	0.833		

Note: If stack dia < 12 inch use EPA Method 1A
(Sample port upstream of pitot port)
Note: If stack dia >24" then adjust traverse point to 1 inch from wall
If stack dia <24" then adjust traverse point to 0.5 inch from wall

Duct Diameters Upstream from Flow Disturbance (Distance A)



Duct Diameters Downstream from Flow Disturbance (Distance B)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS
CARBON BED INLET

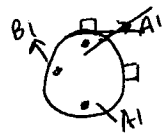
Test Data			
Run number	1	2	3
Location	CBed Inlet	CBed Inlet	CBed Inlet
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
Operator	RS/JL	RS/JL	RS/JL
Inputs For Calcs.			
Sq. rt. delta P	0.44122	0.48699	0.37269
Delta H	0.4508	0.5600	0.3208
Stack temp. (deg.F)	80.5	89.7	82.7
Meter temp. (deg.F)	78.8	92.9	77.3
Sample volume (act.)	35.309	39.980	30.477
Barometric press. (in.Hg)	30.17	30.13	30.08
Volume H_2O imp. (ml)	-4.0	6.0	8.0
Weight change sil. gel (g)	6.6	9.1	7.8
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	6.305	6.305	6.305
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	-2.80	-2.80	-2.80
Nozzle dia. (in.)	0.215	0.215	0.215
Meter box cal.	1.0100	1.0100	1.0100
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS
CARBON BED OUTLET

Test Data			
Run number	1	2	3
Location	CBed Outlet	CBed Outlet	CBed Outlet
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
Operator	KA/AS	KA/AS	KA/AS
Inputs For Calcs.			
Sq. rt. delta P	0.50961	0.56548	0.41322
Delta H	0.7321	0.8725	0.4663
Stack temp. (deg.F)	89.2	96.0	92.8
Meter temp. (deg.F)	75.5	97.7	77.6
Sample volume (act.)	42.462	46.423	34.509
Barometric press. (in.Hg)	30.17	30.13	30.08
Volume H_2O imp. (ml)	-2.0	8.0	8.0
Weight change sil. gel (g)	9.4	13.5	8.9
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	6.305	6.305	6.305
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	1.30	1.30	1.30
Nozzle dia. (in.)	0.215	0.215	0.215
Meter box cal.	1.0107	1.0107	1.0107
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS
DIVISION STACK

Test Data			
Run number	1	2	3
Location	Divison Stack	Divison Stack	Divison Stack
Date	4/17/2019	4/17/2019	4/18/2019
Time period	0925-1148	1346-1547	0922-1116
Operator	MW	MW	MW
Inputs For Calcs.			
Sq. rt. delta P	1.05170	1.03118	0.96682
Delta H	0.8199	0.8066	0.6984
Stack temp. (deg.F)	79.0	88.0	81.8
Meter temp. (deg.F)	66.5	86.4	72.0
Sample volume (act.)	48.790	48.492	45.391
Barometric press. (in.Hg)	30.08	30.06	29.98
Volume H_2O imp. (ml)	8.0	5.0	14.0
Weight change sil. gel (g)	14.0	11.2	14.6
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	7.070	7.070	7.070
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	-0.65	-0.55	-0.55
Nozzle dia. (in.)	0.160	0.160	0.160
Meter box cal.	1.0021	1.0021	1.0021
Cp of pitot tube	0.84	0.84	0.84
Traverse points	12	12	12



* starting points for each port *

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.012
Project ID	Chemours
Mode/Source ID	Carbon Bed
Samp. Loc. ID	IN
Run No.ID	1
Test Method ID	M0010
Date ID	15APR2019
Source/Location	VE North Inlet
Sample Date	4-17-2019 ✓
Baro. Press (in Hg)	30.17 ✓
Operator	RS / JL ✓

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol	0	✓
O2, % by Vol	20.9	✓
Temperature (°F)	80	
Meter Temp (°F)	~~65~~ 70	
Static Press (in H_2O)	~~-0.5~~ -2.8 PS	-2.8 ✓
Ambient Temp (°F)		

Meter Box ID	29		
Meter Box Y	1.0100 ✓		
Meter Box Del H	1.9363		
Probe ID / Length	703		
Probe Material	Boro		
Pitot / Thermocouple ID			
Pitot Coefficient	0.84 ✓		
Nozzle ID	.215		
Nozzle Measurements	.215	.215	.215
Avg Nozzle Dia (in)	.215 ✓		
Area of Stack (ft^2)	6.305 ✓		
Sample Time	96 ✓		
Total Traverse Pts	24 ✓		

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.000	0.000	0.000
Leak Check @ (in Hg)	5"	5"	5"
Pitot leak check good	~~yes~~ / no	~~yes~~ / no	~~yes~~ / no
Pitot Inspection good	~~yes~~ / no	~~yes~~ / no	~~yes~~ / no
Method 3 System good N/A	~~yes~~ / no	~~yes~~ / no	~~yes~~ / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp			
Reference Temp			
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

K Factor ~~2.29~~ 2.33

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	9:25 ✓			641.567									
A 1	4		.25	.58	643.2	78	67	120	120	64	3	46		
2	8		.25	.58	644.9	78	68	120	121	60	3	43		
3	12		.25	.58	646.5	78	68	120	120	58	3	44		
4	16		.23	.53	648.1	78	69	120	120	57	3	45		
5	20		.24	.55	649.8	78	70	120	119	57	3	46		
6	24		.23	.53	651.3	78	71	120	120	57	3	46		
7	28		.21	.48	652.8	78	72	120	119	59	3	47		
8	32		.21	.48	654.3	79	72	120	120	59	3	48		
9	36		.20	.46	655.9	79	73	120	121	60	3	50		
10	40		.20	.46	657.4	79	74	120	119	60	3	51		
11	44		.19	.44	658.8	80	76	120	119	61	2.5	52		
12	48	10:13	.19	.44	660.275	80	77	120	120	62	2.5	52		
B 1	4	11:00	.17	.39	661.7	83	84	120	120	65	2	43		
2	8		.16	.37	663.1	82	84	120	120	65	2	46		
3	12		.16	.37	664.4	82	85	120	120	60	2.5	40		
4	16		.16	.37	665.8	82	85	120	120	58	2.5	39		
5	20		.16	.37	667.1	82	85	120	120	57	2.5	39		
6	24		.16	.37	668.5	83	86	120	120	56	2.5	38		
7	28		.19	.44	669.9	82	86	120	120	56	2.5	39		
8	32		.18	.41	671.3	82	87	120	119	56	2.5	38		
9	36		.18	.41	672.7	82	87	120	120	56	2.5	38		
10	40		.18	.41	674.2	83	88	120	120	57	2.5	39		
11	44		.18	.41	675.6	83	88	120	119	58	2.5	39		
12	48	11:48 ✓	.17	.39	676.945	84	88	120	120	58	2.5	40		
			Avg Delta P .1958 ✓	Avg Delta H .4508 ✓	Total Volume 35.309	Avg Ts 80.54 ✓	Avg Tm 78.75 ✓	Min/Max 120/120	Min/Max 119/121	Max 65	Max Vac 3	Min/Max 38/52		
			Avg Sqrt Delta P .4412 ✓	Avg Sqrt Del H .6694 ✓										

WESTON SOLUTIONS

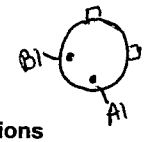
EPA Method 0010 from EPA SW-846

Comments: midpoint leak check.

DGM = 660.275 → 660.344

32.3097 35 *.069*

amd



starting points

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.012
Project ID	Chemours
Mode/Source ID	Carbon Bed
Samp. Loc. ID	IN
Run No.ID	2
Test Method ID	M0010
Date ID	15APR2019
Source/Location	VE North Inlet
Sample Date	4-17-2019 ✓
Baro. Press (in Hg)	30.13 ✓
Operator	RS / JC ✓

Stack Conditions	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol	0 ✓	
O2, % by Vol	20.9 ✓	
Temperature (°F)	90	
Meter Temp (°F)	90	
Static Press (in H_2O)	-2.8	-2.8 ✓
Ambient Temp (°F)	82	

Meter Box ID	29		
Meter Box Y	1.0100 ✓		
Meter Box Del H	1.9363		
Probe ID / Length	705		
Probe Material	Boro		
Pitot / Thermocouple ID			
Pitot Coefficient	0.84 ✓		
Nozzle ID	.215		
Nozzle Measurements	.215	.215	.215
Avg Nozzle Dia (in)	.215 ✓		
Area of Stack (ft^2)	6.365 ✓		
Sample Time	96 ✓		
Total Traverse Pts	24 ✓		

Sample Train (ft^3)	
Leak Check @ (in Hg)	
Pitot leak check good	yes / no
Pitot Inspection good	yes / no
Method 3 System good	N/A yes / no
Temp Check	
Meter Box Temp	
Reference Temp	
Pass/Fail (+/- 2°)	
Temp Change Response ?	

K Factor 2.38

	Initial	Mid-Point	Final
	0.010	0.001	0.000
	15"	5"	5"
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	Pass / Fail		Pass / Fail
	yes / no		yes / no

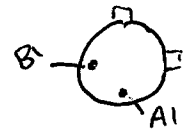
TRAVERSE POINT NO.		SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
		0	13:46 ✓			677.222									
A	1	4		.28	.66	679.0	90	87	120	121	64	3.5	42		
	2	8		.27	.64	680.8	89	87	120	120	64	3	37		
	3	12		.27	.64	682.6	89	87	120	120	63	3	37		
	4	16		.26	.61	684.3	89	88	120	119	63	3	37		
	5	20		.25	.59	685.9	89	88	119	120	60	3	36		
	6	24		.25	.59	687.7	89	88	120	120	60	3	36		
	7	28		.25	.59	689.4	89	88	120	121	58	3	36		
	8	32		.21	.49	691.0	89	89	120	120	57	3	36		
	9	36		.23	.54	692.5	90	89	120	119	57	3	36		
	10	40		.23	.54	694.2	90	89	120	120	56	3	36		
	11	44		.23	.54	695.8	90	89	120	119	56	3	36		
	12	48	14:34	.24	.57	697.508	91	90	119	120	57	3	36		
B	1	4		.20	.47	699.1	92	94	120	119	64	3	37		
	2	8	14:59	.20	.47	700.7	90	94	120	121	64	3	38		
	3	12		.20	.47	702.2	90	95	120	120	61	3	37		
	4	16		.20	.47	703.7	90	96	120	120	60	3	37		
	5	20		.20	.47	705.2	89	97	120	119	60	3	37		
	6	24		.20	.47	706.8	89	97	120	119	60	3	36		
	7	28		.26	.61	708.5	89	98	120	119	59	3	37		
	8	32		.26	.61	710.3	89	99	120	120	61	3	37		
	9	36		.26	.61	712.0	89	99	119	120	62	3	36		
	10	40		.26	.61	713.8	90	100	120	120	63	3.5	37		
	11	44		.26	.61	715.5	90	101	120	119	63	3.5	38		
	12	48	15:47 ✓	.24	.57	717.259	91	101	120	120	63	3.5	38		
				Avg Delta P .2379 ✓	Avg Delta H .5600 ✓	Total Volume 39.98 ✓	Avg Ts 89.66 ✓	Avg Tm 92.91 ✓	Min/Max 119/120	Min/Max 119/121	Max 64	Max Vac 3.5	Min/Max 36/42		
				Avg Sqrt Delta P .4869 ✓	Avg Sqrt Del H .7471 ✓										

Comments: midpoint leak check

DGM = 697.508 → 697.565

36 * .057 *

amd



starting points

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.012
Project ID	Chemours
Mode/Source ID	Carbon Bed
Samp. Loc. ID	IN
Run No.ID	3
Test Method ID	M0010
Date ID	15APR2019
Source/Location	VE North Inlet
Sample Date	4-18-2019 ✓
Baro. Press (In Hg)	30.08 ✓
Operator	RS / JL ✓

Stack Conditions	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol	0	
O2, % by Vol	20.9	
Temperature (°F)	85	
Meter Temp (°F)	75	
Static Press (In H_2O)	-2.8	-2.8 ✓
Ambient Temp (°F)	70	

Meter Box ID	29
Meter Box Y	1.0100 ✓
Meter Box Del H	1.9363
Probe ID / Length	705
Probe Material	Boro
Pitot / Thermocouple ID	
Pitot Coefficient	0.84 ✓
Nozzle ID	.215
Nozzle Measurements	.215 / .215 / .215
Avg Nozzle Dia (in)	.215 ✓
Area of Stack (ft^2)	6.305 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.009	0.004	0.002
Leak Check @ (in Hg)	15"	5"	5"
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	N/A yes / no	yes / no	yes / no

K Factor 2.34

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (In H2O)	ORIFICE PRESSURE Delta H (In H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (In Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	9:22 ✓			717.498									
A 1	4		.15	.35	718.8	82	71	120	120	64	2	40		
2	8		.16	.37	719.7	82	71	120	121	61	2	39		
3	12		.16	.37	721.5	82	72	120	120	58	2	39		
4	16		.16	.37	722.9	82	72	120	120	56	2	39		
5	20		.16	.37	724.2	82	73	120	119	55	2	39		
6	24		.15	.35	725.5	82	73	120	120	54	2	39		
7	28		.14	.32	726.8	82	74	120	119	55	2	38		
8	32		.14	.32	728.0	82	74	119	120	55	2	39		
9	36		.13	.30	729.2	82	75	120	120	56	2	38		
10	40		.14	.32	730.4	82	75	120	120	56	2	38		
11	44		.14	.32	731.7	82	76	120	121	56	2	39		
12	48	10:10	.14	.32	732.935	82	76	119	121	55	2	38		
B 1	4	10:28	.14	.32	734.2	82	78	120	120	64	2	42		
2	8		.13	.30	735.5	83	78	119	120	60	2	41		
3	12		.13	.30	736.7	83	78	120	121	58	2	41		
4	16		.12	.28	737.9	83	79	120	120	57	2	41		
5	20		.12	.28	739.1	83	79	120	120	57	2	41		
6	24		.12	.28	740.3	83	80	120	120	57	2	42		
7	28		.13	.30	741.6	83	81	120	120	57	2	44		
8	32		.13	.30	742.9	84	82	120	120	58	2	43		
9	36		.13	.30	744.2	84	83	120	120	59	2	45		
10	40		.14	.32	745.5	84	85	120	120	59	2	46		
11	44		.14	.32	746.7	84	85	120	120	60	2	47		
12	48	11:16 ✓	.14	.32	748.045	85	86	120	120	60	2	47		
			Avg Delta P .1391 ✓	Avg Delta H .3208 ✓	Total Volume 30.547	Avg Ts ✓ 82.70	Avg Tm ✓ 77.33	Min/Max 119/120	Min/Max 119/121	Max 64	Max Vac 2	Min/Max 38/47		
			Avg Sqrt Delta P .3726 ✓	Avg Sqrt Del H .5658 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

midpoint leak check

DGM: 732.935 → 733.005

30.4771 * .070 *

37

and

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.012
Location/Plant: Fayetteville, NC | Source & Location: VE North Inlet

Run No. 1 | Sample Date 4/17/19 | Recovery Date 4/17/19
Sample I.D. Chemours - Carbon Bed - IN - 1 - M0010 - | Analyst CW | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	0	96	100	0				196	306.6	
Initial	0	100	100	0				200	300	
Gain	0	-4	0	0				-4	6.6	2.6

Impinger Color: Clear | Labeled? ✓ ✓ ✓
Silica Gel Condition: 3/4 Blue | Sealed? ✓

Run No. 2 | Sample Date 4/17/19 | Recovery Date 4/17/19
Sample I.D. Chemours - Carbon Bed - IN - 2 - M0010 - | Analyst CW | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	0	104	102	0				206	309.1	
Initial	0	100	100	0				200	300	
Gain	0	4	2	0				6	9.1	15.1

Impinger Color: Clear | Labeled? ✓ ✓ ✓
Silica Gel Condition: 3/4 Blue | Sealed? ✓

Run No. 3 | Sample Date 4/18/19 | Recovery Date 4/18/19
Sample I.D. Chemours - Carbon Bed - IN - 3 - M0010 - | Analyst CW | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	0	6	108	0				208	307.8	
Initial	0	100	100	0				200	300	
Gain	0	0	8	0				8	7.8	15.8

Impinger Color: Clear | Labeled? ✓ ✓ ✓
Silica Gel Condition: 3/4 Blue | Sealed? ✓

Check COC for Sample IDs of Media Blanks

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.012
Location/Plant: Fayetteville, NC | Source & Location: VE North Inlet

Run No. BT | Sample Date 4/18/19 | Recovery Date 4/18/19
Sample I.D. Chemours-Carbon Bed-BT-maxxo | Analyst CW | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
									Silica Gel	
Contents	Empty	HPLC H20	HPLC H20	Empty						
Final	0	100	100	0				200	500.6	
Initial	0	100	100	0				200	300	
Gain	0	0	0	0				0.0	0.0	0

Impinger Color: Clear | Labeled? ✓
Silica Gel Condition: 100% Blue | Sealed? ✓

Run No. ___ | Sample Date ___ | Recovery Date ___
Sample I.D. ___ | Analyst ___ | Filter Number ___

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
									Silica Gel	
Contents	Empty	HPLC H20	HPLC H20							
Final										
Initial		100	100						300	
Gain										

Impinger Color ___ | Labeled? ___
Silica Gel Condition ___ | Sealed? ___

Run No. ___ | Sample Date ___ | Recovery Date ___
Sample I.D. ___ | Analyst ___ | Filter Number ___

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
									Silica Gel	
Contents	Empty	HPLC H20	HPLC H20							
Final										
Initial		100	100						300	
Gain										

Impinger Color ___ | Labeled? ___
Silica Gel Condition ___ | Sealed? ___

Check COC for Sample IDs of Media Blanks

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions			
Client	Chemours		Assumed	Actual	
W.O.#	15418.002.012	% Moisture	2		
Project ID	Chemours	Impinger Vol (ml)			
Mode/Source ID	Carbon Bed	Silica gel (g)			
Samp. Loc. ID	OUT	CO2, % by Vol	0.0	✓	
Run No.ID	1	O2, % by Vol	20.9	✓	
Test Method ID	M0010	Temperature (°F)	83	89.208	
Date ID	15APR2019	Meter Temp (°F)	80	75.458	
Source/Location	VE North Outlet	Static Press (in H_2O)	1.5	KA 1.5 1.3	
Sample Date	17Apr19 ✓	Ambient Temp (°F)	58		
Baro. Press (in Hg)	30.19 ✓				
Operator	KA/AS ✓				

Meter Box ID	26		
Meter Box Y	1.0107 ✓		
Meter Box Del H	2.0868		
Probe ID / Length	P707	6'	Sample Train (ft^3)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	P707		Pitot leak check good
Pitot Coefficient	0.84 ✓		Pitot Inspection good
Nozzle ID	.216		Method 3 System good
Nozzle Measurements	.215	.215 .215	**Temp Check**
Avg Nozzle Dia (in)	.215 ✓		Meter Box Temp
Area of Stack (ft^2)	6.305 ✓		Reference Temp
Sample Time	96 ✓		Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 2.6*

	Initial	Mid-Point	Final
	0.1009	0.007	0.010
	15"	5"	5"
	(yes) / no	(yes) / no	(yes) / no
	(yes) / no	(yes) / no	(yes) / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	0925 ✓			201.779									
A 1	4		.58	1.5	204.4	84	KA 63 69	120	119	66	4	51		
2	8		.55	1.4	206.9	87	69	120	118	61	4	43		
3	12		.54	1.4	209.4	87	78	120	119	59	4	43		
4	16		.46	1.2	211.5	87	70	120	122	58	KA 3	47		
5	20		.39	1.0	213.5	87	71	120	122	59	3	47		
6	24		.30	.78	215.7	88	71	120	118	59	2	48		*Flow drop
7	28		.17	.46	217.2	88	73	120	121	60	2	49		2.7
8	32		.17	.46	218.6	88	73	120	121	61	2	51		
9	36		.13	.35	220.0	88	74	120	119	62	2	51		
10	40		.11	.30	221.1	88	75	120	120	63	2	52		MPLC
11	44		.11	.30	222.4	89	76	120	119	64	2	53		223.717
12	48	1013	.09	.24	223.394	89	76	120	121	65	2	53		0.323
B 1	4	1100	.30	.81	225.6	89	79	120	121	67	2	59		
2	8		.30	.81	227.5	91	79	120	122	63	2	46		
3	12		.32	.86	229.5	91	79	120	120	60	2	46		
4	16		.31	.84	231.4	90	79	120	120	60	2	47		
5	20		.30	.81	233.4	91	79	120	122	60	2	47		
6	24		.30	.81	235.3	91	78	120	119	61	2	48		
7	28		.23	.62	236.9	91	78	121	121	62	2	48		
8	32		.21	.57	238.5	91	78	120	120	61	2	48		
9	36		.21	.57	240.1	91	78	120	120	63	2	48		
10	40		.19	.51	241.6	91	79	120	121	63	2	49		
11	44		.19	.51	243.2	92	79	120	120	63	2	50		
12	48	1148 ✓	.17	.46	244.564	92	79	120	121	63	2	51		
			Avg Delta P .276 ✓	Avg Delta H .732 ✓	Total Volume 42.785	Avg Ts ✓ 89.208	Avg Tm ✓ 75.458	Min/Max 120/120	Min/Max 118/122	Max 67	Max Vac 4	Min/Max 43/59		
			Avg Sqrt Delta P .510 ✓	Avg Sqrt Del H .831 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

? 42.462

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ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	
Client	Chemours		Assumed / Actual
W.O.#	15418.002.012	% Moisture	2 /
Project ID	Chemours	Impinger Vol (ml)	/
Mode/Source ID	Carbon Bed	Silica gel (g)	/
Samp. Loc. ID	OUT	CO2, % by Vol	0.0 / ✓
Run No.ID	2	O2, % by Vol	20.9 / ✓
Test Method ID	M0010	Temperature (°F)	94 / 95.958
Date ID	15APR2019	Meter Temp (°F)	80 / 97.708
Source/Location	VE North Outlet	Static Press (in H_2O)	3.5 / 4.3 ✓
Sample Date	17Apr19 ✓		
Baro. Press (in Hg)	30.15 30.43 ✓		
Operator	ISA/AS ✓	Ambient Temp (°F)	69

Meter Box ID	26		
Meter Box Y	1.0107 ✓		
Meter Box Del H	2.0868		
Probe ID / Length	P707	6'	Sample Train (ft³)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	P707		Pitot leak check good
Pitot Coefficient	0.84 ✓		Pitot Inspection good
Nozzle ID	.215		Method 3 System good
Nozzle Measurements	.215	.215 .215	**Temp Check**
Avg Nozzle Dia (in)	.215 ✓		Meter Box Temp
Area of Stack (ft²)	6.305 ✓		Reference Temp
Sample Time	96 ✓		Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 2.6

	Initial	Mid-Point	Final
	0.003	0.002	0.004
	15"	6"	6"
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1346 ✓			244.818									
A 1	4		.66	.7	247.6	94	97	120	120	66	5	59		
2	8		.66	.7	250.4	95	97	120	119	64	5	43		
3	12		.61	.6	253.1	96	97	120	118	56	5	44		
4	16		.57	.5	255.6	96	97	120	121	55	4	45		
5	20		.50	.43	258.1	96	96	120	121	56	4	45		
6	24		.43	.1	260.3	96	97	120	118	57	3	45		
7	28		.26	.68	262.1	95	96	120	120	56	2	45		
8	32		.21	.55	263.6	95	97	120	121	57	2	46		
9	36		.19	.49	265.2	95	96	120	122	56	2	47		
10	40		.19	.49	266.6	95	96	120	119	56	2	47		
11	44		.15	.39	267.9	95	95	120	118	57	2	48		
12	48	1434	.11	.29	269.052	95	95	120	122	59	2	48		MPLE
														269.167
B 1	4	1459	.30	.78	271.0	97	98	120	119	67	3	57		.115
2	8		.30	.78	272.9	96	98	120	121	64	2	54		
3	12		.32	.83	274.8	97	98	120	119	60	3	50		
4	16		.32	.83	276.8	97	99	120	119	58	3	50		
5	20		.32	.83	278.7	97	99	120	122	57	3	50		
6	24		.34	.88	280.7	97	99	120	121	58	3	50		
7	28		.32	.83	282.5	96	100	120	120	58	3	51		
8	32		.28	.73	284.4	96	100	120	119	59	3	51		
9	36		.28	.73	286.2	96	100	120	121	60	3	52		
10	40		.26	.68	288.0	97	100	120	121	62	3	52		
11	44		.25	.65	289.8	97	99	120	118	64	2	53		
12	48	1547 ✓	.23	.60	291.356	97	99	120	121	65	2	54		
			Avg Delta P .336 ✓	Avg Delta H .873 ✓	Total Volume 46.423 ✓	Avg Ts 95.958 ✓	Avg Tm 97.708 ✓	Min/Max 120/120	Min/Max 118/122	Max 67	Max Vac 5	Min/Max 43/57		
			Avg Sqrt Delta P .565 ✓	Avg Sqrt Del H .912 ✓	Comments:									

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EPA Method 0010 from EPA SW-846

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ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions				
Client	Chemours		Assumed	Actual	Meter Box ID	26
W.O.#	15418.002.012				Meter Box Y	1.0107 ✓
Project ID	Chemours	% Moisture	2		Meter Box Del H	2.0869
Mode/Source ID	Carbon Bed	Impinger Vol (ml)			Probe ID / Length	P707 6'
Samp. Loc. ID	OUT	Silica gel (g)			Probe Material	Boro
Run No.ID	3	CO2, % by Vol	0.0	✓	Pitot / Thermocouple ID	P707
Test Method ID	M0010	O2, % by Vol	20.9	✓	Pitot Coefficient	0.84 ✓
Date ID	15APR2019	Temperature (°F)	84	92.75	Nozzle ID	.245
Source/Location	VE North Outlet	Meter Temp (°F)	82	77.583	Nozzle Measurements	.245 .245 .245
Sample Date	18Apr19 ✓	Static Press (in H_2O)	1.3	1.3 ✓	Avg Nozzle Dia (in)	.245 ✓
Baro. Press (In Hg)	30.08 ✓				Area of Stack (ft^2)	6.305 ✓
Operator	KA/AS ✓	Ambient Temp (°F)	67		Sample Time	96 ✓
					Total Traverse Pts	24 ✓

Sample Train (ft^3)	6.000	0.000
Leak Check @ (in Hg)	15"	5"
Pitot leak check good	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no
Method 3 System good	yes / no	yes / no
Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

K Factor 2.6

KA 0.000 Final

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	0922 ✓			291.602									
A 1	4		.34	.88	293.6	90	73	120	122	66	3	60		
2	8		.34	.88	295.6	92	74	120	119	58	3	43		
3	12		.31	.81	297.6	92	75	120	119	54	3	44		
4	16		.29	.75	299.4	92	76	120	121	53	3	43		
5	20		.24	.62	301.1	92	76	120	120	53	2	43		
6	24		.19	.49	302.6	92	77	120	120	54	2	44		
7	28		.14	.36	303.9	92	77	120	120	54	2	44		
8	32		.12	.31	305.1	92	77	120	120	55	2	44		
9	36		.10	.26	306.2	92	77	120	121	55	2	44		
10	40		.08	.2	307.3	92	78	120	119	56	2	45		
11	44		.08	.2	308.2	92	78	120	121	56	2	45		
12	48	1010	.07	.18	309.115	92	78	120	120	57	2	46		
														MPLC
B 1	4	1028	.24	.62	310.9	93	77	120	118	66	2	56		309.207
2	8		.24	.62	312.6	93	78	120	121	59	2	47		0.092
3	12		.22	.57	314.2	93	78	120	119	57	2	46		
4	16		.22	.57	315.8	93	78	120	121	56	2	48		
5	20		.20	KA 40 .52	317.5	93	78	120	121	57	2	49		
6	24		.18	.47	318.9	93	79	121	119	57	2	49		
7	28		.14	.36	320.2	94	79	120	121	58	2	49		
8	32		.14	.36	321.6	94	79	120	120	59	2	50		
9	36		.12	.31	322.8	94	80	120	120	60	2	51		
10	40		.12	.31	324.0	94	80	120	120	60	2	51		
11	44		.10	.26	325.1	95	80	120	121	61	2	52		
12	48	1116 ✓	.10	.26	326.203	95	80	120	120	62	2	53		
			Avg Delta P .180 ✓	Avg Delta H .466 ✓	Total Volume 34.509 ✓	Avg Ts 92.75 ✓	Avg Tm 77.583 ✓	Min/Max 120/121	Min/Max 118/122	Max 66	Max Vac 3	Min/Max 43/60		
			Avg Sqrt Delta P .413 ✓	Avg Sqrt Del H .665 ✓	Comments:									

EPA Method 0010 from EPA SW-846

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.012

Location/Plant: Fayetteville, NC | Source & Location: VE North Outlet

Run No. 1 | Sample Date 4/17/19 | Recovery Date 4/17/19

Sample I.D. Chemours - Carbon Bed - OUT - 1 - M0010 - | Analyst CW | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	0	98	100	0				198	309.4	
Initial	0	100	100	0				200	300	
Gain	0	-2	0	0				-2	9.4	7.4

Impinger Color: Clear | Labeled? ✓ ✓ ✓

Silica Gel Condition: 3/4 BLUE | Sealed? ✓

Run No. 2 | Sample Date 4/17/19 | Recovery Date 4/17/19

Sample I.D. Chemours - Carbon Bed - OUT - 2 - M0010 - | Analyst CW | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	2	100	106	0				208	313.5	
Initial	0	100	100	0				200	300	
Gain	2	0	6	0				8	13.5	21.5

Impinger Color: Clear | Labeled? ✓ ✓ ✓

Silica Gel Condition: 3/4 BLUE | Sealed? ✓

Run No. 3 | Sample Date 4/18/19 | Recovery Date 4/18/19

Sample I.D. Chemours - Carbon Bed - OUT - 3 - M0010 - | Analyst CW | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	0	106	102	0				208	308.9	
Initial	0	100	100	0				200	300	
Gain	0	6	2	0				8	8.9	16.9

Impinger Color: Clear | Labeled? ✓ ✓ ✓

Silica Gel Condition: 3/4 BLUE | Sealed? ✓

Check COC for Sample IDs of Media Blanks

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions					
Client	Chemours		Assumed	Actual	Meter Box ID	95	
W.O.#	15418.002.012				Meter Box Y	1.0021 ✓	
Project ID	Chemours	% Moisture	≈2.0		Meter Box Del H	1.9757	
Mode/Source ID	Division	Impinger Vol (ml)		12	Probe ID / Length	P700	5'
Samp. Loc. ID	STK	Silica gel (g)		14	Probe Material		
Run No.ID	1	CO2, % by Vol	0.1	0.1 ✓	Pitot / Thermocouple ID	Borg P700	Sample Train (ft³)
Test Method ID	M0010	O2, % by Vol	20.3	20.9 ✓	Pitot Coefficient	0.84 ✓	Leak Check @ (in Hg)
Date ID	15APR2019	Temperature (°F)	≈75		Nozzle ID	G150	Pitot leak check good
Source/Location	Division Stack	Meter Temp (°F)	≈60		Nozzle Measurements	0.160 | 0.160 | 0.159	Pitot Inspection good
Sample Date	4/17/19 ✓	Static Press (in H_2O)	-0.65	-0.65 ✓	Avg Nozzle Dia (in)	0.160 ✓	Method 3 System good
Baro. Press (In Hg)	30.08 ✓				Area of Stack (ft²)	7.07 ✓	**Temp Check**
Operator	MP WINKELEL	Ambient Temp (°F)	≈55°		Sample Time	96 ✓	Meter Box Temp
					Total Traverse Pts	12 ✓	Reference Temp
							Pass/Fail (+/- 2°)
							Temp Change Response ?

K Factor 0.752

	Initial	Mid-Point	Final
	0.001	0.001	0.001
	@15	@7	@7
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	56		70
	55		70
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	0925			271.270									
A 1	4		1.1	0.827	273.39	74	59	99	99	63	4	64		
1	8		1.1	0.827	275.40	76	59	100	100	58	4	49		
2	12		1.2	0.902	277.67	76	60	100	100	58	4	49		
2	16		1.2	0.902	279.59	76	60	100	100	58	4	49		
3	20		1.3	0.977	281.89	77	62	100	100	56	5	46		
3	24		1.3	0.977	283.88	77	64	100	100	56	5	46		K-factor
4	28		1.2	0.877	285.88	77	64	100	100	56	5	44		0.731
4	32		1.2	0.877	288.31	77	64	101	101	56	5	44		
5	36		1.1	0.804	289.99	77	65	101	101	58	4	43		29.525
5	40		1.1	0.804	291.89	77	65	101	101	58	4	43		
6	44		0.95	0.694	293.85	78	65	102	102	58	4	43		
6	48	1013 1100	0.95	0.694	295.795	78	65	102	102	58	3	43		
					295.900									
B 1	4		1.1	0.804	297.95	80	65	100	100	67	4	59		
1	8		1.1	0.804	300.87	81	68	100	100	65	4	58		
2	12		1.2	0.888	301.97	81	70	100	100	65	4	58		24.27
2	16		1.2	0.888	303.87	81	70	100	100	65	4	58		24.265
3	20		1.4	1.02	307.10	81	70	100	100	63	5	43		
3	24		1.4	1.02	308.98	81	70	100	100	63	5	43		
4	28		1.1	0.804	310.95	81	71	100	100	62	4	44		
4	32		1.1	0.804	313.10	81	71	100	100	59	4	43		
5	36		0.95	0.694	315.06	82	71	100	100	58	3	44		
5	40		0.95	0.694	316.73	82	72	100	100	58	3	45		
6	44		0.75	0.548	318.98	82	72	100	100	58	3	45		
6	48	1148	0.75	0.548	320.165	82	73	100	100	58	3	45		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			1.11250	0.81992	48.79	78.9	66.5	99/102	99/102	67	5	43/64		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			1.05170	0.90273										

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EPA Method 0010 from EPA SW-846

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ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	Assumed	Actual				
Client	Chemours	% Moisture	≈1.8		Meter Box ID	25	K Factor 0.755	
W.O.#	15418.002.012	Impinger Vol (ml)		5	Meter Box Y	1.0021 ✓		
Project ID	Chemours	Silica gel (g)		11.2	Meter Box Del H	1.9757		
Mode/Source ID	Division	CO2, % by Vol	0	✓	Probe ID / Length	700 / 5'		
Samp. Loc. ID	STK	O2, % by Vol	20.9	✓	Probe Material	Boro		
Run No.ID	2	Temperature (°F)	≈78		Pitot / Thermocouple ID	700		
Test Method ID	M0010	Meter Temp (°F)	≈79		Pitot Coefficient	0.84 ✓		
Date ID	15APR2019	Static Press (in H_2O)	-0.55	✓	Nozzle ID	G160		
Source/Location	Division Stack	Ambient Temp (°F)	≈75		Nozzle Measurements	0.160 / 0.160 / 0.160		
Sample Date	4/17/19 ✓				Avg Nozzle Dia (in)	0.160 ✓		
Baro. Press (In Hg)	30.06 ✓				Area of Stack (ft^2)	7.07 ✓		
Operator	Mr. WINKLER				Sample Time	96 ✓		
	BURNOUT				Total Traverse Pts	12 ✓		

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.001	0.001	0.001
Leak Check @ (in Hg)	≤15	≤6	≤7
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	75		80
Reference Temp	75		80
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1346 ✓			320.258									
A 1	4		0.95	0.717	322.03	86	81	100	100	67	4	59		
1	8		0.95	0.717	324.10	86	81	100	100	65	4	55		
2	12		1.2	0.906	326.55	87	81	100	100	65	4	55		
2	16		1.2	0.906	328.35	87	84	100	100	65	5	49		24,270
3	20		1.3	0.981	330.68	87	84	100	100	65	5	49		
3	24		1.3	0.981	333.00	87	85	100	100	65	5	49		
4	28		1.2	0.906	335.13	87	85	101	101	65	5	48		
4	32		1.2	0.906	337.12	88	87	101	101	66	5	53		
5	36		1.0	0.755	339.32	88	87	100	100	65	4	48		
5	40		1.0	0.755	341.14	88	87	101	101	65	4	48		
6	44		0.85	0.641	343.10	88	88	99	99	65	4	48		
6	48	1434 / 1459	0.85	0.641	344.725 / 344.285	88	88	99	99	64	4	48		
B 1	4		0.95	0.714	346.75	88	88	100	100	66	4	48		← 0.752
1	8		0.95	0.714	348.66	88	88	100	100	58	4	44		K-FACTOR
2	12		1.2	0.902	351.26	89	88	100	100	58	4	44		
2	16		1.2	0.902	353.16	89	88	100	100	58	4	44		
3	20		1.3	0.977	355.17	89	88	99	103	58	5	44		24,013
3	24		1.3	0.977	357.44	89	88	99	103	58	5	44		
4	28		1.2	0.902	359.70	88	88	100	103	54	5	43		
4	32		1.2	0.902	361.63	88	88	100	103	54	5	43		
5	36		0.95	0.714	363.55	89	88	100	100	55	4	44		
5	40		0.95	0.714	365.55	89	88	100	100	55	4	46		
6	44		0.75	0.564	367.18	89	88	99	98	55	4	42		
6	48	1547 ✓	0.75 ✓	0.564 ✓	368.900	89	88	99	98	57	4	48		
			Avg Delta P ✓	Avg Delta H	Total Volume	Avg Ts ✓	Avg Tm ✓	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			1.0709 ✓	0.8065 ✓	48.49 ✓	88 ✓	86.4 ✓	99/101	98/103	67	5	59		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments: ✓									
			1.0319 ✓	0.8949 ✓										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

mmd

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions			
Client	Chemours		Assumed	Actual	Meter Box ID: 25
W.O.#	15418.002.012				Meter Box Y: 1.0021
Project ID	Chemours	% Moisture	= 1.5		Meter Box Del H: 1.9757
Mode/Source ID	Division	Impinger Vol (ml)		14.6	Probe ID / Length: P700 5'
Samp. Loc. ID	STK	Silica gel (g)		14.7	Probe Material: Boro
Run No.ID	3	CO2, % by Vol	0.1	✓	Pitot / Thermocouple ID: P700
Test Method ID	M0010	O2, % by Vol	20.9	✓	Pitot Coefficient: 0.84 ✓
Date ID	15APR2019	Temperature (°F)	=		Nozzle ID: G160
Source/Location	Division Stack	Meter Temp (°F)	= 63		Nozzle Measurements: 0.160 | 0.160 | 0.160
Sample Date	4/15/19 ✓	Static Press (in H_2O)	-0.55	✓	Avg Nozzle Dia (in): 0.160
Baro. Press (in Hg)	29.98 ✓				Area of Stack (ft^2): 7.07 ✓
Operator	MP WINKELER ✓	Ambient Temp (°F)	= 63		Sample Time: 96 ✓
					Total Traverse Pts: 12 ✓

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.001	0.001	0.001
Leak Check @ (in Hg)	e15	e6	e6
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no

K Factor 0.742

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	69	76
Reference Temp	63	75
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	0922			368.970									
(A) 1	4		0.75	0.557	370.70	80	69	100	100	64	3	62		
1	8		0.75	0.557	372.40	80	69	100	100	60	3	60		
2	12		0.95	0.704	374.39	80	70	100	100	59	3	60		
2	16		0.95	0.704	376.25	80	70	100	100	57	3	60		22.53
3	20		1.1	0.816	378.29	81	71	99	101	57	4	60		
3	24		1.1	0.816	380.37	81	71	99	100	57	4	60		
4	28		1.2	0.890	382.50	81	71	99	99	57	4	61		
4	32		1.2	0.890	384.59	81	71	100	100	57	4	61		
5	36		0.85	0.630	386.35	82	71	100	100	57	3	55		
5	40		0.85	0.630	388.10	82	71	100	101	57	3	49		
6	44		0.75	0.557	389.92	82	72	100	100	57	3	44		
6	48	1010	0.75	0.557	391.500	82	72	100	100	57	3	44		
		1028			391.640									
(B) 1	4		0.85	0.630	393.50	82	72	100	98	62	3	50		
1	8		0.85	0.630	395.21	82	72	100	98	59	3	50		22.86
2	12		0.95	0.704	397.14	82	72	101	102	59	4	48		
2	16		0.95	0.704	399.07	82	72	100	100	59	4	48		
3	20		1.1	0.816	401.13	82	72	100	100	59	4	47		
3	24		1.1	0.816	403.21	82	72	100	100	57	4	48		
4	28		1.2	0.890	405.35	83	73	101	101	57	4	49		
4	32		1.2	0.890	407.44	83	73	101	101	57	4	49		
5	36		0.85	0.630	409.42	83	75	100	100	60	3.5	52		
5	40		0.85	0.630	411.05	83	75	100	100	61	3	55		
6	44		0.75	0.557	413.00	83	76	100	101	63	3	58		
6	48	1116	0.75	0.557	414.501	83	76	100	101	64	3	59		
			Avg Delta P ✓	Avg Delta H	Total Volume	Avg Ts ✓	Avg Tm ✓	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.94167	0.69842	45.391 ✓	82 ✓	72 ✓	99/101	98/102	64	4	47/62		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.96699 ✓	0.83264 ✓										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

amd

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.012
Location/Plant: Fayetteville, NC | Source & Location: Division Stack

Run No. 1 | Sample Date 4/17/19 | Recovery Date 4/17/19
Sample I.D. Chemours - Division - STK - 1 - M0010 - | Analyst [illegible] | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	2	96	105	5					314.0	
Initial	0	100	100	0					300	
Gain	2	-4	5	5				12	14.0	26.0

Impinger Color: clear | Labeled? ✓ 87 ✓
Silica Gel Condition: Good | Sealed? ✓

Run No. 2 | Sample Date 4/17/19 | Recovery Date 4/17/19
Sample I.D. Chemours - Division - STK - 2 - M0010 - | Analyst [illegible] | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	2	95	104	4					311.2	
Initial	0	100	100	0					300	
Gain	2	-5	4	4				5	11.2	16.2

Impinger Color: clear | Labeled? ✓ ✓ ✓
Silica Gel Condition: Good | Sealed? ✓

Run No. 3 | Sample Date 4/18/19 | Recovery Date 4/18/19
Sample I.D. Chemours - Division - STK - 3 - M0010 - | Analyst [illegible] | Filter Number NA

	Impinger 1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	8	100	102	4					314.6	
Initial	0	100	100	0					300	
Gain	8	0	2	4				14	14.6	28.6

Impinger Color: clear | Labeled? ✓ ✓ ✓
Silica Gel Condition: Good | Sealed? ✓

Check COC for Sample IDs of Media Blanks

METHODS AND ANALYZERS

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

File: C:\DATA\Chemours\041719.cem
Program Version: 2.1, built 19 May 2017 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

Analyte	**O_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.0**

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.6**

CALIBRATION DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Start Time: 07:25

O_2

Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	**Cylinder ID**
12.0	CC18055
21.0	SG9169108

Calibration Results

Zero	2 mv
Span, 21.0 %	8013 mv

Curve Coefficients

Slope	**Intercept**
381.5	2

CO_2

Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	**Cylinder ID**
8.9	CC18055
16.6	SG9169108

Calibration Results

Zero	-2 mv
Span, 16.6 %	8244 mv

Curve Coefficients

Slope	**Intercept**
497.3	-2

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** Project Number:
Location: **Fayetteville, NC** Operator: **CMH**
Source: **VE North** Calibration **1** Date: **17 Apr 2019**

Start Time: 07:25

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 381.5 **Intercept** 2.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.0	12.0	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.6 %
Slope 497.3 **Intercept** -2.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.6	-0.3	-1.8	Pass
16.6	16.6	0.0	0.0	Pass

BIAS

Number 1

Client: **Chemours** | Project Number:
Location: **Fayetteville, NC** | Operator: **CMH**
Source: **VE North** | Calibration **1** | Date: **17 Apr 2019**

Start Time: 07:30

O_2

Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.0	11.9	-0.1	-0.5	Pass

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.4	-0.2	-1.2	Pass

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Time	O_2 %	CO_2 %
	Start R1	
09:26	20.7	0.1
09:27	20.7	0.1
09:28	20.7	0.0
09:29	20.7	0.0
09:30	20.7	0.0
09:31	20.7	0.0
09:32	20.7	0.0
09:33	20.7	0.0
09:34	20.7	0.0
09:35	20.7	0.0
09:36	20.7	0.0
09:37	20.7	0.0
09:38	20.7	0.0
09:39	20.7	0.0
09:40	20.7	0.0
09:41	20.7	0.0
09:42	20.7	0.0
09:43	20.7	0.0
09:44	20.7	0.0
09:45	20.7	0.0
09:46	20.7	0.0
09:47	20.7	0.0
09:48	20.7	0.0
09:49	20.7	0.0
09:50	20.7	0.0
09:51	20.7	0.0
09:52	20.7	0.0
09:53	20.7	0.0
09:54	20.7	0.0
09:55	20.7	0.0
09:56	20.7	0.0
09:57	20.7	0.0
09:58	20.7	0.0
09:59	20.7	0.0
10:00	20.7	0.0
10:01	20.7	0.0
10:02	20.7	0.0
10:03	20.7	0.0
10:04	20.7	0.0

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Time	O_2 %	CO_2 %
10:05	20.7	0.0
10:06	20.7	0.0
10:07	20.7	0.0
10:08	20.7	0.0
10:09	20.7	0.0
10:10	20.7	0.0
10:11	20.7	0.0
10:12	20.7	0.0
10:13	20.7	0.0
Port Change Start Port B		
11:01	20.7	0.0
11:02	20.7	0.0
11:03	20.7	0.1
11:04	20.7	0.1
11:05	20.7	0.1
11:06	20.7	0.1
11:07	20.7	0.1
11:08	20.7	0.1
11:09	20.7	0.1
11:10	20.7	0.1
11:11	20.7	0.1
11:12	20.7	0.1
11:13	20.7	0.1
11:14	20.7	0.1
11:15	20.7	0.1
11:16	20.7	0.1
11:17	20.7	0.1
11:18	20.7	0.1
11:19	20.7	0.1
11:20	20.7	0.1
11:21	20.7	0.1
11:22	20.7	0.1
11:23	20.7	0.1
11:24	20.7	0.1
11:25	20.7	0.1
11:26	20.7	0.1
11:27	20.7	0.1
11:28	20.7	0.1
11:29	20.7	0.1

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Time	O_2 %	CO_2 %
11:30	20.7	0.1
11:31	20.7	0.1
11:32	20.7	0.1
11:33	20.7	0.1
11:34	20.7	0.1
11:35	20.8	0.1
11:36	20.8	0.1
11:37	20.8	0.1
11:38	20.8	0.1
11:39	20.8	0.1
11:40	20.8	0.1
11:41	20.8	0.1
11:42	20.8	0.1
11:43	20.8	0.1
11:44	20.8	0.1
11:45	20.8	0.1
11:46	20.8	0.1
11:47	20.8	0.1
11:48	20.8	0.1
	End R1	
Avgs	**20.7**	**0.0**

RUN SUMMARY

Number 1

Client: **Chemours** Project Number:
Location: **Fayetteville, NC** Operator: **CMH**
Source: **VE North** Calibration **1** Date: **17 Apr 2019**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 09:25 to 11:48

Run Averages

20.7	0.0

Pre-run Bias at 07:30

Zero Bias	0.1	0.0
Span Bias	11.9	8.4
Span Gas	12.0	8.9

Post-run Bias at 12:37

Zero Bias	0.1	0.0
Span Bias	12.0	8.4
Span Gas	12.0	8.9

Run averages corrected for the average of the pre-run and post-run bias

20.9	0.1

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number:
Location: **Fayetteville, NC** | Operator: **CMH**
Source: **VE North** | Calibration **1** | Date: **17 Apr 2019**

Start Time: 12:37

O_2

Method: EPA 3A

Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.0	12.0	0.0	0.0	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	11.9	12.0	0.1	0.5	Pass

*Bias No. 1

CO_2

Method: EPA 3A

Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.4	-0.2	-1.2	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.4	8.4	0.0	0.0	Pass

*Bias No. 1

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Time	O_2 %	CO_2 %
	Start R2	
13:47	20.7	0.1
13:48	20.7	0.1
13:49	20.7	0.0
13:50	20.7	0.1
13:51	20.7	0.1
13:52	20.7	0.1
13:53	20.7	0.1
13:54	20.7	0.1
13:55	20.6	0.1
13:56	20.6	0.1
13:57	20.7	0.1
13:58	20.7	0.1
13:59	20.7	0.1
14:00	20.7	0.1
14:01	20.6	0.1
14:02	20.7	0.1
14:03	20.7	0.1
14:04	20.7	0.1
14:05	20.7	0.1
14:06	20.7	0.1
14:07	20.7	0.1
14:08	20.7	0.1
14:09	20.7	0.1
14:10	20.7	0.1
14:11	20.7	0.1
14:12	20.7	0.1
14:13	20.7	0.1
14:14	20.7	0.1
14:15	20.7	0.1
14:16	20.7	0.1
14:17	20.7	0.1
14:18	20.7	0.1
14:19	20.7	0.1
14:20	20.7	0.1
14:21	20.7	0.1
14:22	20.7	0.1
14:23	20.7	0.1
14:24	20.7	0.1
14:25	20.7	0.1

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Time	O_2 %	CO_2 %
14:26	20.7	0.1
14:27	20.8	0.1
14:28	20.8	0.1
14:29	20.8	0.1
14:30	20.8	0.1
14:31	20.8	0.1
14:32	20.8	0.1
14:33	20.8	0.1
Port Change Start Port B		
14:59	20.7	0.1
15:00	20.7	0.0
15:01	20.7	0.1
15:02	20.7	0.1
15:03	20.7	0.1
15:04	20.6	0.1
15:05	20.6	0.1
15:06	20.6	0.1
15:07	20.6	0.1
15:08	20.6	0.1
15:09	20.6	0.1
15:10	20.7	0.1
15:11	20.7	0.1
15:12	20.7	0.1
15:13	20.7	0.1
15:14	20.7	0.1
15:15	20.8	0.1
15:16	20.8	0.1
15:17	20.8	0.1
15:18	20.8	0.1
15:19	20.8	0.1
15:20	20.8	0.1
15:21	20.8	0.1
15:22	20.8	0.1
15:23	20.8	0.1
15:24	20.8	0.1
15:25	20.8	0.1
15:26	20.8	0.1
15:27	20.8	0.1
15:28	20.8	0.1

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **17 Apr 2019**

Time	O_2 %	CO_2 %
15:29	20.8	0.1
15:30	20.8	0.1
15:31	20.8	0.1
15:32	20.8	0.1
15:33	20.8	0.1
15:34	20.8	0.1
15:35	20.8	0.1
15:36	20.8	0.1
15:37	20.8	0.1
15:38	20.8	0.1
15:39	20.8	0.1
15:40	20.8	0.1
15:41	20.8	0.1
15:42	20.8	0.1
15:43	20.8	0.1
15:44	20.8	0.1
15:45	20.8	0.1
15:46	20.8	0.1
15:47	20.8	0.1
	End R2	
Avgs	**20.7**	**0.1**

RUN SUMMARY

Number 2

Client: **Chemours** Project Number:
Location: **Fayetteville, NC** Operator: **CMH**
Source: **VE North** Calibration **1** Date: **17 Apr 2019**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 13:46 to 15:47

Run Averages

20.7	0.1

Pre-run Bias at 12:37

Zero Bias	0.1	0.0
Span Bias	12.0	8.4
Span Gas	12.0	8.9

Post-run Bias at 16:27

Zero Bias	0.1	0.0
Span Bias	11.9	8.4
Span Gas	12.0	8.9

Run averages corrected for the average of the pre-run and post-run bias

20.9	0.1

BIAS AND CALIBRATION DRIFT

Number 3

Client: **Chemours** | Project Number:
Location: **Fayetteville, NC** | Operator: **CMH**
Source: **VE North** | Calibration **1** | Date: **17 Apr 2019**

Start Time: 16:27

O_2

Method: EPA 3A

Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.0	11.9	-0.1	-0.5	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	12.0	11.9	-0.1	-0.5	Pass

*Bias No. 2

CO_2

Method: EPA 3A

Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.4	-0.2	-1.2	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.4	8.4	0.0	0.0	Pass

*Bias No. 2

METHODS AND ANALYZERS

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Project Number:
Operator: **CMH**
Date: **18 Apr 2019**

File: C:\DATA\Chemours\041819.cem
Program Version: 2.1, built 19 May 2017 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

Analyte	**O_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.0**

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.6**

CALIBRATION DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Project Number:
Operator: **CMH**
Date: **18 Apr 2019**

Start Time: 07:24

O_2

Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	**Cylinder ID**
12.0	CC18055
21.0	SG9169108

Calibration Results

Zero	3 mv
Span, 21.0 %	7997 mv

Curve Coefficients

Slope	**Intercept**
380.7	3

CO_2

Method: EPA 3A
Calibration Type: Linear Zero and High Span

Calibration Standards

%	**Cylinder ID**
8.9	CC18055
16.6	SG9169108

Calibration Results

Zero	-1 mv
Span, 16.6 %	8290 mv

Curve Coefficients

Slope	**Intercept**
500.1	-1

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** Project Number:
Location: **Fayetteville, NC** Operator: **CMH**
Source: **VE North** Calibration **1** Date: **18 Apr 2019**

Start Time: 07:24

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 380.7 **Intercept** 3.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.0	12.0	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.6 %
Slope 500.1 **Intercept** -1.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.6	-0.3	-1.8	Pass
16.6	16.6	0.0	0.0	Pass

BIAS

Number 1

Client: **Chemours** | Project Number:
Location: **Fayetteville, NC** | Operator: **CMH**
Source: **VE North** | Calibration **1** | Date: **18 Apr 2019**

Start Time: 07:28

O_2

Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.0	12.0	0.0	0.0	Pass

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.4	-0.2	-1.2	Pass

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **18 Apr 2019**

Time	O_2 %	CO_2 %
	start R3	
09:23	20.8	0.0
09:24	20.8	0.0
09:25	20.8	0.0
09:26	20.8	0.0
09:27	20.8	0.0
09:28	20.8	0.0
09:29	20.8	0.0
09:30	20.8	0.0
09:31	20.8	0.0
09:32	20.8	0.0
09:33	20.8	0.0
09:34	20.8	0.0
09:35	20.8	0.0
09:36	20.8	0.0
09:37	20.8	0.0
09:38	20.8	0.0
09:39	20.8	0.0
09:40	20.8	0.0
09:41	20.8	0.0
09:42	20.8	0.0
09:43	20.8	0.0
09:44	20.8	0.0
09:45	20.8	0.0
09:46	20.8	0.0
09:47	20.8	0.0
09:48	20.8	0.0
09:49	20.8	0.0
09:50	20.8	0.0
09:51	20.8	0.0
09:52	20.8	0.0
09:53	20.8	0.0
09:54	20.8	0.0
09:55	20.8	0.0
09:56	20.8	0.0
09:57	20.8	0.0
09:58	20.8	0.0
09:59	20.8	0.0
10:00	20.8	0.0
10:01	20.8	0.0

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **18 Apr 2019**

Time	O_2 %	CO_2 %
10:02	20.8	0.0
10:03	20.8	0.0
10:04	20.8	0.0
10:05	20.8	0.0
10:06	20.8	0.0
10:07	20.8	0.0
10:08	20.8	0.0
10:09	20.8	0.0
10:10	20.8	0.0
Port Change Start Port B		
10:29	20.8	0.0
10:30	20.8	0.0
10:31	20.8	0.0
10:32	20.8	0.0
10:33	20.8	0.0
10:34	20.8	0.0
10:35	20.8	0.0
10:36	20.8	0.0
10:37	20.8	0.0
10:38	20.8	0.0
10:39	20.8	0.0
10:40	20.8	0.0
10:41	20.8	0.0
10:42	20.8	0.0
10:43	20.8	0.0
10:44	20.8	0.0
10:45	20.8	0.0
10:46	20.8	0.0
10:47	20.8	0.0
10:48	20.8	0.0
10:49	20.8	0.0
10:50	20.8	0.0
10:51	20.8	0.0
10:52	20.8	0.0
10:53	20.8	0.0
10:54	20.8	0.0
10:55	20.8	0.0
10:56	20.8	0.0
10:57	20.8	0.0

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **VE North**

Calibration **1**

Project Number:
Operator: **CMH**
Date: **18 Apr 2019**

Time	O_2 %	CO_2 %
10:58	20.8	0.0
10:59	20.9	0.0
11:00	20.9	0.0
11:01	20.9	0.0
11:02	20.9	0.0
11:03	20.9	0.0
11:04	20.9	0.0
11:05	20.9	0.0
11:06	20.9	0.0
11:07	20.9	0.0
11:08	20.9	0.0
11:09	20.9	0.0
11:10	20.9	0.0
11:11	20.9	0.0
11:12	20.9	0.0
11:13	20.9	0.0
11:14	20.9	0.0
11:15	20.9	0.0
11:16	20.9	0.0
	End R3	
Avgs	**20.8**	**0.0**

RUN SUMMARY

Number 1

Client: **Chemours** Project Number:
Location: **Fayetteville, NC** Operator: **CMH**
Source: **VE North** Calibration **1** Date: **18 Apr 2019**

	O_2	CO_2
Method	EPA 3A	EPA 3A
Conc. Units	%	%

Time: 09:22 to 11:16

Run Averages

20.8	0.0

Pre-run Bias at 07:28

Zero Bias	0.0	0.0
Span Bias	12.0	8.4
Span Gas	12.0	8.9

Post-run Bias at 07:28

Zero Bias	0.0	0.0
Span Bias	12.0	8.4
Span Gas	12.0	8.9

Run averages corrected for the average of the pre-run and post-run bias

20.8	0.0

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number:
Location: **Fayetteville, NC** | Operator: **CMH**
Source: **VE North** | Calibration **1** | Date: **18 Apr 2019**

Start Time: 07:28

O_2

Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.0	12.0	0.0	0.0	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.0	12.0	0.0	0.0	Pass

*Bias No. 1

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.4	-0.2	-1.2	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.4	8.4	0.0	0.0	Pass

*Bias No. 1

APPENDIX C
LABORATORY ANALYTICAL REPORT

Note: The analytical report is included on the attached CD.

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

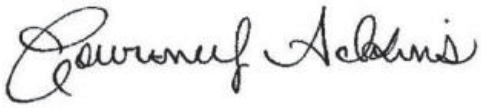
Job Number: 140-15031-1

Job Description: VEN Carbon Bed Inlet

Contract Number: LBIO-67048

For:
Chemours Company FC, LLC The
c/o AECOM
Sabre Building, Suite 300
4051 Ogletown Road
Newark, DE 19713

Attention: Michael Aucoin



Approved for release.
Courtney M Adkins
Project Manager I
5/6/2019 3:46 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
05/06/2019

Table of Contents

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Qualifiers

LCMS

Qualifier	Qualifier Description
D	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
X	Surrogate is outside control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Chemours Company FC, LLC The
Project/Site: VEN Carbon Bed Inlet

Job ID: 140-15031-1

Method	Method Description	Protocol	Laboratory
8321A	HFPO-DA	SW846	TAL DEN
8321A	PFOA and PFOS	SW846	TAL DEN
None	Leaching Procedure	TAL SOP	TAL DEN
None	Leaching Procedure for Condensate	TAL SOP	TAL DEN
None	Leaching Procedure for XAD	TAL SOP	TAL DEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

Sample Summary

Client: Chemours Company FC, LLC The
Project/Site: VEN Carbon Bed Inlet

Job ID: 140-15031-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-15031-1	E-2112,2113 VEN CB INLET R1 M0010 FH	Air	04/17/19 00:00	04/19/19 07:00
140-15031-2	E-2114,2115,2117 VEN CB INLET R1 M0010 BH	Air	04/17/19 00:00	04/19/19 07:00
140-15031-3	E-2116 VEN CB INLET R1 M0010 IMP 1,2&3 CONDENSATE	Air	04/17/19 00:00	04/19/19 07:00
140-15031-4	E-2118 VEN CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/17/19 00:00	04/19/19 07:00
140-15031-5	E-2119,2120 VEN CB INLET R2 M0010 FH	Air	04/18/19 00:00	04/19/19 07:00
140-15031-6	E-2121,2122,2124 VEN CB INLET R2 M0010 BH	Air	04/18/19 00:00	04/19/19 07:00
140-15031-7	E-2123 VEN CB INLET R2 M0010 IMP 1,2&3 CONDENSATE	Air	04/18/19 00:00	04/19/19 07:00
140-15031-8	E-2125 VEN CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/18/19 00:00	04/19/19 07:00
140-15031-9	E-2126,2127 VEN CB INLET R3 M0010 FH	Air	04/18/19 00:00	04/19/19 07:00
140-15031-10	E-2128,2129,2131 VEN CB INLET R3 M0010 BH	Air	04/18/19 00:00	04/19/19 07:00
140-15031-11	E-2130 VEN CB INLET R3 M0010 IMP 1,2&3 CONDENSATE	Air	04/18/19 00:00	04/19/19 07:00
140-15031-12	E-2132 VEN CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/18/19 00:00	04/19/19 07:00

Job Narrative
140-15031-1

Sample Receipt

The samples were received on April 19, 2019 at 7:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 1.1º C.

Method 0010/Method 3542 Sampling Train Preparation

Train fractions were extracted and prepared for analysis in TestAmerica's Knoxville laboratory. Extracts and condensate samples were forwarded to the Denver laboratory for HFPO-DA analysis. All results are reported in "Total ug" per sample.

Quality Control and Data Interpretation

Unless otherwise noted, all holding times, and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

LCMS

Method 8321A: The Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: E-2118 VEN CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15031-4), E-2121,2122,2124 VEN CB INLET R2 M0010 BH (140-15031-6), E-2125 VEN CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15031-8) and E-2132 VEN CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15031-12). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the sample(s). All detection limits are below the lower calibration.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Comments

Reporting Limits (RLs) and Method Detection Limits (MDLs) for the HFPO-DA used in this report were derived in Denver for reporting soils and water samples. Method 0010 sampling train matrix specific RLs and MDLs have not been established for HFPO-DA. The soil and water limits are expected to be reasonable approximations of the actual matrix specific limits, under these conditions.

Breakthrough from the Modified Method 0010 Sampling Train for PFAS compounds will be measured by the percentage (%) concentration of a specific PFAS target analyte determined to be present in the Breakthrough XAD-2 resin module of a test run. If the concentration of a specific PFAS compound is ≤30% of the sum of the concentrations determined for the other three (3) fractions of the sampling train, then sampling breakthrough is determined not to have occurred. Also, no breakthrough will be determined to have occurred if < 250 µg of a target analyte is collected on all fractions of a sampling train. Breakthrough the sampling train implies that sample loss through the train has occurred and results in a negative bias to the sample results.

LCMS

Analysis Batch: 436957

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-436957/13	Lab Control Sample	Total/NA	Air	8321A	

Prep Batch: 455653

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15031-1	E-2112,2113 VEN CB INLET R1 M0010 FH	Total/NA	Air	None	
140-15031-5	E-2119,2120 VEN CB INLET R2 M0010 FH	Total/NA	Air	None	
140-15031-9	E-2126,2127 VEN CB INLET R3 M0010 FH	Total/NA	Air	None	
MB 280-455653/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455653/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 455736

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15031-3	E-2116 VEN CB INLET R1 M0010 IMP 1,2&3 CC	Total/NA	Air	None	
140-15031-7	E-2123 VEN CB INLET R2 M0010 IMP 1,2&3 CC	Total/NA	Air	None	
140-15031-11	E-2130 VEN CB INLET R3 M0010 IMP 1,2&3 CC	Total/NA	Air	None	
MB 280-455736/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455736/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 455752

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15031-2	E-2114,2115,2117 VEN CB INLET R1 M0010 BH	Total/NA	Air	None	
140-15031-4	E-2118 VEN CB INLET R1 M0010 BREAKTHRO	Total/NA	Air	None	
140-15031-6	E-2121,2122,2124 VEN CB INLET R2 M0010 BH	Total/NA	Air	None	
140-15031-8	E-2125 VEN CB INLET R2 M0010 BREAKTHRO	Total/NA	Air	None	
140-15031-10	E-2128,2129,2131 VEN CB INLET R3 M0010 BH	Total/NA	Air	None	
140-15031-12	E-2132 VEN CB INLET R3 M0010 BREAKTHRO	Total/NA	Air	None	
MB 280-455752/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455752/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 456394

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15031-1	E-2112,2113 VEN CB INLET R1 M0010 FH	Total/NA	Air	8321A	455653
140-15031-2	E-2114,2115,2117 VEN CB INLET R1 M0010 BH	Total/NA	Air	8321A	455752
140-15031-3	E-2116 VEN CB INLET R1 M0010 IMP 1,2&3 CC	Total/NA	Air	8321A	455736
140-15031-4	E-2118 VEN CB INLET R1 M0010 BREAKTHRO	Total/NA	Air	8321A	455752
140-15031-5	E-2119,2120 VEN CB INLET R2 M0010 FH	Total/NA	Air	8321A	455653
140-15031-6	E-2121,2122,2124 VEN CB INLET R2 M0010 BH	Total/NA	Air	8321A	455752
140-15031-7	E-2123 VEN CB INLET R2 M0010 IMP 1,2&3 CC	Total/NA	Air	8321A	455736
140-15031-8	E-2125 VEN CB INLET R2 M0010 BREAKTHRO	Total/NA	Air	8321A	455752
140-15031-9	E-2126,2127 VEN CB INLET R3 M0010 FH	Total/NA	Air	8321A	455653
140-15031-10	E-2128,2129,2131 VEN CB INLET R3 M0010 BH	Total/NA	Air	8321A	455752
140-15031-11	E-2130 VEN CB INLET R3 M0010 IMP 1,2&3 CC	Total/NA	Air	8321A	455736
140-15031-12	E-2132 VEN CB INLET R3 M0010 BREAKTHRO	Total/NA	Air	8321A	455752
MB 280-455653/1-A	Method Blank	Total/NA	Air	8321A	455653
MB 280-455736/1-A	Method Blank	Total/NA	Air	8321A	455736
MB 280-455752/1-A	Method Blank	Total/NA	Air	8321A	455752
LCS 280-455653/2-A	Lab Control Sample	Total/NA	Air	8321A	455653
LCS 280-455736/2-A	Lab Control Sample	Total/NA	Air	8321A	455736
LCS 280-455752/2-A	Lab Control Sample	Total/NA	Air	8321A	455752

Client Sample ID: E-2112,2113 VEN CB INLET R1 M0010 FH

Lab Sample ID: 140-15031-1

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	20.7		0.760	0.0821	ug/Sample		04/23/19 15:35	04/29/19 11:13	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:13*	*10*

Client Sample ID: E-2114,2115,2117 VEN CB INLET R1 M0010 BH

Lab Sample ID: 140-15031-2

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	178		2.00	0.400	ug/Sample		04/24/19 07:26	04/29/19 12:44	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*59*	*D*	*50 - 200*	*04/24/19 07:26*	*04/29/19 12:44*	*10*

Client Sample ID: E-2116 VEN CB INLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15031-3

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.188	0.00959	ug/Sample		04/24/19 03:41	04/29/19 11:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*70*		*50 - 200*	*04/24/19 03:41*	*04/29/19 11:58*	*1*

Client Sample ID: E-2118 VEN CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15031-4

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 12:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*42*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 12:50*	*1*

Client Sample ID: E-2119,2120 VEN CB INLET R2 M0010 FH

Lab Sample ID: 140-15031-5

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	26.4		0.760	0.0821	ug/Sample		04/23/19 15:35	04/29/19 11:16	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*77*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:16*	*10*

Client Sample ID: E-2121,2122,2124 VEN CB INLET R2 M0010 BH

Lab Sample ID: 140-15031-6

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	537		10.0	2.00	ug/Sample		04/24/19 07:26	04/29/19 12:53	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*46*	*X D*	*50 - 200*	*04/24/19 07:26*	*04/29/19 12:53*	*50*

Client Sample ID: E-2123 VEN CB INLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15031-7

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	18.2		0.206	0.0105	ug/Sample		04/24/19 03:41	04/29/19 12:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*65*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:01*	*1*

Client Sample ID: E-2125 VEN CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15031-8

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.985		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 12:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*35*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 12:57*	*1*

Client Sample ID: E-2126,2127 VEN CB INLET R3 M0010 FH

Lab Sample ID: 140-15031-9

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	18.3		0.203	0.0219	ug/Sample		04/23/19 15:35	04/29/19 11:19	2

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*73*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:19*	*2*

Client Sample ID: E-2128,2129,2131 VEN CB INLET R3 M0010 BH

Lab Sample ID: 140-15031-10

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	124		2.00	0.400	ug/Sample		04/24/19 07:26	04/29/19 13:00	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*61*	*D*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:00*	*10*

Client Sample ID: E-2130 VEN CB INLET R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15031-11

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0726	J	0.204	0.0104	ug/Sample		04/24/19 03:41	04/29/19 12:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*67*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:05*	*1*

Client Sample ID: E-2132 VEN CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15031-12

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.205		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*44*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:03*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: VEN Carbon Bed Inlet

Job ID: 140-15031-1

Method: 8321A - HFPO-DA

Prep: None

Analyte	RL	MDL	Units
HFPO-DA	0.00250	0.00128	ug/Sample

Method: 8321A - PFOA and PFOS

Prep: None

Analyte	RL	MDL	Units
HFPO-DA	0.0250	0.00270	ug/Sample
HFPO-DA	0.100	0.0200	ug/Sample

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ANALYTICAL REPORT

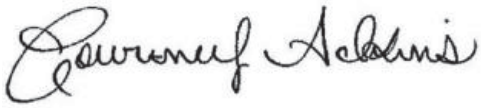
Job Number: 140-15035-1

Job Description: VEN Carbon Bed Outlet

Contract Number: LBIO-67048

For:
Chemours Company FC, LLC The
c/o AECOM
Sabre Building, Suite 300
4051 Ogletown Road
Newark, DE 19713

Attention: Michael Aucoin



Approved for release.
Courtney M Adkins
Project Manager I
5/6/2019 4:14 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
05/06/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
D	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
X	Surrogate is outside control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Chemours Company FC, LLC The
Project/Site: VEN Carbon Bed Outlet

Job ID: 140-15035-1

Method	Method Description	Protocol	Laboratory
8321A	HFPO-DA	SW846	TAL DEN
8321A	PFOA and PFOS	SW846	TAL DEN
None	Leaching Procedure	TAL SOP	TAL DEN
None	Leaching Procedure for Condensate	TAL SOP	TAL DEN
None	Leaching Procedure for XAD	TAL SOP	TAL DEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

Sample Summary

Client: Chemours Company FC, LLC The
Project/Site: VEN Carbon Bed Outlet

Job ID: 140-15035-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-15035-1	K-2112,2113 VEN CB OUTLET R1 M0010 FH	Air	04/17/19 00:00	04/19/19 07:00
140-15035-2	K-2114,2115,2117 VEN CB OUTLET R1 M0010 BH	Air	04/17/19 00:00	04/19/19 07:00
140-15035-3	K-2116 VEN CB OUTLET R1 M0010 IMP 1,2&3 CONDENSATE	Air	04/17/19 00:00	04/19/19 07:00
140-15035-4	K-2118 VEN CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/17/19 00:00	04/19/19 07:00
140-15035-5	K-2119,2120 VEN CB OUTLET R2 M0010 FH	Air	04/17/19 00:00	04/19/19 07:00
140-15035-6	K-2121,2122,2124 VEN CB OUTLET R2 M0010 BH	Air	04/17/19 00:00	04/19/19 07:00
140-15035-7	K-2123 VEN CB OUTLET R2 M0010 IMP 1,2&3 CONDENSATE	Air	04/17/19 00:00	04/19/19 07:00
140-15035-8	K-2125 VEN CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/17/19 00:00	04/19/19 07:00
140-15035-9	K-2126,2127 VEN CB OUTLET R3 M0010 FH	Air	04/18/19 00:00	04/19/19 07:00
140-15035-10	K-2128,2129,2131 VEN CB OUTLET R3 M0010 BH	Air	04/18/19 00:00	04/19/19 07:00
140-15035-11	K-2130 VEN CB OUTLET R3 M0010 IMP 1,2&3 CONDENSATE	Air	04/18/19 00:00	04/19/19 07:00
140-15035-12	K-2132 VEN CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/18/19 00:00	04/19/19 07:00

Job Narrative
140-15035-1

Sample Receipt

The samples were received on April 19, 2019 at 7:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 2.5º C.

Method 0010/Method 3542 Sampling Train Preparation

Train fractions were extracted and prepared for analysis in TestAmerica's Knoxville laboratory. Extracts and condensate samples were forwarded to the Denver laboratory for HFPO-DA analysis. All results are reported in "Total ug" per sample.

Quality Control and Data Interpretation

Unless otherwise noted, all holding times, and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

LCMS

Method 8321A: The Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: K-2114,2115,2117 VEN CB OUTLET R1 M0010 BH (140-15035-2), K-2118 VEN CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15035-4), K-2121,2122,2124 VEN CB OUTLET R2 M0010 BH (140-15035-6), K-2125 VEN CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15035-8), K-2128,2129,2131 VEN CB OUTLET R3 M0010 BH (140-15035-10) and K-2132 VEN CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15035-12). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the sample(s). All detection limits are below the lower calibration.preparation batch 280-455945 and analytical batch 280-456611 HFPO

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Comments

Reporting Limits (RLs) and Method Detection Limits (MDLs) for the HFPO-DA used in this report were derived in Denver for reporting soils and water samples. Method 0010 sampling train matrix specific RLs and MDLs have not been established for HFPO-DA. The soil and water limits are expected to be reasonable approximations of the actual matrix specific limits, under these conditions.

Breakthrough from the Modified Method 0010 Sampling Train for PFAS compounds will be measured by the percentage (%) concentration of a specific PFAS target analyte determined to be present in the Breakthrough XAD-2 resin module of a test run. If the concentration of a specific PFAS compound is ≤30% of the sum of the concentrations determined for the other three (3) fractions of the sampling train, then sampling breakthrough is determined not to have occurred. Also, no breakthrough will be determined to have occurred if < 250 µg of a target analyte is collected on all fractions of a sampling train. Breakthrough the sampling train implies that sample loss through the train has occurred and results in a negative bias to the sample results.

LCMS

Analysis Batch: 436957

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-436957/13	Lab Control Sample	Total/NA	Air	8321A	

Prep Batch: 455653

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15035-1	K-2112,2113 VEN CB OUTLET R1 M0010 FH	Total/NA	Air	None	
140-15035-5	K-2119,2120 VEN CB OUTLET R2 M0010 FH	Total/NA	Air	None	
140-15035-9	K-2126,2127 VEN CB OUTLET R3 M0010 FH	Total/NA	Air	None	
MB 280-455653/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455653/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 455736

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15035-3	K-2116 VEN CB OUTLET R1 M0010 IMP 1,2&3 (	Total/NA	Air	None	
140-15035-7	K-2123 VEN CB OUTLET R2 M0010 IMP 1,2&3 (	Total/NA	Air	None	
140-15035-11	K-2130 VEN CB OUTLET R3 M0010 IMP 1,2&3 (	Total/NA	Air	None	
MB 280-455736/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455736/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 455945

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15035-2	K-2114,2115,2117 VEN CB OUTLET R1 M0010 I	Total/NA	Air	None	
140-15035-4	K-2118 VEN CB OUTLET R1 M0010 BREAKTHF	Total/NA	Air	None	
140-15035-6	K-2121,2122,2124 VEN CB OUTLET R2 M0010 I	Total/NA	Air	None	
140-15035-8	K-2125 VEN CB OUTLET R2 M0010 BREAKTHF	Total/NA	Air	None	
140-15035-10	K-2128,2129,2131 VEN CB OUTLET R3 M0010 I	Total/NA	Air	None	
140-15035-12	K-2132 VEN CB OUTLET R3 M0010 BREAKTHF	Total/NA	Air	None	
MB 280-455945/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455945/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 456394

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15035-1	K-2112,2113 VEN CB OUTLET R1 M0010 FH	Total/NA	Air	8321A	455653
140-15035-3	K-2116 VEN CB OUTLET R1 M0010 IMP 1,2&3 (	Total/NA	Air	8321A	455736
140-15035-5	K-2119,2120 VEN CB OUTLET R2 M0010 FH	Total/NA	Air	8321A	455653
140-15035-7	K-2123 VEN CB OUTLET R2 M0010 IMP 1,2&3 (	Total/NA	Air	8321A	455736
140-15035-9	K-2126,2127 VEN CB OUTLET R3 M0010 FH	Total/NA	Air	8321A	455653
140-15035-11	K-2130 VEN CB OUTLET R3 M0010 IMP 1,2&3 (	Total/NA	Air	8321A	455736
MB 280-455653/1-A	Method Blank	Total/NA	Air	8321A	455653
MB 280-455736/1-A	Method Blank	Total/NA	Air	8321A	455736
LCS 280-455653/2-A	Lab Control Sample	Total/NA	Air	8321A	455653
LCS 280-455736/2-A	Lab Control Sample	Total/NA	Air	8321A	455736

Analysis Batch: 456611

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15035-2	K-2114,2115,2117 VEN CB OUTLET R1 M0010 I	Total/NA	Air	8321A	455945
140-15035-4	K-2118 VEN CB OUTLET R1 M0010 BREAKTHF	Total/NA	Air	8321A	455945
140-15035-6	K-2121,2122,2124 VEN CB OUTLET R2 M0010 I	Total/NA	Air	8321A	455945
140-15035-8	K-2125 VEN CB OUTLET R2 M0010 BREAKTHF	Total/NA	Air	8321A	455945
140-15035-10	K-2128,2129,2131 VEN CB OUTLET R3 M0010 I	Total/NA	Air	8321A	455945
140-15035-12	K-2132 VEN CB OUTLET R3 M0010 BREAKTHF	Total/NA	Air	8321A	455945
MB 280-455945/1-A	Method Blank	Total/NA	Air	8321A	455945

LCMS (Continued)

Analysis Batch: 456611 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 280-455945/2-A	Lab Control Sample	Total/NA	Air	8321A	455945

Client Sample ID: K-2112,2113 VEN CB OUTLET R1 M0010 FH

Lab Sample ID: 140-15035-1

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	57.5		0.760	0.0821	ug/Sample		04/23/19 15:35	04/29/19 11:42	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:42*	*10*

Client Sample ID: K-2114,2115,2117 VEN CB OUTLET R1 M0010 BH

Lab Sample ID: 140-15035-2

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	6.16		0.200	0.0400	ug/Sample		04/25/19 15:30	05/01/19 10:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*36*	*X*	*50 - 200*	*04/25/19 15:30*	*05/01/19 10:04*	*1*

Client Sample ID: K-2116 VEN CB OUTLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15035-3

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.192	0.00979	ug/Sample		04/24/19 03:41	04/29/19 12:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*65*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:27*	*1*

Client Sample ID: K-2118 VEN CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15035-4

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0489	J	0.200	0.0400	ug/Sample		04/25/19 15:30	05/01/19 10:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*42*	*X*	*50 - 200*	*04/25/19 15:30*	*05/01/19 10:07*	*1*

Client Sample ID: K-2119,2120 VEN CB OUTLET R2 M0010 FH

Lab Sample ID: 140-15035-5

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	52.3		0.510	0.0551	ug/Sample		04/23/19 15:35	04/29/19 11:45	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*74*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:45*	*10*

Client Sample ID: K-2121,2122,2124 VEN CB OUTLET R2 M0010 BH

Lab Sample ID: 140-15035-6

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	5.71		0.250	0.0500	ug/Sample		04/25/19 15:30	05/01/19 10:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*40*	*X*	*50 - 200*	*04/25/19 15:30*	*05/01/19 10:10*	*1*

Client Sample ID: K-2123 VEN CB OUTLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15035-7

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.198	J	0.206	0.0105	ug/Sample		04/24/19 03:41	04/29/19 12:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:31*	*1*

Client Sample ID: K-2125 VEN CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15035-8

Date Collected: 04/17/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		04/25/19 15:30	05/01/19 10:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*41*	*X*	*50 - 200*	*04/25/19 15:30*	*05/01/19 10:13*	*1*

Client Sample ID: K-2126,2127 VEN CB OUTLET R3 M0010 FH

Lab Sample ID: 140-15035-9

Date Collected: 04/18/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	97.4		1.02	0.110	ug/Sample		04/23/19 15:35	04/29/19 11:48	20

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*71*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:48*	*20*

Client Sample ID: K-2128,2129,2131 VEN CB OUTLET R3 M0010 BH

Lab Sample ID: 140-15035-10

Date Collected: 04/18/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	8.00		0.200	0.0400	ug/Sample		04/25/19 15:30	05/01/19 10:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*35*	*X*	*50 - 200*	*04/25/19 15:30*	*05/01/19 10:17*	*1*

Client Sample ID: K-2130 VEN CB OUTLET R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15035-11

Date Collected: 04/18/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.204	0.0104	ug/Sample		04/24/19 03:41	04/29/19 12:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*64*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:34*	*1*

Client Sample ID: K-2132 VEN CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15035-12

Date Collected: 04/18/19 00:00
Matrix: Air
Date Received: 04/19/19 07:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0846	J	0.200	0.0400	ug/Sample		04/25/19 15:30	05/01/19 10:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*42*	*X*	*50 - 200*	*04/25/19 15:30*	*05/01/19 10:20*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: VEN Carbon Bed Outlet

Job ID: 140-15035-1

Method: 8321A - HFPO-DA

Prep: None

Analyte	RL	MDL	Units
HFPO-DA	0.00250	0.00128	ug/Sample

Method: 8321A - PFOA and PFOS

Prep: None

Analyte	RL	MDL	Units
HFPO-DA	0.0250	0.00270	ug/Sample
HFPO-DA	0.100	0.0200	ug/Sample

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ANALYTICAL REPORT

Job Number: 140-15034-1

Job Description: Division Stack

Contract Number: LBIO-67048

For:
Chemours Company FC, LLC The
c/o AECOM
Sabre Building, Suite 300
4051 Ogletown Road
Newark, DE 19713

Attention: Michael Aucoin

Approved for release.
Courtney M Adkins
Project Manager I
5/6/2019 3:52 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
05/06/2019

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Definitions/Glossary

Client: Chemours Company FC, LLC The
Project/Site: Division Stack

Job ID: 140-15034-1

Qualifiers

LCMS

Qualifier	Qualifier Description
D	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
X	Surrogate is outside control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Chemours Company FC, LLC The
Project/Site: Division Stack

Job ID: 140-15034-1

Method	Method Description	Protocol	Laboratory
8321A	HFPO-DA	SW846	TAL DEN
8321A	PFOA and PFOS	SW846	TAL DEN
None	Leaching Procedure	TAL SOP	TAL DEN
None	Leaching Procedure for Condensate	TAL SOP	TAL DEN
None	Leaching Procedure for XAD	TAL SOP	TAL DEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100

Sample Summary

Client: Chemours Company FC, LLC The
Project/Site: Division Stack

Job ID: 140-15034-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-15034-1	D-1877,1878 DIV STACK OUTLET R1 M0010 FH	Air	04/17/19 00:00	04/19/19 07:00
140-15034-2	D-1879,1880,1882 DIV STACK OUTLET R1 M0010 BH	Air	04/17/19 00:00	04/19/19 07:00
140-15034-3	D-1881 DIV STACK OUTLET R1 M0010 IMP 1,2&3 CONDENSATE	Air	04/17/19 00:00	04/19/19 07:00
140-15034-4	D-1883 DIV STACK OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/17/19 00:00	04/19/19 07:00
140-15034-5	D-1884,1885 DIV STACK OUTLET R2 M0010 FH	Air	04/17/19 00:00	04/19/19 07:00
140-15034-6	D-1886,1887,1889 DIV STACK OUTLET R2 M0010 BH	Air	04/17/19 00:00	04/19/19 07:00
140-15034-7	D-1888 DIV STACK OUTLET R2 M0010 IMP 1,2&3 CONDENSATE	Air	04/17/19 00:00	04/19/19 07:00
140-15034-8	D-1890 DIV STACK OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/17/19 00:00	04/19/19 07:00
140-15034-9	D-1891,1892 DIV STACK OUTLET R3 M0010 FH	Air	04/18/19 00:00	04/19/19 07:00
140-15034-10	D-1893,1894,1896 DIV STACK OUTLET R3 M0010 BH	Air	04/18/19 00:00	04/19/19 07:00
140-15034-11	D-1895 DIV STACK OUTLET R3 M0010 IMP 1,2&3 CONDENSATE	Air	04/18/19 00:00	04/19/19 07:00
140-15034-12	D-1897 DIV STACK OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/18/19 00:00	04/19/19 07:00

Job Narrative
140-15034-1

Sample Receipt

The samples were received on April 19, 2019 at 7:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 0.6º C.

Method 0010/Method 3542 Sampling Train Preparation

Train fractions were extracted and prepared for analysis in TestAmerica's Knoxville laboratory. Extracts and condensate samples were forwarded to the Denver laboratory for HFPO-DA analysis. All results are reported in "Total ug" per sample.

Quality Control and Data Interpretation

Unless otherwise noted, all holding times, and QC criteria were met and the test results shown in this report meet all applicable NELAC requirements.

LCMS

Method 8321A: The Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: D-1879,1880,1882 DIV STACK OUTLET R1 M0010 BH (140-15034-2), D-1883 DIV STACK OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15034-4), D-1886,1887,1889 DIV STACK OUTLET R2 M0010 BH (140-15034-6), D-1893,1894,1896 DIV STACK OUTLET R3 M0010 BH (140-15034-10) and D-1897 DIV STACK OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15034-12). Generally, data quality is not considered affected if the IDA signal-to-noise ratio is greater than 10:1, which is achieved for all IDA in the sample(s). All detection limits are below the lower calibration.

preparation batch 280-455752 and analytical batch 280-456394 HFPO

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Comments

Reporting Limits (RLs) and Method Detection Limits (MDLs) for the HFPO-DA used in this report were derived in Denver for reporting soils and water samples. Method 0010 sampling train matrix specific RLs and MDLs have not been established for HFPO-DA. The soil and water limits are expected to be reasonable approximations of the actual matrix specific limits, under these conditions.

Breakthrough from the Modified Method 0010 Sampling Train for PFAS compounds will be measured by the percentage (%) concentration of a specific PFAS target analyte determined to be present in the Breakthrough XAD-2 resin module of a test run. If the concentration of a specific PFAS compound is ≤30% of the sum of the concentrations determined for the other three (3) fractions of the sampling train, then sampling breakthrough is determined not to have occurred. Also, no breakthrough will be determined to have occurred if < 250 µg of a target analyte is collected on all fractions of a sampling train. Breakthrough the sampling train implies that sample loss through the train has occurred and results in a negative bias to the sample results.

LCMS

Analysis Batch: 436957

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-436957/13	Lab Control Sample	Total/NA	Air	8321A	

Prep Batch: 455653

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15034-1	D-1877,1878 DIV STACK OUTLET R1 M0010 FH	Total/NA	Air	None	
140-15034-5	D-1884,1885 DIV STACK OUTLET R2 M0010 FH	Total/NA	Air	None	
140-15034-9	D-1891,1892 DIV STACK OUTLET R3 M0010 FH	Total/NA	Air	None	
MB 280-455653/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455653/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 455736

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15034-3	D-1881 DIV STACK OUTLET R1 M0010 IMP 1,2	Total/NA	Air	None	
140-15034-7	D-1888 DIV STACK OUTLET R2 M0010 IMP 1,2	Total/NA	Air	None	
140-15034-11	D-1895 DIV STACK OUTLET R3 M0010 IMP 1,2	Total/NA	Air	None	
MB 280-455736/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455736/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 455752

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15034-2	D-1879,1880,1882 DIV STACK OUTLET R1 M00	Total/NA	Air	None	
140-15034-4	D-1883 DIV STACK OUTLET R1 M0010 BREAK	Total/NA	Air	None	
140-15034-6	D-1886,1887,1889 DIV STACK OUTLET R2 M00	Total/NA	Air	None	
140-15034-8	D-1890 DIV STACK OUTLET R2 M0010 BREAK	Total/NA	Air	None	
140-15034-10	D-1893,1894,1896 DIV STACK OUTLET R3 M00	Total/NA	Air	None	
140-15034-12	D-1897 DIV STACK OUTLET R3 M0010 BREAK	Total/NA	Air	None	
MB 280-455752/13-A	Method Blank	Total/NA	Air	None	
MB 280-455752/1-A	Method Blank	Total/NA	Air	None	
LCS 280-455752/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 456394

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15034-1	D-1877,1878 DIV STACK OUTLET R1 M0010 FH	Total/NA	Air	8321A	455653
140-15034-2	D-1879,1880,1882 DIV STACK OUTLET R1 M00	Total/NA	Air	8321A	455752
140-15034-3	D-1881 DIV STACK OUTLET R1 M0010 IMP 1,2	Total/NA	Air	8321A	455736
140-15034-4	D-1883 DIV STACK OUTLET R1 M0010 BREAK	Total/NA	Air	8321A	455752
140-15034-5	D-1884,1885 DIV STACK OUTLET R2 M0010 FH	Total/NA	Air	8321A	455653
140-15034-6	D-1886,1887,1889 DIV STACK OUTLET R2 M00	Total/NA	Air	8321A	455752
140-15034-7	D-1888 DIV STACK OUTLET R2 M0010 IMP 1,2	Total/NA	Air	8321A	455736
140-15034-8	D-1890 DIV STACK OUTLET R2 M0010 BREAK	Total/NA	Air	8321A	455752
140-15034-9	D-1891,1892 DIV STACK OUTLET R3 M0010 FH	Total/NA	Air	8321A	455653
140-15034-10	D-1893,1894,1896 DIV STACK OUTLET R3 M00	Total/NA	Air	8321A	455752
140-15034-11	D-1895 DIV STACK OUTLET R3 M0010 IMP 1,2	Total/NA	Air	8321A	455736
140-15034-12	D-1897 DIV STACK OUTLET R3 M0010 BREAK	Total/NA	Air	8321A	455752
MB 280-455653/1-A	Method Blank	Total/NA	Air	8321A	455653
MB 280-455736/1-A	Method Blank	Total/NA	Air	8321A	455736
MB 280-455752/13-A	Method Blank	Total/NA	Air	8321A	455752
MB 280-455752/1-A	Method Blank	Total/NA	Air	8321A	455752
LCS 280-455653/2-A	Lab Control Sample	Total/NA	Air	8321A	455653
LCS 280-455736/2-A	Lab Control Sample	Total/NA	Air	8321A	455736
LCS 280-455752/2-A	Lab Control Sample	Total/NA	Air	8321A	455752

Client Sample ID: D-1877,1878 DIV STACK OUTLET R1 M0010 FH

Lab Sample ID: 140-15034-1

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	63.6		1.01	0.109	ug/Sample		04/23/19 15:35	04/29/19 11:29	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*79*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:29*	*10*

Client Sample ID: D-1879,1880,1882 DIV STACK OUTLET R1 M0010 BH

Lab Sample ID: 140-15034-2

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	5.86		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*45*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:39*	*1*

Client Sample ID: D-1881 DIV STACK OUTLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15034-3

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.198	0.0101	ug/Sample		04/24/19 03:41	04/29/19 12:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:17*	*1*

Client Sample ID: D-1883 DIV STACK OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15034-4

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*49*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:43*	*1*

Client Sample ID: D-1884,1885 DIV STACK OUTLET R2 M0010 FH

Lab Sample ID: 140-15034-5

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	17.1		0.101	0.0109	ug/Sample		04/23/19 15:35	04/29/19 11:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*		*50 - 200*	*04/23/19 15:35*	*04/29/19 11:32*	*1*

Client Sample ID: D-1886,1887,1889 DIV STACK OUTLET R2 M0010 BH

Lab Sample ID: 140-15034-6

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	4.91		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*46*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:46*	*1*

Client Sample ID: D-1888 DIV STACK OUTLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15034-7

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.196	0.00999	ug/Sample		04/24/19 03:41	04/29/19 12:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*65*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:21*	*1*

Client Sample ID: D-1890 DIV STACK OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15034-8

Date Collected: 04/17/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*50*		*50 - 200*	*04/24/19 07:26*	*04/29/19 13:49*	*1*

Client Sample ID: D-1891,1892 DIV STACK OUTLET R3 M0010 FH

Lab Sample ID: 140-15034-9

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	58.7		1.01	0.109	ug/Sample		04/23/19 15:35	04/29/19 11:38	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*77*	*D*	*50 - 200*	*04/23/19 15:35*	*04/29/19 11:38*	*10*

Client Sample ID: D-1893,1894,1896 DIV STACK OUTLET R3 M0010 BH

Lab Sample ID: 140-15034-10

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	6.66		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*33*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:52*	*1*

Client Sample ID: D-1895 DIV STACK OUTLET R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15034-11

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0788	J	0.192	0.00979	ug/Sample		04/24/19 03:41	04/29/19 12:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*71*		*50 - 200*	*04/24/19 03:41*	*04/29/19 12:24*	*1*

Client Sample ID: D-1897 DIV STACK OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15034-12

Date Collected: 04/18/19 00:00
Date Received: 04/19/19 07:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		04/24/19 07:26	04/29/19 13:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*48*	*X*	*50 - 200*	*04/24/19 07:26*	*04/29/19 13:55*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: Division Stack

Job ID: 140-15034-1

Method: 8321A - HFPO-DA

Prep: None

Analyte	RL	MDL	Units
HFPO-DA	0.00250	0.00128	ug/Sample

Method: 8321A - PFOA and PFOS

Prep: None

Analyte	RL	MDL	Units
HFPO-DA	0.0250	0.00270	ug/Sample
HFPO-DA	0.100	0.0200	ug/Sample

APPENDIX D
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 1 | **Test Date: 4/17/2019**
Test Location: CBed Inlet | **Test Period: 0925-1148**

1. HFPO Dimer Acid concentration, lbs/dscf.

$$Conc1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm(std)}$$

$$Conc1 = \frac{198.7 \times 2.2046 \times 10\text{-}9}{35.267}$$

Conc1 = 1.24E-08

Where:

W = Weight of HFPO Dimer Acid collected in sample in ug

Conc1 = HFPO Dimer Acid concentration, lbs/dscf.

2.2046×10^{-9} = Conversion factor from ug to lbs.

2. HFPO Dimer Acid concentration, ug/dscm.

Conc2 = W / (Vm(std) x 0.02832)

Conc2 = 198.7 / (35.267 x 0.02832)

Conc2 = 198.9

Where:

Conc2 = HFPO Dimer Acid concentration, ug/dscm.

0.02832 = Conversion factor from cubic feet to cubic meters.

3. HFPO Dimer Acid mass emission rate, lbs/hr.

$MR1_{(Inlet)}$ = Conc1 x Qs(std) x 60 min/hr

$MR1_{(Inlet)}$ = 1.24E-08 x 9244 x 60

$MR1_{(Inlet)}$ = 6.89E-03

Where:

$MR1_{(Inlet)}$ = HFPO Dimer Acid mass emission rate, lbs/hr.

4. HFPO Dimer Acid mass emission rate, g/sec.

$MR2_{(Inlet)}$ = $MR1_{(Inlet)}$ x 453.59 / 3600

$MR2_{(Inlet)}$ = 6.89E-03 x 453.59 /3600

$MR2_{(Inlet)}$ = 8.67E-04

Where:

$MR2_{(Inlet)}$ = HFPO Dimer Acid mass emission rate, g/sec.

453.59 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

5. HFPO Dimer Acid Removal Efficiency, %

$$RE = \frac{MR1_{(Inlet)} - MR1_{(Outlet)}}{MR1_{(Inlet)}}$$

$$RE = \frac{(6.89E\text{-}03) - (2.09E\text{-}03)}{6.89E\text{-}03}$$

RE = 69.7

Where:

RE = Carbon Bed Removal Efficiency.

$MR1_{(Inlet)}$ = Carbon Bed Inlet HFPO Dimer Acid mass rate, lbs/hr.

$MR1_{(Outlet)}$ = Carbon Bed Outlet HFPO Dimer Acid mass rate, lbs/hr.

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 1	Test Date: 4/17/19
Test Location: VEN-Carbon Bed Inlet	Test Period: 0925-1148

1. Volume of dry gas sampled at standard conditions (68 deg F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times Vm \times \left(Pb + \frac{delta\ H}{13.6} \right)}{(Tm + 460)}$$

$$Vm(std) = \frac{17.64 \times 1.0100 \times 35.309 \times \left(30.17 + \frac{0.451}{13.6} \right)}{78.75 + 460} = 35.267$$

Where:

Vm(std) =	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
Vm =	Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
Pb =	Barometric Pressure, in Hg.
delt H =	Average pressure drop across the orifice meter, in H_2O
Tm =	Average dry gas meter temperature , deg F.
Y =	Dry gas meter calibration factor.
17.64 =	Factor that includes ratio of standard temperature (528 deg R) to standard pressure (29.92 in. Hg), deg R/in. Hg.
13.6 =	Specific gravity of mercury.

2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$Vw(std) = (0.04707 \times Vwc) + (0.04715 \times Wwsg)$$

$$Vw(std) = (0.04707 \times -4.0) + (0.04715 \times 6.6) = 0.12$$

Where:

Vw(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
Vwc =	Volume of liquid condensed in impingers, ml.
Wwsg =	Weight of water vapor collected in silica gel, g.
0.04707 =	Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), ft^3/ml.
0.04715 =	Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft^3/g.

3. Moisture content

$$bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$bws = \frac{0.12}{0.12 + 35.267} = 0.003$$

Where:

bws = Proportion of water vapor, by volume, in the gas stream, dimensionless.

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.003 = 0.997$$

Where:

Md = Mole fraction of dry gas, dimensionless.

5. Dry molecular weight of gas stream, lb/lb-mole.

$$MWd = (0.440 \times \%\ CO_2) + (0.320 \times \%\ O_2) + (0.280 \times (\%\ N_2 + \%\ CO))$$

$$MWd = (0.440 \times 0.0) + (0.320 \times 20.9) + (0.280 \times (79.1 + 0.00))$$

$$MWd = 28.84$$

Where:

MWd = Dry molecular weight , lb/lb-mole.
% CO2 = Percent carbon dioxide by volume, dry basis.
$\%\ O_2$ = Percent oxygen by volume, dry basis.
$\%\ N_2$ = Percent nitrogen by volume, dry basis.
% CO = Percent carbon monoxide by volume, dry basis.
0.440 = Molecular weight of carbon dioxide, divided by 100.
0.320 = Molecular weight of oxygen, divided by 100.
0.280 = Molecular weight of nitrogen or carbon monoxide, divided by 100.

6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.

$$MWs = (MWd \times Md) + (18 \times (1 - Md))$$

$$MWs = (28.84 \times 0.997) +(18 (1 - 0.997)) = 28.80$$

Where:

MWs = Molecular weight of wet gas, lb/lb-mole.
18 = Molecular weight of water, lb/lb-mole.

7. Average velocity of gas stream at actual conditions, ft/sec.

$$Vs = 85.49 \times Cp \times ((\text{delt } p)^{1/2})avg \times \left(\frac{Ts\ (avg)}{Ps \times MWs} \right)^{1/2}$$

$$Vs = 85.49 \times 0.84 \times 0.44122 \times \left(\frac{541}{29.96 \times 28.80} \right)^{\wedge}1/2 = 25.1$$

Where:

Vs = Average gas stream velocity, ft/sec.

85.49 = Pitot tube constant, ft/sec $\times \frac{(\text{lb/lb-mole})(\text{in. Hg})^{1/2}}{(\text{deg R})(\text{in } H_2O)}$

Cp = Pitot tube coefficient, dimensionless.

Ts = Absolute gas stream temperature, deg R = Ts, deg F + 460.

Ps = Absolute gas stack pressure, in. Hg. = Pb + $\frac{P(\text{static})}{13.6}$

delt p = Velocity head of stack, in. H_2O.

8. Average gas stream volumetric flow rate at actual conditions, wacf/min.

$$Qs(act) = 60 \times Vs \times As$$

$$Qs(act) = 60 \times 25.1 \times 6.31 = 9487$$

Where:

Qs(act) = Volumetric flow rate of wet stack gas at actual conditions, wacf/min.

As = Cross-sectional area of stack, ft^2.

60 = Conversion factor from seconds to minutes.

9. Average gas stream dry volumetric flow rate at standard conditions, dscf/min.

$$Qs(std) = 17.64 \times Md \times \frac{Ps}{Ts} \times Qs(act)$$

$$Qs(std) = 17.64 \times 0.997 \times \frac{29.96}{540.5} \times 9487$$

$$Qs(std) = 9244$$

Where:

Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min.

10. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.327 \times Ts \times Vm(std)}{Vs \times O \times Ps \times Md \times (Dn)^2}$$

$$I = \frac{17.327 \times 541 \times 35.267}{25.1 \times 96 \times 29.96 \times 0.997 \times (0.215)^{\wedge}2} = 99.4$$

Where:

I =	Percent of isokinetic sampling.
O =	Total sampling time, minutes.
Dn =	Diameter of nozzle, inches.
17.327 =	Factor which includes standard temperature (528 deg R), standard pressure (29.92 in. Hg), the formula for calculating area of circle $D^{2/4}$, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100), $\frac{(\text{in. Hg})(\text{in}^2)(\text{min})}{(\text{deg R})(\text{ft}^2)(\text{sec})}$

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 1 | **Test Date: 4/17/19 Test**
Test Location: CBed Outlet | **Period: 0925-1148**

1. HFPO Dimer Acid concentration, lbs/dscf.

$$C_1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm(std)}$$

$$C_1 = \frac{63.7 \times 2.2046 \times 10\text{-}9}{42.731}$$

$$= 3.29E\text{-}09$$

Where:

W = Weight of HFPO Dimer Acid collected in sample in ug.

C_1 = HFPO Dimer Acid concentration, lbs/dscf.

2.2046×10^{-9} = Conversion factor from ug to lbs.

2. HFPO Dimer Acid concentration, ug/dscm.

$C_2 = W / (Vm(std) \times 0.02832)$

$C_2 = 63.7 / (42.731 \times 0.02832)$

$= 5.26E+01$

Where:

C_2 = HFPO Dimer Acid concentration, ug/dscm.

0.02832 = Conversion factor from cubic feet to cubic meters.

3. HFPO Dimer Acid mass emission rate, lbs/hr.

PMR1 = C_1 x Qs(std) x 60 min/hr

PMR1 = 3.29E-09 x 10606 x 60

= 2.09E-03

Where:

PMR1 = HFPO Dimer Acid mass emission rate, lbs/hr.

4. HFPO Dimer Acid mass emission rate, g/sec.

PMR2 = PMR1 x 453.59 / 3600

PMR2 = 2.09E-03 x 453.59 /3600

= 2.63E-04

Where:

PMR2 = HFPO Dimer Acid mass emission rate, g/sec.

453.6 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 3 | **Test Date: 4/18/2019**
Test Location: Divison Stack | **Test Period: 0922-1116**

1. HFPO Dimer Acid concentration, lbs/dscf.

$$Conc1 = \frac{W \times 2.2046 \times 10^{-9}}{Vm(std)}$$

$$Conc1 = \frac{65.4 \times 2.2046 \times 10\text{-}9}{45.294}$$

Conc1 = 3.19E-09

Where:

W = Weight of HFPO Dimer Acid collected in sample in ug.

Conc1 = Division Stack HFPO Dimer Acid concentration, lbs/dscf.

2.2046×10^{-9} = Conversion factor from ug to lbs.

2. HFPO Dimer Acid concentration, ug/dscm.

Conc2 = W / (Vm(std) x 0.02832)

Conc2 = 65.4 / (45.294 x 0.02832)

Conc2 = 5.10E+01

Where:

Conc2 = Division Stack HFPO Dimer Acid concentration, ug/dscm.

0.02832 = Conversion factor from cubic feet to cubic meters.

3. HFPO Dimer Acid mass emission rate, lbs/hr.

$MR1_{(Outlet)}$ = Conc1 x Qs(std) x 60 min/hr

$MR1_{(Outlet)}$ = 3.19E-09 x 22208 x 60

$MR1_{(Outlet)}$ = 4.24E-03

Where:

$MR1_{(Outlet)}$ = Division Stack HFPO Dimer Acid mass emission rate, lbs/hr.

4. HFPO Dimer Acid mass emission rate, g/sec.

$MR2_{(Outlet)}$ = PMR1 x 453.59 / 3600

$MR2_{(Outlet)}$ = 4.24E-03 x 453.59 /3600

$MR2_{(Outlet)}$ = 5.34E-04

Where:

$MR2_{(Outlet)}$ = Division Stack HFPO Dimer Acid mass emission rate, g/sec.

453.6 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 3	Test Date: 4/18/2019
Test Location: Division Stack	Test Period: 0922-1116

1. Volume of dry gas sampled at standard conditions (68 deg F, 29.92 in. Hg), dscf.

$$Vm(std) = \frac{17.64 \times Y \times Vm \times \left(Pb + \frac{delta\ H}{13.6} \right)}{(Tm + 460)}$$

$$Vm(std) = \frac{17.64 \times 1.0021 \times 45.391 \times \left(29.98 + \frac{0.698}{13.6} \right)}{72.00 + 460} = 45.294$$

Where:

Vm(std) =	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf.
Vm =	Volume of gas sample measured by the dry gas meter at meter conditions, dcf.
Pb =	Barometric Pressure, in Hg.
delt H =	Average pressure drop across the orifice meter, in H_2O
Tm =	Average dry gas meter temperature , deg F.
Y =	Dry gas meter calibration factor.
17.64 =	Factor that includes ratio of standard temperature (528 deg R) to standard pressure (29.92 in. Hg), deg R/in. Hg.
13.6 =	Specific gravity of mercury.

2. Volume of water vapor in the gas sample corrected to standard conditions, scf.

$$Vw(std) = (0.04707 \times Vwc) + (0.04715 \times Wwsg)$$

$$Vw(std) = (0.04707 \times 14.0) + (0.04715 \times 14.6) = 1.35$$

Where:

Vw(std) =	Volume of water vapor in the gas sample corrected to standard conditions, scf.
Vwc =	Volume of liquid condensed in impingers, ml.
Wwsg =	Weight of water vapor collected in silica gel, g.
0.04707 =	Factor which includes the density of water (0.002201 lb/ml), the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), ft^3/ml.
0.04715 =	Factor which includes the molecular weight of water (18.0 lb/lb-mole), the ideal gas constant 21.85 (in. Hg) (ft^3)/lb-mole)(deg R); absolute temperature at standard conditions (528 deg R), absolute pressure at standard conditions (29.92 in. Hg), and 453.6 g/lb, ft^3/g.

3. Moisture content

$$bws = \frac{Vw(std)}{Vw(std) + Vm(std)}$$

$$bws = \frac{1.35}{1.35 + 45.294} = 0.029$$

Where:

bws = Proportion of water vapor, by volume, in the gas stream, dimensionless.

4. Mole fraction of dry gas.

Md = 1 - bws

Md = 1 - 0.029 = 0.971

Where:

Md = Mole fraction of dry gas, dimensionless.

5. Dry molecular weight of gas stream, lb/lb-mole.

$MWd = (0.440 \times \% CO_2) + (0.320 \times \% O_2) + (0.280 \times (\% N_2 + \% CO))$

MWd = (0.440 x 0.0) + (0.320 x 20.9) + (0.280 x (79.1 + 0.00))

MWd = 28.84

Where:

MWd = Dry molecular weight , lb/lb-mole.
% CO2 = Percent carbon dioxide by volume, dry basis.
$\% O_2$ = Percent oxygen by volume, dry basis.
$\% N_2$ = Percent nitrogen by volume, dry basis.
% CO = Percent carbon monoxide by volume, dry basis.
0.440 = Molecular weight of carbon dioxide, divided by 100.
0.320 = Molecular weight of oxygen, divided by 100.
0.280 = Molecular weight of nitrogen or carbon monoxide, divided by 100.

6. Actual molecular weight of gas stream (wet basis), lb/lb-mole.

MWs = (MWd x Md) + (18 x (1 - Md))

MWs = (28.84 x 0.971) +(18 (1 - 0.971)) = 28.52

Where:

MWs = Molecular weight of wet gas, lb/lb-mole.
18 = Molecular weight of water, lb/lb-mole.

7. Average velocity of gas stream at actual conditions, ft/sec.

$$Vs = 85.49 \times Cp \times ((\text{delt } p)^{1/2})avg \times \left(\frac{Ts\ (avg)}{Ps \times MWs} \right)^{1/2}$$

$$Vs = 85.49 \times 0.84 \times 0.96682 \times \left(\frac{542}{29.94 \times 28.52} \right)^{\wedge}1/2 = 55.3$$

Where:

Vs = Average gas stream velocity, ft/sec.

85.49 = Pitot tube constant, ft/sec x $\frac{(lb/lb\text{-}mole)(in.\ Hg)^{1/2}}{(deg\ R)(in\ H_2O)}$

Cp = Pitot tube coefficient, dimensionless.

Ts = Absolute gas stream temperature, deg R = Ts, deg F + 460.

Ps = Absolute gas stack pressure, in. Hg. = Pb + $\frac{P(static)}{13.6}$

delt p = Velocity head of stack, in. H_2O.

8. Average gas stream volumetric flow rate at actual conditions, wacf/min.

$$Qs(act) = 60 \times Vs \times As$$

$$Qs(act) = 60 \times 55.3 \times 7.07 = 23458$$

Where:

Qs(act) = Volumetric flow rate of wet stack gas at actual conditions, wacf/min.

As = Cross-sectional area of stack, ft^2.

60 = Conversion factor from seconds to minutes.

9. Average gas stream dry volumetric flow rate at standard conditions, dscf/min.

$$Qs(std) = 17.64 \times Md \times \frac{Ps}{Ts} \times Qs(act)$$

$$Qs(std) = 17.64 \times 0.971 \times \frac{29.94}{541.8} \times 23458$$

$$Qs(std) = 22208$$

Where:

Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min.

10. Isokinetic variation calculated from intermediate values, percent.

$$I = \frac{17.327 \times Ts \times Vm(std)}{Vs \times O \times Ps \times Md \times (Dn)^2}$$

$$I = \frac{17.327 \times 542 \times 45.294}{55.3 \times 96 \times 29.94 \times 0.971 \times (0.160)^{\wedge}2} = 107.6$$

Where:

I =	Percent of isokinetic sampling.
O =	Total sampling time, minutes.
Dn =	Diameter of nozzle, inches.
17.327 =	Factor which includes standard temperature (528 deg R), standard pressure (29.92 in. Hg), the formula for calculating area of circle $D^{2/4}$, conversion of square feet to square inches (144), conversion of seconds to minutes (60), and conversion to percent (100), $\frac{(\text{in. Hg})(\text{in}^2)(\text{min})}{(\text{deg R})(\text{ft}^2)(\text{sec})}$

APPENDIX E
EQUIPMENT CALIBRATION RECORDS

INTERFERENCE CHECK

Date: 12/4/14-12/5/14
Analyzer Type: Servomex - O_2
Model No: 4900
Serial No: 49000-652921
Calibration Span: 21.09 %
Pollutant: 21.09% O_2 - CC418692

INTERFERENT GAS	ANALYZER RESPONSE		% OF CALIBRATION SPAN[(a)]
	INTERFERENT GAS RESPONSE (%)	INTERFERENT GAS RESPONSE, WITH BACKGROUND POLLUTANT (%)	
CO_2 (30.17% CC199689)	0.00	-0.01	0.00
NO (445 ppm CC346681)	0.00	0.02	0.11
NO_2 (23.78 ppm CC500749)	NA	NA	NA
N_2O (90.4 ppm CC352661)	0.00	0.05	0.24
CO (461.5 ppm XC006064B)	0.00	0.02	0.00
SO_2 (451.2 ppm CC409079)	0.00	0.05	0.23
CH_4 (453.1 ppm SG901795)	NA	NA	NA
H_2 (552 ppm ALM048043)	0.00	0.09	0.44
HCl (45.1 ppm CC17830)	0.00	0.03	0.14
NH_3 (9.69 ppm CC58181)	0.00	0.01	0.03
TOTAL INTERFERENCE RESPONSE			**1.20**
METHOD SPECIFICATION			**< 2.5%**

[(a)] The larger of the absolute values obtained for the interferent tested with and without the pollutant present was used in summing the interferences.

Chad Walker

INTERFERENCE CHECK

Date: 12/4/14-12/5/14
Analyzer Type: Servomex - CO_2
Model No: 4900
Serial No: 49000-652921
Calibration Span: 16.65%
Pollutant: 16.65% CO_2 - CC418692

INTERFERENT GAS	ANALYZER RESPONSE		% OF CALIBRATION SPAN[(a)]
	INTERFERENT GAS RESPONSE (%)	INTERFERENT GAS RESPONSE, WITH BACKGROUND POLLUTANT (%)	
CO_2 (30.17% CC199689)	NA .	NA	NA
NO (445 ppm CC346681)	0.00	0.02	0.10
NO_2 (23.78 ppm CC500749)	0.00	0.00	0.02
N_2O (90.4 ppm CC352661)	0.00	0.01	0.04
CO (461.5 ppm XC006064B)	0.00	0.01	0.00
SO_2 (451.2 ppm CC409079)	0.00	0.11	0.64
CH_4 (453.1 ppm SG901795)	0.00	0.07	0.44
H_2 (552 ppm ALM048043)	0.00	0.04	0.22
HCl (45.1 ppm CC17830)	0.10	0.06	0.60
NH_3 (9.69 ppm CC58181)	0.00	0.02	0.14
TOTAL INTERFERENCE RESPONSE			**2.19**
METHOD SPECIFICATION			**< 2.5%**

[(a)] The larger of the absolute values obtained for the interferent tested with and without the pollutant present was used in summing the interferences.

Chad Walker

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
600 Union Landing Road
Cinnaminson, NJ 08077-0000
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	82-401288926-1
Cylinder Number:	CC18055	Cylinder Volume:	150.5 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Sep 04, 2018

Expiration Date: Sep 04, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	9.000 %	8.864 %	G1	+/- 0.7% NIST Traceable	09/04/2018
OXYGEN	12.00 %	12.00 %	G1	+/- 0.4% NIST Traceable	09/04/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060629	CC413730	13.359 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 09, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA 510-CO2-19GYCXEG	NDIR	Aug 09, 2018
Horiba MPA 510-O2-7TWMJ041	Paramagnetic	Aug 09, 2018

Triad Data Available Upon Request

Signature on file
Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
600 Union Landing Road
Cinnaminson, NJ 08077-0000
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI62E15A0224	Reference Number:	82-401044874-1
Cylinder Number:	SG9169108	Cylinder Volume:	157.2 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Nov 18, 2017

Expiration Date: Nov 18, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	17.00 %	16.58 %	G1	+/- 0.7% NIST Traceable	11/18/2017
OXYGEN	21.00 %	21.00 %	G1	+/- 0.5% NIST Traceable	11/18/2017
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061336	CC360792	11.002 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2018
NTRM	09061415	CC273526	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA 510-CO2-19GYCXEG	NDIR	Oct 30, 2017
Horiba MPA 510-O2-7TWMJ041	Paramagnetic	Oct 27, 2017

Triad Data Available Upon Request

Signature on file
Approved for Release

Long Cal and Temperature Cal Datasheet for Standard Dry Gas Meter Console

Calibrator MDW **Meter Box Number** 25 **Ambient Temp** 72

Date 22-Feb-19 **Wet Test Meter Number** P-2952 **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 16300943

Baro Press, in Hg (Pb)	30.18

Setting	Gas Volume		Temperatures					Calibration Results	
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter					
in H_2O (ΔH)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_i)	Average, °F (Td)	Time, min (O)	Y	ΔH
0.5	5.0	216.260	72.0	71.00	71.00	71.5	13.0	0.9978	1.8905
		221.260		72.00	72.00				
		5.000		71.50	71.50				
1.0	5.0	222.260	72.0	72.00	72.00	72.5	9.2	0.9975	1.8901
		227.265		73.00	73.00				
		5.005		72.50	72.50				
1.5	10.0	228.450	72.0	73.00	73.00	74.0	15.4	0.9941	1.9804
		238.510		75.00	75.00				
		10.060		74.00	74.00				
2.0	10.0	239.180	71.0	75.00	75.00	75.5	13.6	1.0076	2.0459
		249.140		76.00	76.00				
		9.960		75.50	75.50				
3.0	10.0	257.725	70.0	76.00	76.00	76.0	11.2	1.0134	2.0715
		267.632		76.00	76.00				
		9.907		76.00	76.00				
							Average	**1.0021**	**1.9757**

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
Tw - Temp of gas in the wet test meter
Tdi - Temp of the inlet gas of the dry gas meter
Tdo - Temp of the outlet gas of the dry gas meter
Td - Average temp of the gas in the dry gas meter

0 - Time of calibration run
Pb - Barometric Pressure
ΔH - Pressure differential across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter

$$Y = \frac{Vw * Pb * (td + 460)}{Vd * \left[Pb + \frac{(\Delta H)}{13.6}\right] * (tw + 460)}$$

$$\Delta H = \left[\frac{0.0317 * \Delta H}{Pb * (td + 460)}\right] * \left[\frac{(tw + 460) * O}{Vw}\right]^2$$

Reference Temperature Select Temperature ○ °C ◉ °F	Temperature Reading from Individual Thermocouple Input [1] Channel Number						Average Temperature Reading	Temp Difference [2] (%)
	1	2	3	4	5	6		
32	32	32	32	32	32		32.0	0.0%
212	212	213	213	212	212		212.4	-0.1%
932	933	933	933	933	933		933.0	-0.1%
1832	1829	1829	1829	1829	1829		1829.0	0.1%

1 - Channel Temps must agree with +/- 5°F or 3°C

2 - Acceptable Temperature Difference less than 1.5 %

$$\text{Temp Diff} = \left[\frac{(\text{Reference Temp}(°F) + 460) - (\text{Test Temp}(°F) + 460)}{\text{Reference Temp}(°F) + 460}\right]$$

Post Test Calibration

Calibrator PM | **Meter Box Number** 25 | **Client** Chemours Fayetteville

Date 5/29/19 | **Wet Test Meter Number** P-2952 | **Location/Plant** Fayetteville, NC

Dry Gas Meter Number 16300943 | **PreTest Y** 1.0021

Baro Press, in Hg (Pb)	29.52

Setting	Gas Volume		Temperatures					
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter				
in H_20 (ΔH)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_i)	Average, °F (Td)	Time, min (O)	Y
0.80	7.0	499.139 505.984 6.845	71.5	71.00	72.00	71.5	14.3	1.0206
0.80	7.0	505.984 512.759 6.775	71.5	72.00	73.00	72.5	14.2	1.0331
0.80	7.0	512.759 519.554 6.795	71.5	73.00	74.00	73.5	14.3	1.0320
							Average	**1.0286**
							Difference[1]	**0.0265**

1 - Tolerance for Y is less than 0.0500

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
Tw - Temp of gas in the wet test meter
Tdi - Temp of the inlet gas of the dry gas meter
Tdo - Temp of the outlet gas of the dry gas meter
Td - Average temp of the gas in the dry gas meter

0 - Time of calibration run
Pb - Barometric Pressure
ΔH - Pressure differential across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter

$$Y = \frac{Vw * Pb * (td + 460)}{Vd * \left[Pb + \frac{(\Delta H)}{13.6} \right] * (tw + 460)}$$

$$\Delta H = \left[\frac{0.0317 * \Delta H}{Pb * (td + 460)} \right] * \left[\frac{(tw + 460) * O}{Vw} \right]^2$$

No Long Calibration Required

Long Cal and Temperature Cal Datasheet for Standard Dry Gas Meter Console

Calibrator PM | **Meter Box Number** 26 | **Ambient Temp** 71

Date 18-Jan-19 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 16300942

Baro Press, in Hg (Pb)	29.79

Setting	Gas Volume		Temperatures					Calibration Results	
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter					
in H_20 (ΔH)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_i)	Average, °F (Td)	Time, min (O)	Y	ΔH
0.5	5.0	4.524	71.0	72.00	72.00	72.5	13.5	1.0044	2.0538
		9.510		73.00	73.00				
		4.986		72.50	72.50				
1.0	7.0	9.510	71.0	72.00	72.00	72.5	13.3	1.0083	2.0341
		16.455		73.00	73.00				
		6.945		72.50	72.50				
1.5	10.0	16.455	71.0	73.00	73.00	73.5	16.0	1.0105	2.1596
		26.361		74.00	74.00				
		9.906		73.50	73.50				
2.0	10.0	26.361	71.0	74.00	74.00	75.0	13.5	1.0156	2.0442
		36.233		76.00	76.00				
		9.872		75.00	75.00				
3.0	10.0	36.233	71.0	76.00	76.00	76.5	11.3	1.0145	2.1423
		46.119		77.00	77.00				
		9.886		76.50	76.50				
							Average	**1.0107**	**2.0868**

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
Tw - Temp of gas in the wet test meter
Tdi - Temp of the inlet gas of the dry gas meter
Tdo - Temp of the outlet gas of the dry gas meter
Td - Average temp of the gas in the dry gas meter

0 - Time of calibration run
Pb - Barometric Pressure
ΔH - Pressure differential across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter

$$Y = \frac{Vw * Pb * (td + 460)}{Vd * \left[Pb + \frac{(\Delta H)}{13.6} \right] * (tw + 460)}$$

$$\Delta H = \left[\frac{0.0317 * \Delta H}{Pb * (td + 460)} \right] * \left[\frac{(tw + 460) * O}{Vw} \right]^2$$

Reference Temperature	Temperature Reading from Individual Thermocouple Input [1]						Average Temperature Reading	Temp Difference [2] (%)
Select Temperature ○ °C ◉ °F	Channel Number							
	1	2	3	4	5	6		
32	31	31	31	31	31		31.0	0.2%
212	212	212	212	212	212		212.0	0.0%
932	931	931	931	931	931		931.0	0.1%
1832	1830	1830	1830	1830	1830		1830.0	0.1%

1 - Channel Temps must agree with +/- 5°F or 3°C

2 - Acceptable Temperature Difference less than 1.5 %

$$\text{Temp Diff} = \left[\frac{(\text{Reference Temp}(^\circ F) + 460) - (\text{Test Temp}(^\circ F) + 460)}{\text{Reference Temp}(^\circ F) + 460} \right]$$

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN

CARBON BED OUTLET

METER BOX NO. WC 26

4/17/2019 + 4/18/2019

	Run 1	Run 2	Run 3
MWd = Dry molecular weight source gas, lb/lb-mole.			
0.32 = Molecular weight of oxygen, divided by 100.			
0.44 = Molecular weight of carbon dioxide, divided by 100.			
0.28 = Molecular weight of nitrogen or carbon monoxide, divided by 100.			
% CO_2 = Percent carbon dioxide by volume, dry basis.	0.0	0.0	0.0
% O_2 = Percent oxygen by volume, dry basis.	20.9	20.9	20.9

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWd = (0.32 * 20.9) + (0.44 * 0) + (0.28 * (100 - (0 + 20.9)))$$

$$MWd = (6.69) + (0.00) + (22.15)$$

MWd =	28.84	28.84	28.84

Tma = Source Temperature, absolute(^{o}R)			
Tm = Average dry gas meter temperature , deg F.	75.5	97.7	77.6

$$Tma = Ts + 460$$

$$Tma = 75.46 + 460$$

Tma =	535.46	557.71	537.58

Ps = Absolute meter pressure, inches Hg.			
13.60 = Specific gravity of mercury.			
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	0.73	0.87	0.47
Pb = Barometric Pressure, in Hg.	30.17	30.13	30.08

$$Pm = Pb + (delta\ H / 13.6)$$

$$Pm = 30.17 + (0.732083333333334 / 13.6)$$

Pm =	30.22	30.19	30.11

Yqa = dry gas meter calibration check value, dimensionless.			
0.03 = (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.			
29.00 = dry molecular weight of air, lb/lb-mole.			
Vm = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	42.462	46.423	34.509
Y = Dry gas meter calibration factor (based on full calibration)	1.0107	1.0107	1.0107
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	2.0868	2.0868	2.0868
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.8313	0.9116	0.6651
O = Total sampling time, minutes.	96	96	96

$$Yqa = (O / Vm) * SQRT (0.0319 * Tma * 29) / (Delta\ H@ * Pm * MWd) * avg\ SQRT\ Delta\ H$$

$$Yqa = (96.00 / 42.46) * SQRT (0.0319 * 535.46 * 29) / (2.09 * 30.22 * 28.84) * 0.83$$

$$Yqa = 2.261 * SQRT 495.353 / 1,818.487 * 0.83$$

Yqa =	0.9809	1.0046	0.9693

Diff = Absolute difference between Yqa and Y	2.95	0.60	4.10

$$Diff = ((Y - Yqa) / Y) * 100$$

$$Diff = ((1.0107 - 0.981) / 1.0107) * 100$$

Average Diff = 2.55

Allowable = 5.0

Long Cal and Temperature Cal Datasheet for Standard Dry Gas Meter Console

Calibrator PM | **Meter Box Number** 29 | **Ambient Temp** 72

Date 28-Jan-19 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 17176777

Baro Press, in Hg (Pb)	29.88

Setting	Gas Volume		Temperatures					Calibration Results	
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter					
in H_20 (ΔH)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_i)	Average, °F (Td)	Time, min (O)	Y	ΔH
0.5	5.0	921.442	72.0	71.00	71.00	71.5	12.8	1.0132	1.8512
		926.366		72.00	72.00				
		4.924		71.50	71.50				
1.0	7.0	926.366	72.0	72.00	72.00	72.5	12.80	1.0149	1.8854
		933.253		73.00	73.00				
		6.887		72.50	72.50				
1.5	10.0	933.253	72.0	73.00	73.00	74.0	15.3	1.0130	1.9744
		943.125		75.00	75.00				
		9.872		74.00	74.00				
2.0	11.0	943.125	72.0	75.00	75.00	75.5	14.6	1.0093	1.9756
		954.042		76.00	76.00				
		10.917		75.50	75.50				
3.0	10.0	954.042	72.0	76.00	76.00	76.5	10.9	0.9996	1.9948
		964.057		77.00	77.00				
		10.015		76.50	76.50				
							Average	**1.0100**	**1.9363**

Vw - Gas Volume passing through the wet test meter
Vd - Gas Volume passing through the dry gas meter
Tw - Temp of gas in the wet test meter
Tdi - Temp of the inlet gas of the dry gas meter
Tdo - Temp of the outlet gas of the dry gas meter
Td - Average temp of the gas in the dry gas meter

0 - Time of calibration run
Pb - Barometric Pressure
ΔH - Pressure differential across orifice
Y - Ratio of accuracy of wet test meter to dry gas meter

$$Y = \frac{Vw * Pb * (td + 460)}{Vd * \left[Pb + \frac{(\Delta H)}{13.6} \right] * (tw + 460)}$$

$$\Delta H = \left[\frac{0.0317 * \Delta H}{Pb * (td + 460)} \right] * \left[\frac{(tw + 460) * O}{Vw} \right]^2$$

Reference Temperature	Temperature Reading from Individual Thermocouple Input [1]						Average Temperature Reading	Temp Difference [2] (%)
Select Temperature ○ °C ◉ °F	Channel Number							
	1	2	3	4	5	6		
32	31	31	31	31	31		31.0	0.2%
212	212	212	212	212	212		212.0	0.0%
932	932	932	932	932	932		932.0	0.0%
1832	1830	1830	1830	1830	1830		1830.0	0.1%

1 - Channel Temps must agree with +/- 5°F or 3°C

2 - Acceptable Temperature Difference less than 1.5 %

$$\text{Temp Diff} = \left[\frac{(\text{Reference Temp}(^\circ F) + 460) - (\text{Test Temp}(^\circ F) + 460)}{\text{Reference Temp}(^\circ F) + 460} \right]$$

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN

CARBON BED INLET

METER BOX NO. 29

4/17/2019 + 4/18/2019

	Run 1	Run 2	Run 3
MWd = Dry molecular weight source gas, lb/lb-mole.			
0.32 = Molecular weight of oxygen, divided by 100.			
0.44 = Molecular weight of carbon dioxide, divided by 100.			
0.28 = Molecular weight of nitrogen or carbon monoxide, divided by 100.			
% CO_2 = Percent carbon dioxide by volume, dry basis.	0.0	0.0	0.0
% O_2 = Percent oxygen by volume, dry basis.	20.9	20.9	20.9

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWd = (0.32 * 20.9) + (0.44 * 0) + (0.28 * (100 - (0 + 20.9)))$$

$$MWd = (6.69) + (0.00) + (22.15)$$

MWd =	28.84	28.84	28.84

Tma = Source Temperature, absolute(^{o}R)			
Tm = Average dry gas meter temperature , deg F.	78.8	92.9	77.3

$$Tma = Ts + 460$$

$$Tma = 78.75 + 460$$

Tma =	538.75	552.92	537.33

Ps = Absolute meter pressure, inches Hg.			
13.60 = Specific gravity of mercury.			
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	0.45	0.56	0.32
Pb = Barometric Pressure, in Hg.	30.17	30.13	30.08

$$Pm = Pb + (delta\ H / 13.6)$$

$$Pm = 30.17 + (0.450833333333333 / 13.6)$$

Pm =	30.20	30.17	30.10

Yqa = dry gas meter calibration check value, dimensionless.			
0.03 = (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.			
29.00 = dry molecular weight of air, lb/lb-mole.			
Vm = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	35.309	39.980	30.477
Y = Dry gas meter calibration factor (based on full calibration)	1.0100	1.0100	1.0100
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.9363	1.9363	1.9363
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.6694	0.7471	0.5659
O = Total sampling time, minutes.	96	96	96

$$Yqa = (O / Vm) * SQRT (0.0319 * Tma * 29) / (Delta\ H@ * Pm * MWd) * avg\ SQRT\ Delta\ H$$

$$Yqa = (96.00 / 35.31) * SQRT (0.0319 * 538.75 * 29) / (1.94 * 30.20 * 28.84) * 0.67$$

$$Yqa = 2.719 * SQRT 498.398 / 1,686.221 * 0.67$$

Yqa =	0.989	0.989	0.969

Diff = Absolute difference between Yqa and Y	2.08	2.08	4.06

$$Diff = ((Y - Yqa) / Y) * 100$$

$$Diff = ((1.01 - 0.989) / 1.01) * 100$$

Average Diff = 2.74

Allowable = 5.0

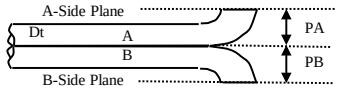
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-700**

Inspection Date 2/19/19 Individual Conducting Inspection ks

If all Criteria PASS
Cp is equal to 0.84

PASS/FAIL



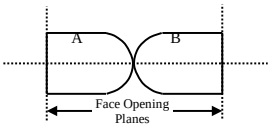
Distance to A Plane (PA) - inches 0.459 PASS

Distance to B Plane (PB) - inches 0.459 PASS

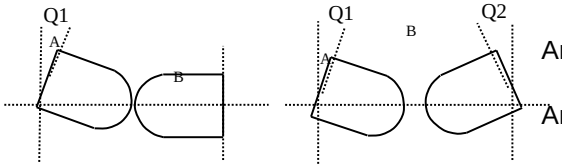
Pitot OD (D_t) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



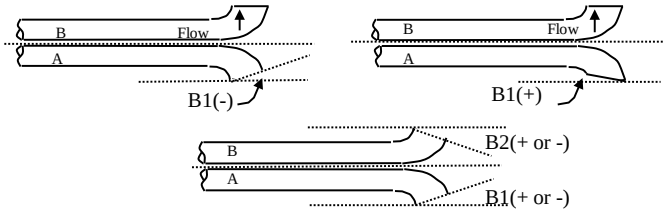
Are Open Faces Aligned Perpendicular to the Tube Axis (●) YES ( ) NO PASS



Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS

Angle of Q2 from vertical B Tube- degrees (absolute) 0 PASS

Q1 and Q2 must be $\leq 10^o$



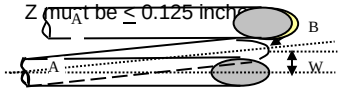
Angle of B1 from vertical A Tube- degrees (absolute) 0 PASS

Angle of B1 from vertical B Tube- degrees (absolute) 0 PASS

B1 or B2 must be $\leq 5^o$

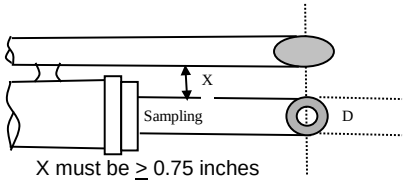
Horizontal offset between A and B Tubes (Z) - inches 0.003 PASS

Z must be ≤ 0.125 inches



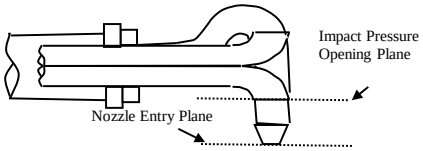
Vertical offset between A and B Tubes (W) - inches 0.012 PASS

W must be ≤ 0.03125 inches

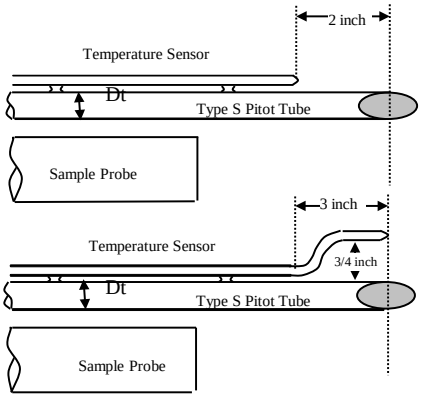


Distance between Sample Nozzle and Pitot (X) - inches 0.93 PASS

X must be ≥ 0.75 inches



Impact Pressure Opening Plane is above the Nozzle Entry Plane (●) YES ( ) NO ( ) NA



Thermocouple meets the Distance Criteria in the adjacent figure (●) YES ( ) NO ( ) NA

Thermocouple meets the Distance Criteria in the adjacent figure ( ) YES ( ) NO (●) NA

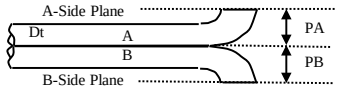
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-707**

Inspection Date 6/15/18 Individual Conducting Inspection KS

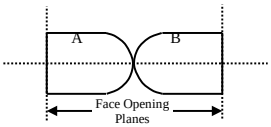
If all Criteria PASS
Cp is equal to 0.84

		PASS/FAIL
Distance to A Plane (PA) - inches	0.44	PASS
Distance to B Plane (PB) - inches	0.44	PASS
Pitot OD (D_t) - inches	0.375	

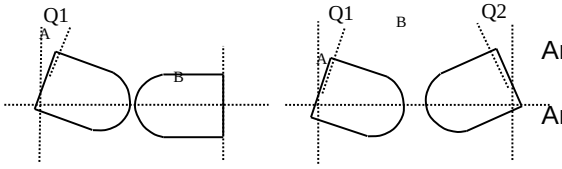


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



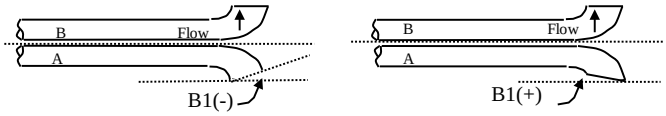
Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



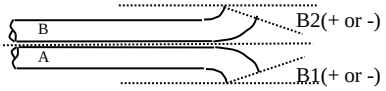
Angle of Q1 from vertical A Tube- degrees (absolute): 0 — PASS

Angle of Q2 from vertical B Tube- degrees (absolute): 0 — PASS

Q1 and Q2 must be $\leq 10^o$



Angle of B1 from vertical A Tube- degrees (absolute): 0 — PASS

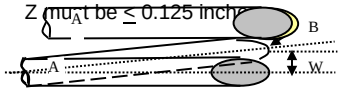


Angle of B1 from vertical B Tube- degrees (absolute): 0 — PASS

B1 or B2 must be $\leq 5^o$

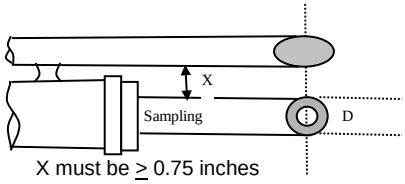
Horizontal offset between A and B Tubes (Z) - inches: 0.007 — PASS

Z must be $\leq$ 0.125 inches



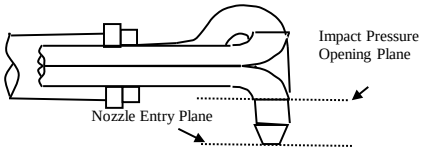
Vertical offset between A and B Tubes (W) - inches: 0.018 — PASS

W must be $\leq$ 0.03125 inches

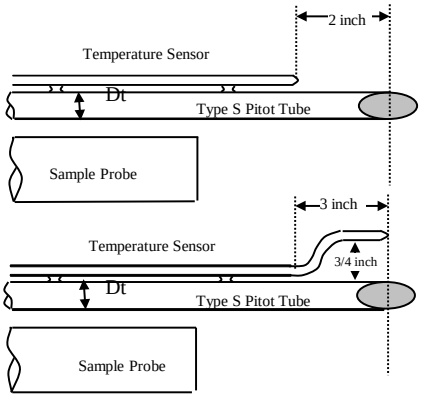


Distance between Sample Nozzle and Pitot (X) - inches: 0.86 — PASS

X must be $\geq$ 0.75 inches



Impact Pressure Opening Plane is above the Nozzle Entry Plane: (●) YES ( ) NO ( ) NA



Thermocouple meets the Distance Criteria in the adjacent figure: (●) YES ( ) NO ( ) NA

Thermocouple meets the Distance Criteria in the adjacent figure: ( ) YES ( ) NO (●) NA

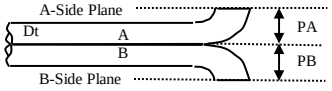
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-703**

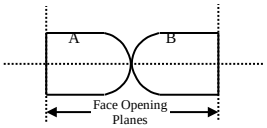
Inspection Date 5/30/18 Individual Conducting Inspection SR

If all Criteria PASS
Cp is equal to 0.84

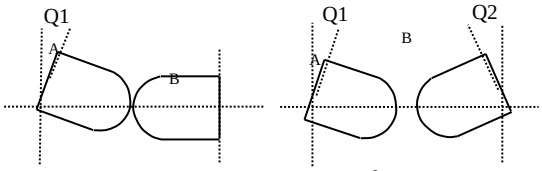
		PASS/FAIL
Distance to A Plane (PA) - inches	0.453	PASS
Distance to B Plane (PB) - inches	0.453	PASS
Pitot OD (D_t) - inches	0.375	



$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB

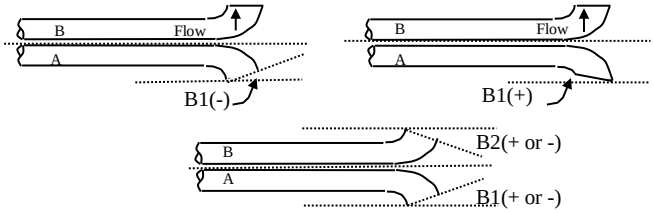


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



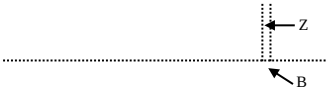
Q1 and Q2 must be ≤ 10°

Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS



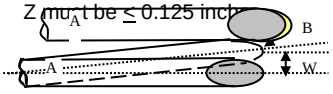
Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be ≤ 5°



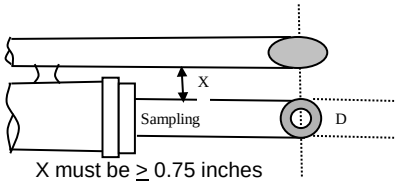
Z must be ≤ 0.125 inch

Horizontal offset between A and B Tubes (Z) - inches	0.006	PASS



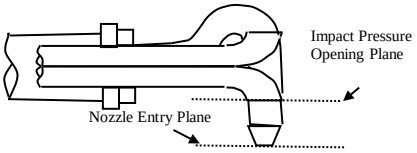
W must be ≤ 0.03125 inches

Vertical offset between A and B Tubes (W) - inches	0.022	PASS

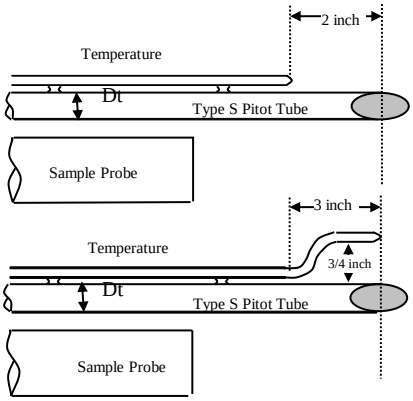


X must be ≥ 0.75 inches

Distance between Sample Nozzle and Pitot (X) - inches	0.84	PASS



Impact Pressure Opening Plane is above the Nozzle Entry Plane: (●) YES ( ) NO ( ) NA



Thermocouple meets the Distance Criteria in the adjacent figure: (●) YES ( ) NO ( ) NA

Thermocouple meets the Distance Criteria in the adjacent figure: ( ) YES ( ) NO (●) NA

APPENDIX F
LIST OF PROJECT PARTICIPANTS

The following WESTON employees participated in this project.

Paul Meeter	Senior Project Manager
Matt Winkeler	Team Member
Robert Scroggins	Team Member
Jacob Little	Team Member
Austin Squires	Team Member
Kris Ansley	Team Member