FLUOROMONOMERS
MANUFACTURING PROCESS
VINYL ETHERS NORTH CARBON BED
REMOVAL EFFICIENCY AND
DIVISION STACK EMISSIONS TEST REPORT
TEST DATES: 12 AND 13 JUNE 2019

THE CHEMOURS COMPANY
FAYETTEVILLE, NORTH CAROLINA

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July 2019

W.O. No. 15418.002.015

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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 12 and 13 June 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 and M2 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	$\geq 1.5m^3$	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				
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 and M2 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]	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	1.26E-02	1.00E-01	4.53E-05	3.60E-04	99.6	4.63E-04	3.68E-03
R3*	3.73E-02	2.96E-01	1.70E-04	1.35E-03	99.5	6.25E-04	4.97E-03
R2	2.49E-02	1.98E-01	2.33E-04	1.85E-03	99.1	6.55E-04	5.21E-03
Average	2.49E-02	1.98E-01	1.49E-04	1.19E-03	99.4	5.81E-04	4.62E-03

*Run 3 conducted prior to Run 2. See Section 6 for details.

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	PPVE	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

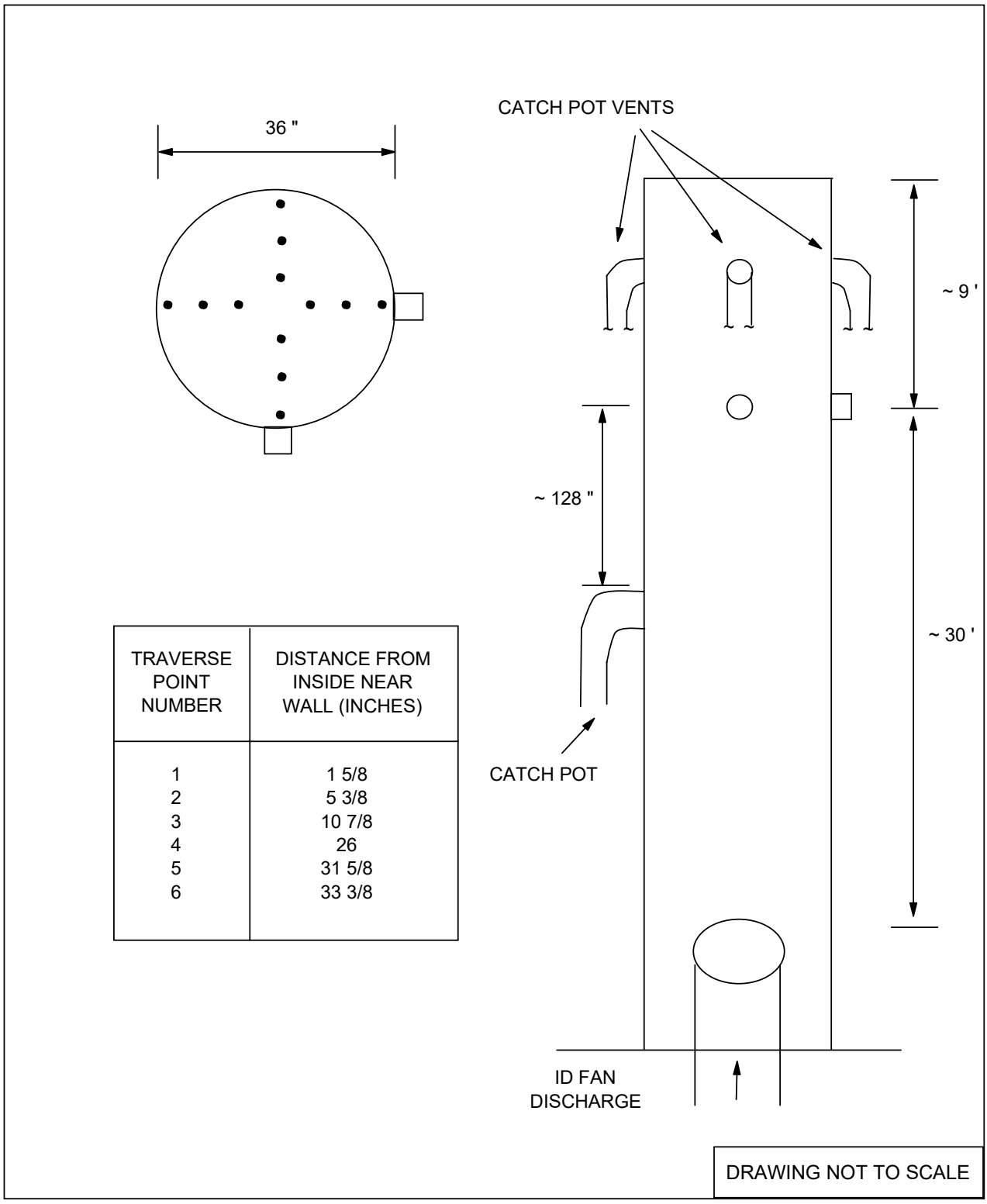
Two 6-inch ID test ports were installed on the 36-inch ID fiberglass stack as shown below. The four vents that enter the top of the stack and the one vent ~11 feet below are catch pots which, under normal process operations, do not discharge to the stack. They are used to vent process gas to the stack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

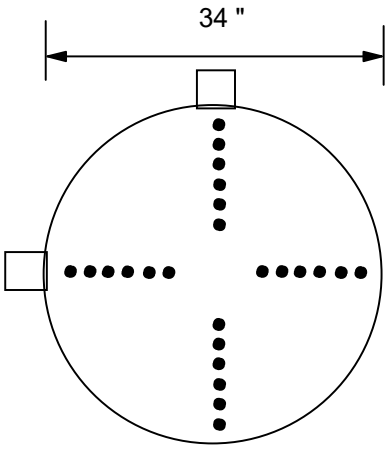
Location	Distance from Flow Disturbance	
	Downstream (B)	Upstream (A)
Carbon Bed Inlet	67 inches > 1.9 duct diameters	61 inches > 1.8 duct diameters
Carbon Bed Outlet	58 inches > 1.7 duct diameters	57 inches > 1.5 duct diameters
Division Stack	30 feet > 10 duct diameters	9 feet > 3 diameters



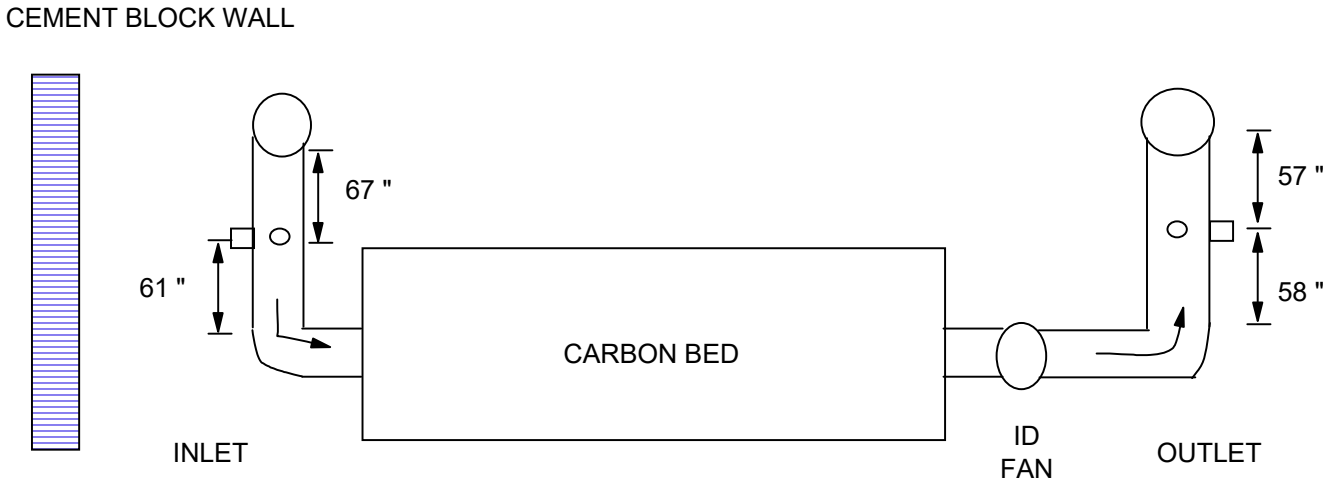
TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	1 5/8
2	5 3/8
3	10 7/8
4	26
5	31 5/8
6	33 3/8

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

IASDATA\CHEMOURS\15418.002.015\FIGURE 4-1 DIVISION STACK



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 CARBON BED INLET AND OUTLET 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.

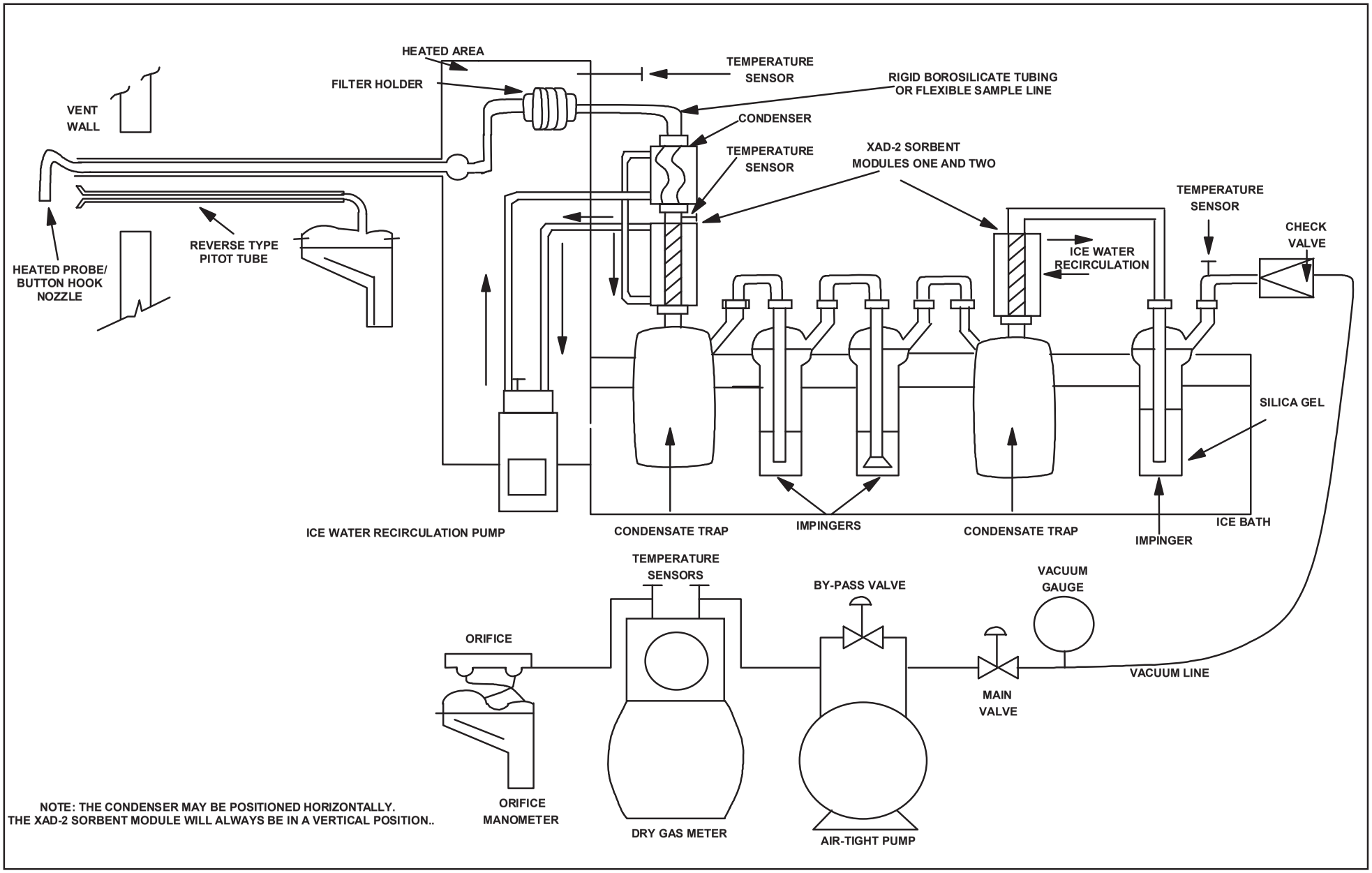


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

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.

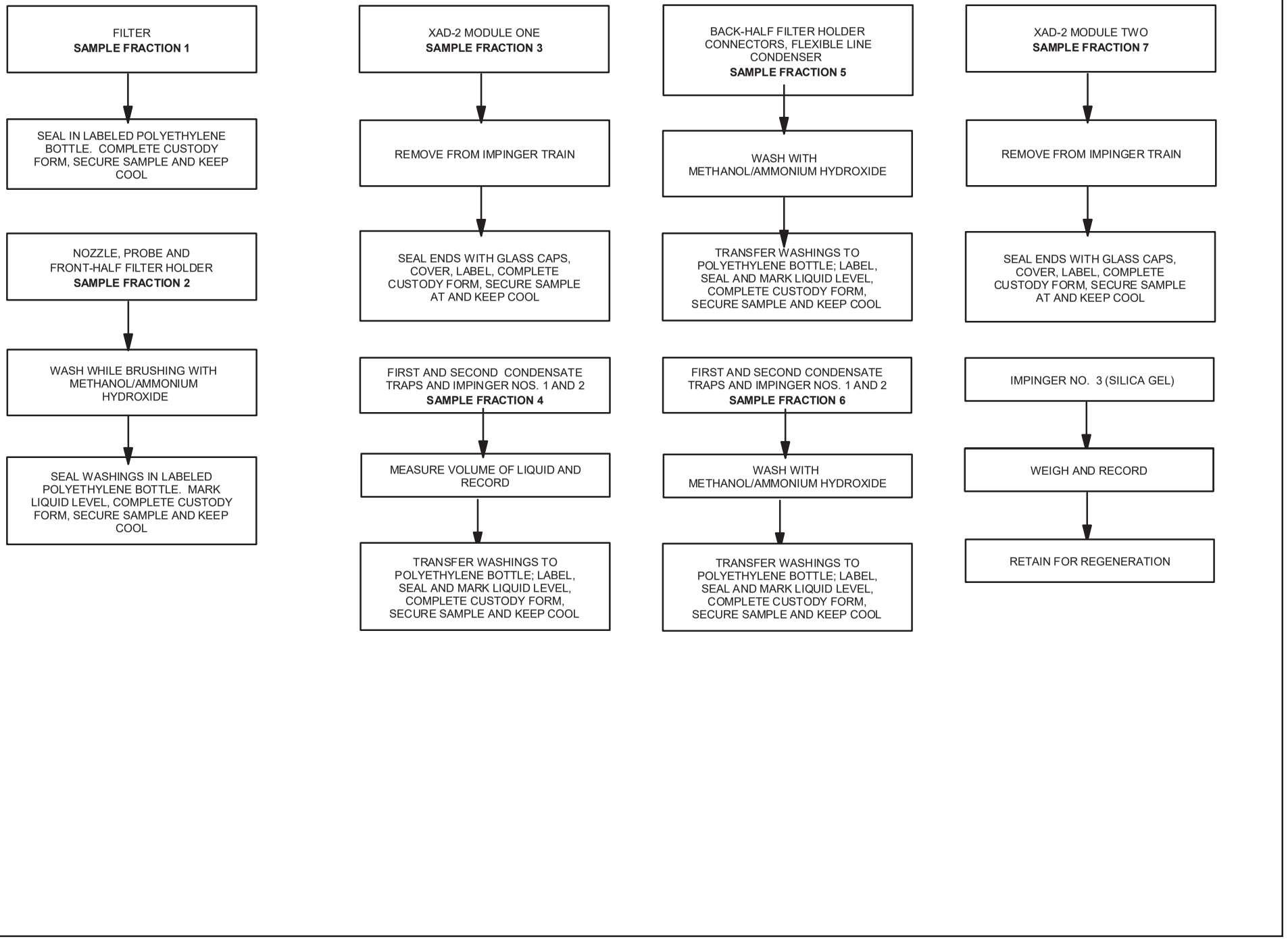


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.015\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.

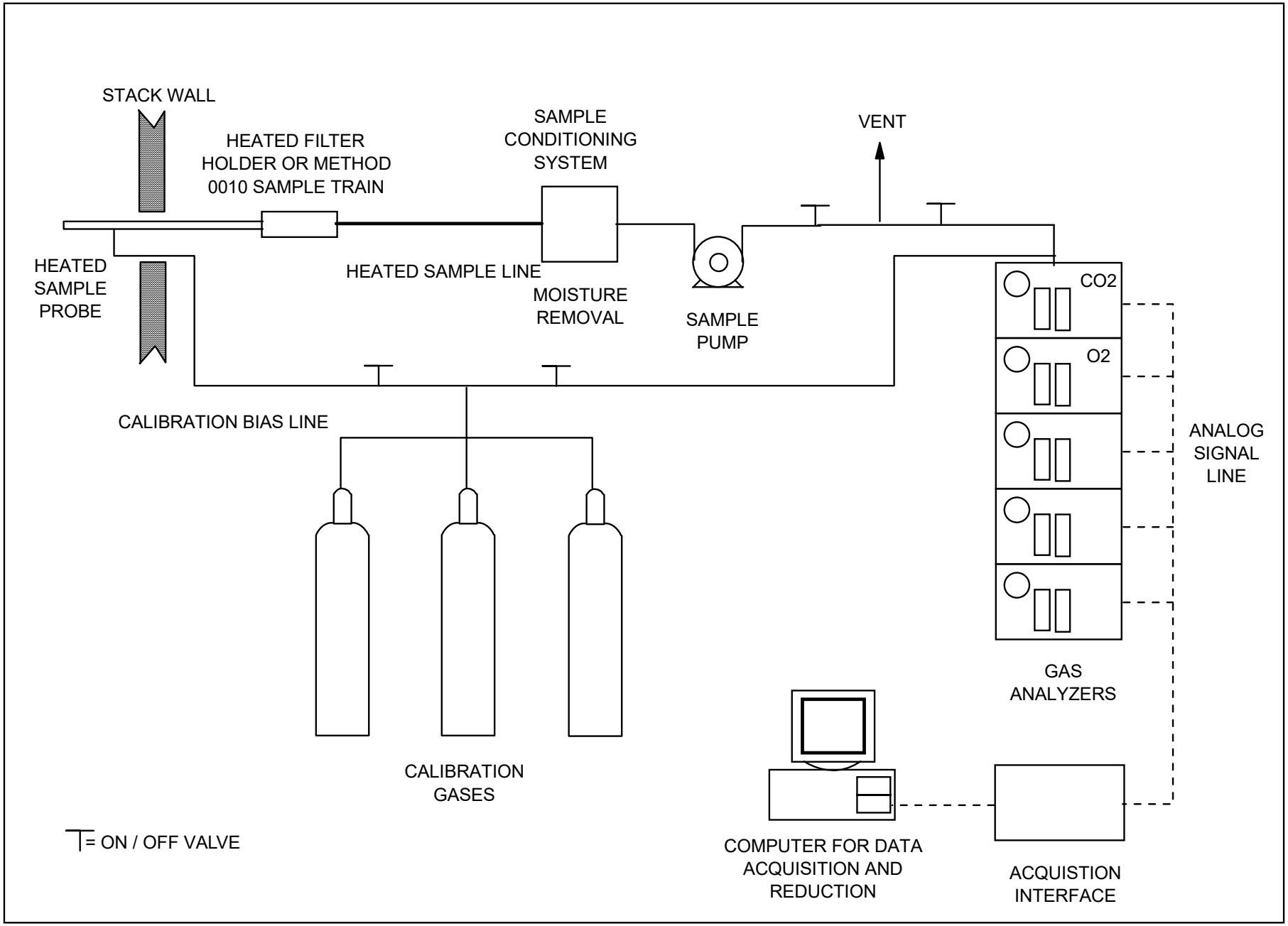


FIGURE 5-3
WESTON SAMPLING SYSTEM

IASDATA\CHEMOURS\15418.002.015\FIGURE 5-3 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 carbon bed removal efficiency was calculated based upon the HFPO Dimer Acid inlet and outlet mass emission rates in lb/hr.

The Method 3A sampling on the Division stack 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 Method 0010 sample train at the VEN Carbon Bed Outlet was bumped during the sampling port change at the halfway point of run number 2. In an effort to correct the glassware misalignment caused by this contact at the connection to the inlet of the coil condenser, the Weston technician tried to move the connecting glassware back into the correct position when the glass condenser broke. In discussions with the onsite DEQ representative, it was decided to abort the partial test run because a sample train leak check could not be performed. These samples were not saved and the sample trains were cleaned for reuse. Weston had already assembled the sample trains for the next test run, run number 3, which included pre-labeled sampling media, data sheets and chain of custody ID numbers. Test run number 3 was then started and there were no further sampling issues. At the conclusion of run 3, the run 2 test equipment was recharged and run 2 was repeated. This resulted in a total of three valid test runs, in the following order in which they were performed: run 1, run 3 and then run 2. This has also been noted on the test results summary tables.

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

Test Data			
Run number	1	3*	2
Location	CBed Inlet	CBed Inlet	CBed Inlet
Date	6/12/19	6/13/19	6/13/19
Time period	1109-1332	1108-1314	1442-1641
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	30.06	29.90	29.88
Avg. orifice press. diff., in H_2O	0.57	0.51	0.53
Avg. dry gas meter temp., deg F	74.5	73.8	83.9
Avg. abs. dry gas meter temp., deg. R	535	534	544
Total liquid collected by train, ml	26.7	31.8	31.0
Std. vol. of H_2O vapor coll., cu.ft.	1.26	1.50	1.46
Dry gas meter calibration factor	0.9834	0.9834	0.9834
Sample vol. at meter cond., dcf	41.698	39.865	41.015
Sample vol. at std. cond., dscf [(1)]	40.734	38.788	39.140
Percent of isokinetic sampling	99.2	100.7	99.9
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.	0.030	0.037	0.036
Mole fraction of dry gas	0.970	0.963	0.964
Molecular wt. of wet gas, lb/lb mole	28.51	28.43	28.45
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-6.50	-6.50	-6.50
Absolute pressure, in. Hg	29.58	29.42	29.40
Avg. temperature, deg. F	83	83	89
Avg. absolute temperature, deg.R	543	543	549
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	30.3	28.8	29.6
Stack/duct cross sectional area, sq.ft.	6.31	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	11480	10904	11199
Avg. gas stream volumetric flow, dscf/min.	10701	10037	10208

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

*Run 3 conducted prior to Run 2

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

TEST DATA			
Run number	1	3*	2
Location	CBed Inlet	CBed Inlet	CBed Inlet
Date	6/12/19	6/13/19	6/13/19
Time period	1109-1332	1108-1314	1442-1641
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	2877.25	8650.90	5736.40
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	2493.94	7874.56	5174.66
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	1.56E-07	4.92E-07	3.23E-07
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	1.00E-01	2.96E-01	1.98E-01
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	1.26E-02	3.73E-02	2.49E-02

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

Test Data			
Run number	1	3*	2
Location	CBed Outlet	CBed Outlet	CBed Outlet
Date	6/12/19	6/13/19	6/13/19
Time period	1109-1332	1108-1314	1442-1641
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	30.06	29.90	29.88
Avg. orifice press. diff., in H_2O	0.83	0.81	0.81
Avg. dry gas meter temp., deg F	75.2	75.5	85.4
Avg. abs. dry gas meter temp., deg. R	535	536	545
Total liquid collected by train, ml	26.9	37.2	27.2
Std. vol. of H_2O vapor coll., cu.ft.	1.3	1.8	1.3
Dry gas meter calibration factor	1.0021	1.0021	1.0021
Sample vol. at meter cond., dcf	47.889	46.960	47.161
Sample vol. at std. cond., dscf [(1)]	47.643	45.572	44.909
Percent of isokinetic sampling	107.5	105.9	103.8
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.	0.026	0.037	0.028
Mole fraction of dry gas	0.974	0.963	0.972
Molecular wt. of wet gas, lb/lb mole	28.56	28.43	28.54
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	3.50	3.70	3.70
Absolute pressure, in. Hg	30.32	30.17	30.15
Avg. temperature, deg. F	90	89	93
Avg. absolute temperature, deg.R	550	549	553
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	32.2	31.8	31.9
Stack/duct cross sectional area, sq.ft.	6.31	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	12195	12011	12056
Avg. gas stream volumetric flow, dscf/min.	11548	11209	11273

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

*Run 3 conducted prior to Run 2

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

TEST DATA			
Run number	1	3*	2
Location	CBed Outlet	CBed Outlet	CBed Outlet
Date	6/12/19	6/13/19	6/13/19
Time period	1109-1332	1108-1314	1442-1641
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	11.189	41.48	55.87
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	8.29	32.14	43.92
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	5.18E-10	2.01E-09	2.74E-09
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	3.60E-04	1.35E-03	1.85E-03
HFPO Dimer Acid (From Inlet Data)	1.00E-01	2.96E-01	1.98E-01
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	4.53E-05	1.70E-04	2.33E-04
Carbon Bed Removal Efficiency, %	99.6	99.5	99.1

*Run 3 conducted prior to Run 2

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

Test Data			
Run number	1	3*	2
Location	Divison Stack	Divison Stack	Divison Stack
Date	6/12/19	6/13/2019	6/13/2019
Time period	1109-1332	1108-1314	1442-1641
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	30.06	29.90	29.88
Avg. orifice press. diff., in H_2O	0.82	0.81	0.83
Avg. dry gas meter temp., deg F	76.1	76.0	84.0
Avg. abs. dry gas meter temp., deg. R	536	536	544
Total liquid collected by train, ml	16.9	37.5	15.7
Std. vol. of H_2O vapor coll., cu.ft.	0.8	1.8	0.74
Dry gas meter calibration factor	1.0107	1.0107	1.0107
Sample vol. at meter cond., dcf	46.185	45.911	46.445
Sample vol. at std. cond., dscf [(1)]	46.265	45.752	45.575
Percent of isokinetic sampling	103.1	104.6	101.4
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.	0.017	0.037	0.016
Mole fraction of dry gas	0.983	0.963	0.984
Molecular wt. of wet gas, lb/lb mole	28.65	28.43	28.66
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-0.55	-0.25	-0.35
Absolute pressure, in. Hg	30.02	29.88	29.85
Avg. temperature, deg. F	85	84	81
Avg. absolute temperature, deg.R	545	544	541
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	12	12	12
Avg. gas stream velocity, ft./sec.	58.4	58.3	58.4
Stack/duct cross sectional area, sq.ft.	7.07	7.07	7.07
Avg. gas stream volumetric flow, wacf/min.	24786	24742	24758
Avg. gas stream volumetric flow, dscf/min.	23683	23066	23723

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

*Run 3 conducted prior to Run 2

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

TEST DATA			
Run number	1	3*	2
Location	Divison Stack	Divison Stack	Divison Stack
Date	6/12/19	6/13/2019	6/13/2019
Time period	1109-1332	1108-1314	1442-1641
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	54.27	74.49	75.60
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	41.42	57.48	58.57
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	2.59E-09	3.59E-09	3.66E-09
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	3.68E-03	4.97E-03	5.21E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	4.63E-04	6.25E-04	6.55E-04

*Run 3 conducted prior to Run 2

APPENDIX A
PROCESS OPERATIONS DATA

Division WGS Outlet Routed to Carbon Bed for all testing days

Date	6/12/2019															
Time	1000				1100				1200				1300			
Stack Testing						Run 1 - 1109 - 1332										
HFPO																
VEN Product	PPVE															
VEN Precursor																
VEN Condensation (HFPO)																
VEN ABR																
VEN Refining																
Stripper Column Vent																
Division WGS Recirculation Flow	15000 kg/h															
Division WGS Inlet Flow	140 kg/h				95 kg/h								76 kg/h			

Date	6/13/2019																											
Time	1000				1100				1200				1300				1400				1500				1600			
Stack Testing						RUN 2 - 1108-1314																Run 3 - 1442-1641						
HFPO																												
VEN Product	PPVE																											
VEN Precursor																												
VEN Condensation (HFPO)																												
VEN ABR																												
VEN Refining																												
Stripper Column Vent																												
Division WGS Recirculation Flow	15000 kg/h																											
Division WGS Inlet Flow	112 kg/h																											

APPENDIX B
RAW AND REDUCED TEST DATA

INLET

Sample and Velocity Traverse Point Data Sheet - Method 1

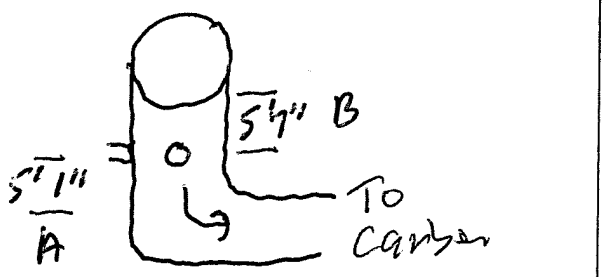
Client Chemours
Loaction/Plant Fayetteville NC
Source VE North Carbon Inlet
Operator AS
Date 6-13-18
W.O. Number

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

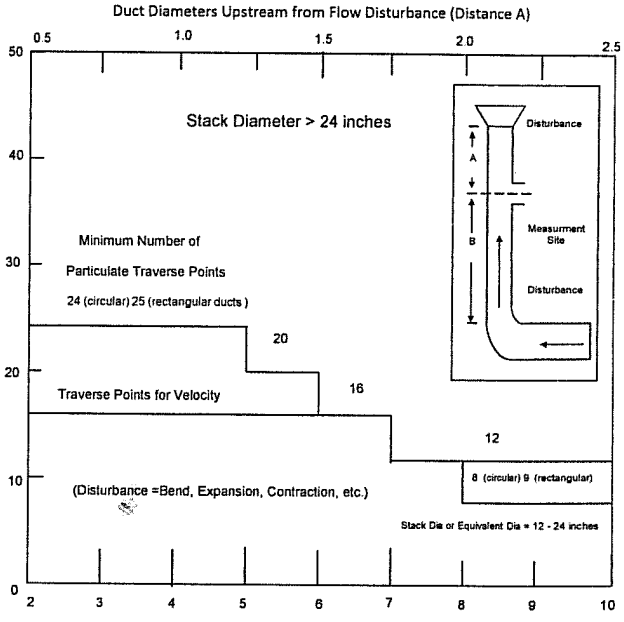
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.021	3/4	21 3/8
2	.067	2 1/4	22 7/8
3	.118	4	24 5/8
4	.177	6	26 5/8
5	.250	8 1/2	29 1/8
6	.356	12 1/8	32 3/4
7	.644	21 7/8	42 1/2
8	.750	25 1/2	46 1/8
9	.823	28	48 5/8
10	.882	30	50 5/8
11	.933	31 3/4	52 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
Location/Plant Fayetteville NC
Source VE North Carbon Outlet
Operator KG
Date 6/13/18
W.O. Number

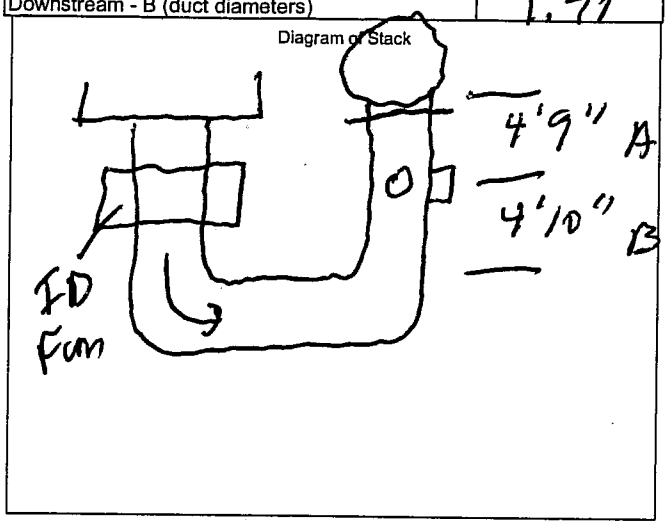
Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type	
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse		☐ CEM Traverse

Distance from far wall to outside of port (in.) = C	54 5/8
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)	

N

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

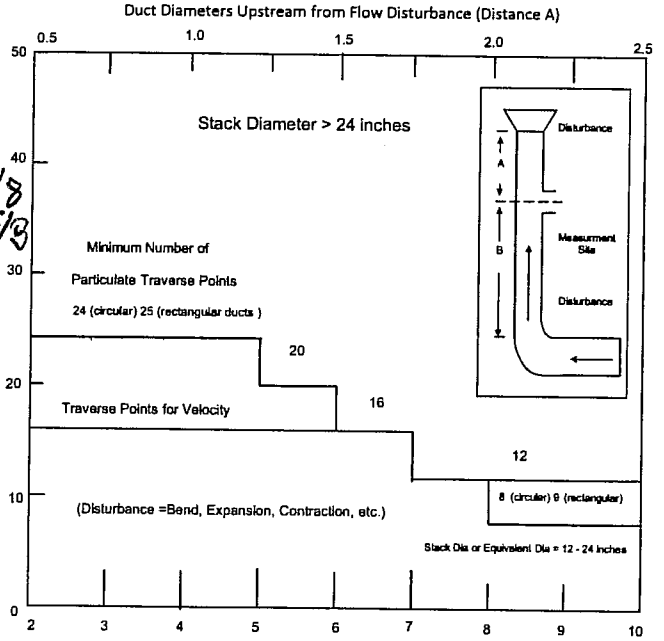
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.021	3/4	21 3/8
2	.067	2 1/4	22 7/8
3	.118	4	24 5/8
4	.177	6	26 5/8
5	.250	8 1/2	29 1/8
6	.356	12 1/8	32 3/4
7	.644	21 5/8	42 1/2
8	.75	25 1/2	46 1/8
9	.823	28	48 5/8
10	.882	30	50 5/8
11	.933	31 3/4	52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

Sample and Velocity Traverse Point Data Sheet - Method 1

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

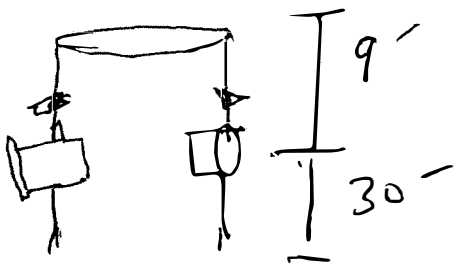
Operator MWKS
Date 11/22/12
W.O. Number 10418.00.002

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	55
Port Depth (in.) = D	12.5
Depth of Duct, diameter (in.) = C-D	37
Area of Duct (ft²) 3/07/18 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

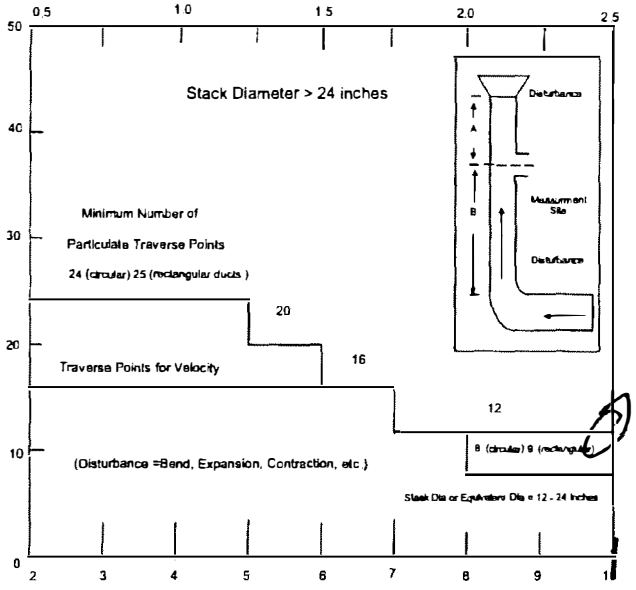
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	4.4	1.62	19 3/4	20 1/8
2	14.6	5.40	23 3/4	24 3/8
3	29.6	10.95	23 7/8	24 7/8
4	70.4	26.04	49.0	49
5	95.4	31.59	49 3/4	50 5/8
6	95.6	35.37	53 1/4	54 3/8
7				
8				
9				
10				
11				
12				

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		26		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

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

Test Data			
Run number	1	3*	2
Location	CBed Inlet	CBed Inlet	CBed Inlet
Date	6/12/19	6/13/19	6/13/19
Time period	1109-1332	1108-1314	1442-1641
Operator	RS/JL	RS/JL	RS/JL
Inputs For Calcs.			
Sq. rt. delta P	0.52664	0.49826	0.50903
Delta H	0.5658	0.5075	0.5292
Stack temp. (deg.F)	83.1	82.9	88.5
Meter temp. (deg.F)	74.5	73.8	83.9
Sample volume (act.)	41.698	39.865	41.015
Barometric press. (in.Hg)	30.06	29.90	29.88
Volume H_2O imp. (ml)	16.0	20.0	20.0
Weight change sil. gel (g)	10.7	11.8	11.0
% 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)	-6.50	-6.50	-6.50
Nozzle dia. (in.)	0.215	0.215	0.215
Meter box cal.	0.9834	0.9834	0.9834
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

*Run 3 conducted prior to Run 2

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

A1

		Stack Conditions	Assumed	Actual					
Client	Chemours				Meter Box ID	32			
W.O.#	15418.002.015.0001				Meter Box Y	.9834 ✓			
Project ID	Chemours	% Moisture	2		Meter Box Del H	1.7175			
Mode/Source ID	Carbon Bed	Impinger Vol (ml)			Probe ID / Length	705		Sample Train (ft³)	
Samp. Loc. ID	IN	Silica gel (g)			Probe Material	Boro		Leak Check @ (in Hg)	
Run No.ID	1	CO2, % by Vol	0		Pitot / Thermocouple ID	705 / 32		Pitot leak check good	
Test Method ID	M0010	O2, % by Vol	20.9		Pitot Coefficient	0.84 ✓		Pitot Inspection good	
Date ID	10JUN2019	Temperature (°F)	~~75~~ 85		Nozzle ID	.215		Method 3 System good	
Source/Location	VE North Inlet	Meter Temp (°F)	75		Nozzle Measurements	.215	.215	.215	Temp Check
Sample Date	6-12-19 ✓	Static Press (in H_2O)	-6.5	✓	Avg Nozzle Dia (in)	.215 ✓			Meter Box Temp
Baro. Press (in Hg)	30.06 ✓				Area of Stack (ft²)	6.305 ✓			Reference Temp
Operator	RS / JL ✓	Ambient Temp (°F)	70°		Sample Time	96 ✓			Pass/Fail (+/- 2°)
					Total Traverse Pts	24 ✓			Temp Change Response ?

K Factor 2.05

	Initial	Mid-Point	Final
Sample Train (ft³)	0.004	0.002	0.002
Leak Check @ (in Hg)	15"	6 4"	5"
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
	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 (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	11:09			~~655.630~~ 655.815 AB									
A 1	4		.30	.61	657.4	82	70	115	114	66	2.5	48		
2	8		.30	.61	659.2	82	71	117	120	66	2.5	47		
3	12		.32	.65	661.1	82	71	120	121	62	2.5	45		
4	16		.32	.65	662.9	82	71	120	121	59	2.5	42		
5	20		.31	.63	664.8	82	72	120	121	57	2.5	44		
6	24		.27	.55	666.5	82	72	120	120	57	2	45		
7	28		.29	.59	668.2	82	72	120	121	57	2	44		
8	32		.28	.57	669.9	82	73	120	120	56	2.5	45		
9	36		.27	.55	671.7	82	73	119	120	57	2	45		
10	40		.27	.55	673.4	82	73	120	120	57	2	44		
11	44		.27	.55	675.1	82	74	120	121	57	2	45		
12	48	11:57	.26	.53	676.774	81	74	120	119	58	2	43		
B 1	4	12:44	.24	.49	678.3	84	76	120	121	64	2	52		
2	8		.24	.49	680.1	84	77	120	121	64	2	51		
3	12		.24	.49	681.6	85	77	120	121	63	2	49		
4	16		.24	.49	683.2	85	77	120	120	61	2	48		
5	20		.24	.49	684.9	85	77	120	119	60	2	46		
6	24		.26	.53	686.6	84	77	120	121	58	2.5	45		
7	28		.29	.59	688.3	84	77	120	120	59	2.5	45		
8	32		.30	.61	690.2	84	77	119	120	58	3	45		
9	36		.29	.59	692.0	84	77	120	120	58	3	45		
10	40		.29	.59	693.7	84	77	120	119	58	3	45		
11	44		.29	.59	695.6	84	77	120	120	~~58~~	3	46		
12	48	13:32	.29	.59	697.375	84	77	120	120	59	3	46		
			Avg Delta P ✓ .2779	Avg Delta H ✓ .5658	Total Volume ✓ 41.698	Avg Ts ✓ 83.08	Avg Tm ✓ 74.54	Min/Max 115/120	Min/Max 114/121	Max 66	Max Vac 3	Min/Max 42/52		
			Avg Sqrt Delta P .5266 ✓	Avg Sqrt Del H .7514 ✓										

WESTON SOLUTIONS

Comments:

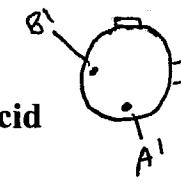
* mid point leak check *

DGM: 676.774 → 676.815

.041

EPA Method 0010 from EPA SW-846

amd



ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

			Stack Conditions								
Client	Chemours		Assumed	Actual	Meter Box ID	32			K Factor	2.07	
W.O.#	15418.002.015.0001				Meter Box Y	.9834 ✓				Initial	Mid-Point	Final
Project ID	Chemours	% Moisture	2		Meter Box Del H	1.7175			Sample Train (ft^3)	0.014	0.005	0.005
Mode/Source ID	Carbon Bed	Impinger Vol (ml)			Probe ID / Length	705			Leak Check @ (in Hg)	15"	4"	4"
Samp. Loc. ID	IN	Silica gel (g)			Probe Material	Boro			Pitot leak check good	(yes) / no	(yes) / no	(yes) / no
Run No.ID	3	CO_2, % by Vol	0		Pitot / Thermocouple ID	705 / 32			Pitot Coefficient good	(yes) / no	(yes) / no	(yes) / no
Test Method ID	M0010	O_2, % by Vol	20.9		Pitot Coefficient	0.84 ✓			Nozzle ID good	(yes) / no	(yes) / no	(yes) / no
Date ID	10JUN2019	Temperature (°F)	80		Nozzle ID	.215			Method 3 System good	~~yes~~ / no	~~yes~~ / no	~~yes~~ / no
Source/Location	VE North Inlet	Meter Temp (°F)	75		Nozzle Measurements	.215	.215	.215	**Temp Check**	Pre-Test Set		Post-Test Set
Sample Date	6-13-19 ✓	Static Press (in H_2O)	-6.5	-6.5 ✓	Avg Nozzle Dia (in)	.215 ✓			Meter Box Temp			
Baro. Press (in Hg)	29.90				Area of Stack (ft^2)	6.305 ✓			Reference Temp			
Operator	RS / JL ✓	Ambient Temp (°F)	72°		Sample Time	96 ✓			Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
					Total Traverse Pts	24 ✓			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	11:08 ✓			717.875									
A	1	4		.28	.57	719.6	81	71	120	120	64	2	45		
	2	8		.27	.55	721.3	82	71	120	122	60	2	42		
	3	12		.26	.53	723.0	82	71	120	120	56	2	45		
	4	16		.27	.55	724.7	82	71	120	121	55	2	46		
	5	20		.27	.55	726.5	82	71	120	119	54	2	47		
	6	24		.27	.55	728.2	82	72	120	120	53	2	47		
	7	28		.22	.45	729.8	82	72	120	120	55	2	48		
	8	32		.24	.49	731.4	82	73	120	119	55	2	48		
	9	36		.24	.49	733.1	82	73	120	119	55	2	49		
	10	40		.24	.49	734.7	82	73	120	120	56	2	50		
	11	44		.24	.49	736.3	82	73	120	121	56	2	50		
	12	48	11:56	.24	.49	737.939	82	73	120	120	56	2	49		
B	1	4	12:26	.22	.45	739.5	82	74	120	119	64	2	53		
	2	8		.22	.45	741.1	84	74	120	120	63	2	49		
	3	12		.22	.45	742.7	84	75	120	119	60	2	49		
	4	16		.22	.45	744.3	84	75	120	119	58	2	49		
	5	20		.22	.45	745.8	84	75	120	120	58	2	49		
	6	24		.22	.45	747.4	84	75	120	120	59	2	51		
	7	28		.26	.53	749.0	84	76	120	120	59	2.5	51		
	8	32		.27	.55	750.8	84	76	119	119	60	2.5	52		
	9	36		27	.55	752.5	84	76	120	120	61	2.5	54		
	10	40		.27	.55	754.2	84	76	120	120	62	2.5	55		
	11	44		.27	.55	756.0	84	77	120	120	63	2.5	56		
	12	48	13:14 ✓	.27	.55	757.751 ✓	84	77	120	120	64	2.5	55		
				Avg Delta P ✓ .2487	Avg Delta H ✓ .5075	Total Volume ✓ 39.865	Avg Ts ✓ 82.87	Avg Tm ✓ 73.75	Min/Max 119/120	Min/Max 119/122	Max 64	Max Vac 2.5	Min/Max 42/56		
				Avg Sqrt Delta P .4982 ✓	Avg Sqrt Del H .7117 ✓										

Comments: midpoint leak check

DGM: 737.939 → 737.950

EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

B A' Starting points

Page 1 of 1

		Stack Conditions	
Client	Chemours		Assumed / Actual
W.O.#	15418.002.015.0001		
Project ID	Chemours	% Moisture	2
Mode/Source ID	VEN	Impinger Vol (ml)	
Samp. Loc. ID	Carbon Bed Inlet	Silica gel (g)	
Run No.ID	2	CO2, % by Vol	0
Test Method ID	M0010	O2, % by Vol	20.9
Date ID	10JUN2019	Temperature (°F)	95
Source/Location	VEN Carbon Bed Inlet	Meter Temp (°F)	85
Sample Date	6/13-2019 ✓	Static Press (in H_2O)	-6.5 / -6.5 ✓
Baro. Press (in Hg)	29.89 ✓		
Operator	RS / JL ✓	Ambient Temp (°F)	85°

Meter Box ID	32		
Meter Box Y	.9834 ✓		
Meter Box Del H	1.7175		
Probe ID / Length	705		Sample Train (ft³)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	705 / 32		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 2.05

	Initial	Mid-Point	Final
Sample Train (ft³)	0.011	0.002	0.002
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	~~yes~~ / no	~~yes~~ / no	~~yes~~ / no
	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 (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	2:42			757.937									
A	1	4		.27	.55	759.7	88	82	120	121	65	2.5	50		
	2	8		.26	.53	761.3	88	82	120	122	65	2.5	48		
	3	12		.27	.55	763.1	88	83	120	118	64	2	48		
	4	16		.25	.51	764.8	88	83	120	119	64	2	44		
	5	20		.25	.51	766.5	88	83	120	120	62	2	43		
	6	24		.25	.51	768.1	88	83	119	120	61	2	45		
	7	28		.25	.51	769.8	88	83	119	120	61	2	47		
	8	32		.25	.51	771.5	89	84	120	120	62	2	48		
	9	36		.26	.53	773.3	89	84	119	119	62	2	45		
	10	40		.25	.51	774.9	88	84	120	120	62	2	43		
	11	44		.25	.51	776.5	88	84	120	120	62	2	44		
	12	48	15:30	.25	.51	778.272	88	84	120	121	62	2	45		
B	1	4	15:53	.23	.47	780.0	88	83	120	121	66	2	54		
	2	8		.23	.47	781.5	89	84	120	120	66	2	48		
	3	12		.23	.47	783.1	89	84	120	119	65	2	45		
	4	16		.23	.47	784.7	89	84	120	120	63	2	46		
	5	20		.24	.49	786.4	89	84	120	120	62	2	46		
	6	24		.25	.51	788.1	89	85	120	120	62	2	47		
	7	28		.29	.59	789.9	89	85	119	121	63	3	46		
	8	32		.29	.59	791.7	89	85	120	119	63	3	47		
	9	36		.30	.61	793.5	89	85	120	120	63	3	50		
	10	40		.30	.61	795.3	89	85	120	119	62	3	50		
	11	44		.29	.59	797.2	89	85	120	120	63	3	51		
	12	48	16:41 ✓	.29	.59	798.986	89	85	120	120	63	3	51		
				Avg Delta P ✓ .2595	Avg Delta H ✓ .5291	Total Volume ✓ 41.015	Avg Ts ✓ 88.54	Avg Tm 83.87	Min/Max 119/120	Min/Max 118/122	Max 66	Max Vac 3	Min/Max 43/54		
				Avg Sqrt Delta P ✓ .5090	Avg Sqrt Del H ✓ .7268										

WESTON SOLUTIONS

Comments: midpoint leak check 83.88

DGM: 778.272 → 778.306

.034 35

EPA Method 0010 from EPA SW-846

SAMPLE RECOVERY FIELD DATA

Client: Chemours | W.O. #: 17[illegible].002.05.0001
Location/Plant: Fayetteville NC | Source & Location: [illegible]

Run No. 1 | Sample Date 6-12-19 | Recovery Date 6-12-19
Sample I.D. [illegible] | Analyst AS | Filter Number ✓

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8 Silica Gel	Total
Contents	Empty	100	100	Empty						
Final	6	100	104	6				216	310.7	526.7
Initial	0	100	100	0				200	300	500
Gain	6	0	4	6				16 ✓	10.7 ✓	26.7

Impinger Color: Clear | Labeled? ✓
Silica Gel Condition: good | Sealed? ✓

Run No. 2 | Sample Date 6-13-19 | Recovery Date 6-13-19
Sample I.D. | Analyst AS | Filter Number ✓

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8 Silica Gel	Total
Contents	Empty	H_2O	H_2O	Empty						
Final	2	108	110	0				220	311	531
Initial	0	100	100	0				200	300	500
Gain	2	8	10	0				20 ✓	11 ✓	31

Impinger Color: Clear | Labeled? ✓
Silica Gel Condition: good | Sealed? ✓

Run No. 3 | Sample Date 6-13-19 | Recovery Date 6-13-19
Sample I.D. | Analyst AS | Filter Number ✓

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8 Silica Gel	Total
Contents	Empty	H_2O	H_2O	Empty						
Final	8	102	106	4				220	311.8	531.8
Initial	0	100	100	0				200	300	500
Gain	8	2	6	4				20 ✓	11.8 ✓	31.8

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

Check COC for Sample IDs of Media Blanks

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

Test Data			
Run number	1	3*	2
Location	CBed Outlet	CBed Outlet	CBed Outlet
Date	6/12/19	6/13/19	6/13/19
Time period	1109-1332	1108-1314	1442-1641
Operator	KA	KA/BB	KA/BB
Inputs For Calcs.			
Sq. rt. delta P	0.56312	0.55261	0.55352
Delta H	0.8338	0.8125	0.8104
Stack temp. (deg.F)	90.2	89.2	93.0
Meter temp. (deg.F)	75.2	75.5	85.4
Sample volume (act.)	47.889	46.960	47.161
Barometric press. (in.Hg)	30.06	29.90	29.88
Volume H_2O imp. (ml)	16.0	24.0	14.0
Weight change sil. gel (g)	10.9	13.2	13.2
% 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)	3.50	3.70	3.70
Nozzle dia. (in.)	0.215	0.215	0.215
Meter box cal.	1.0021	0.9834	0.9834
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

*Run 3 conducted prior to Run 2

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.015.0001
Project ID	Chemours
Mode/Source ID	Carbon Bed
Samp. Loc. ID	OUT
Run No.ID	1
Test Method ID	M0010
Date ID	10JUN2019
Source/Location	VE North Outlet
Sample Date	6/12/19 ✓
Baro. Press (in Hg)	30.06 ✓
Operator	KA ✓

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol	0.0	
O2, % by Vol	20.9	
Temperature (°F)	69	
Meter Temp (°F)	69	75.208
Static Press (in H_2O)	3.5	3.5 ✓
Ambient Temp (°F)	66	

Meter Box ID	25
Meter Box Y	1.0021 ✓
Meter Box Del H	1.9757
Probe ID / Length	P710
Probe Material	Boro
Pitot / Thermocouple ID	P710
Pitot Coefficient	0.84 ✓
Nozzle ID	.215
Nozzle Measurements	.215 / .215 / .215
Avg Nozzle Dia (in)	.215 ✓
Area of Stack (ft²)	6.305 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

K Factor 2.5

	Initial	Mid-Point	Final
Sample Train (ft³)	0.004	0.003	0.002
Leak Check @ (In Hg)	10"	6"	6"
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			
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 (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	1109 ✓			883.560									
A 1	4		.67	1.7	886.5	88	70	110	110	66	5	63		
2	8		.60	1.5	889.2	88	72	122	113	61	5	42		
3	12		KA .61	1.5	891.9	88	72	121	120	59	5	45		
4	16		.57	1.4	894.5	89	72	120	120	59	5	47		
5	20		.52	1.3	897.1	89	73	120	120	59	5	49		
6	24		.45	1.1	899.5	89	73	120	120	57	4	47		
7	28		.28	.70	901.3	89	74	120	120	58	3	48		
8	32		.21	.53	903.0	88	74	120	120	58	2	50		
9	36		.19	.48	904.6	89	74	121	120	59	2	50		
10	40		.17	.43	906.0	89	74	121	120	59	2	51		
11	44		.14	.35	907.3	89	74	121	121	59	2	52		
12	48	1157	.12	.30	908.589	89	75	121	120	60	2	53		
B 1	4	1244	.23	.58	912.5	90	77	120	120	67	2	61		910.893
2	8		.25	.63	913.7	91	77	120	120	65	3	60		2304
3	12		.25	.63	916.1	91	77	120	120	62	3	53		MPLC
4	16		.27	.68	918.0	92	77	120	120	61	3	52		
5	20		.31	.78	920.0	92	77	120	120	61	3	52		
6	24		.33	.83	922.1	92	77	119	120	60	3	50		
7	28		.35	.88	924.1	92	78	120	121	60	3	51		
8	32		.33	.83	926.2	92	77	120	120	59	3	50		
9	36		.33	.83	928.2	92	77	120	120	59	3	50		
10	40		.30	.75	930.3	92	78	120	120	58	3	50		
11	44		.28	.70	932.0	92	78	120	120	58	3	51		
12	48	KA ~~1320~~ 1332 ✓	.24	.60	933.753	92	78	120	120	59	3	51		
			Avg Delta P .333 ✓	Avg Delta H .834 ✓	Total Volume 47.889 ✓	Avg Ts 90.167 ✓	Avg Tm 75.208 ✓	Min/Max 110/122	Min/Max 110/121	Max 67	Max Vac 5	Min/Max 47/63		
			Avg Sqrt Delta P .563 ✓	Avg Sqrt Del H .891 ✓										

Comments: Mid Point leak check had a broken hash pipe and a shifted gasket on the Jumper. These were both the result of removing the probe and bumping the Jumper. Once the issues were corrected the leak check was good. AMM

EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	Assumed	Actual
Client	Chemours			
W.O.#	15418.002.015.0001			
Project ID	Chemours	% Moisture	2	
Mode/Source ID	Carbon Bed	Impinger Vol (ml)		
Samp. Loc. ID	OUT	Silica gel (g)		
Run No.ID	3	CO2, % by Vol	0.0	
Test Method ID	M0010	O2, % by Vol	20.9	
Date ID	10JUN2019	Temperature (°F)	85	84.208
Source/Location	VE North Outlet	Meter Temp (°F)	75	75.512
Sample Date	6/13/19 ✓	Static Press (in H_2O)	3.5	3.7 ✓
Baro. Press (in Hg)	29.90 ✓			
Operator	KA/BB ✓	Ambient Temp (°F)	73	

Meter Box ID	~~32~~ 25		
Meter Box Y	~~.9834~~ 1.0021		
Meter Box Del H	~~1.7175~~ 1.9757		
Probe ID / Length	P706		Sample Train (ft^3)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	P706		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 (ft^2)	~~6.31~~ 6.305		Reference Temp
Sample Time	96 ✓		Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 2.5

	Initial	Mid-Point	Final
	0.004	0.003	0.008
	10"	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 (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	1108 ✓			958.943									
A 1	4		.66	1.7	961.8	88	72	115	116	65	5	36		
2	8		.65	1.6	964.7	89	73	115	115	63	5	35		
3	12		.63	1.6	967.5	88	73	115	116	61	5	37		
4	16		.55	1.4	970.2	88	73	115	116	61	5	37		
5	20		.52	1.3	972.7	88	74	114	115	64	4	38		
6	24		.45	1.1	974.9	88	74	115	113	64	4	38		
7	28		.29	.73	976.0	88	74	115	116	64	3	39		
8	32		.22	.55	978.5	89	74	115	114	64	2	40		
9	36		.18	.46	980.0	88	75	115	115	64	2	40		
10	40		.15	.38	981.4	88	75	115	116	64	2	41		
11	44		.12	.30	982.6	88	KA ~~75~~ 76	114	115	64	2	42		
12	48	1156	.11	.28	983.833	88	75	116	115	64	2	42		
														983.935
B 1	4	1226	.26	.65	985.7	89	76	115	115	64	3	60		-.102
2	8		.28	.70	987.7	90	76	115	115	61	3	40		MPLC
3	12		.30	.75	989.5	90	76	115	116	60	3	40		
4	16		.30	.75	991.5	90	76	115	115	58	3	40		
5	20		.30	.75	993.4	90	77	115	114	58	3	40		
6	24		.33	.83	995.4	90	77	115	115	59	3	41		
7	28		.30	.75	997.4	90	77	116	116	59	3	41		
8	32		.26	.65	999.2	90	78	116	115	59	3	42		
9	36		.26	.65	1000.9	91	78	115	116	60	3	41		
10	40		.24	.60	1002.8	91	78	115	116	60	3	42		
11	44		.21	.53	1004.0	91	78	115	115	61	3	43		
12	48	1314 ✓	.20	.50	1006.005	91	79	114	116	61	3	43		
			Avg Delta P/ .324 ✓	Avg Delta H .813 ✓	Total Volume 46.960 ✓	Avg Ts 89.208 ✓	Avg Tm 75.542 ✓	Min/Max 114/116	Min/Max 113/116	Max 65	Max Vac 5	Min/Max 35/60		
			Avg Sqrt Delta P .553 ✓	Avg Sqrt Del H .875 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

			Stack Conditions				
Client	Chemours			Meter Box ID	~~32~~ 25		
W.O.#	15418.002.015.0001			Meter Box Y	.4834	1.0021	
Project ID	Chemours	% Moisture	Assumed: 2	Meter Box Del H	1.7175	1.9757	
Mode/Source ID	VEN	Impinger Vol (ml)		Probe ID / Length	P706	—	Sample Train (ft³)
Samp. Loc. ID	Carbon Bed Outlet	Silica gel (g)		Probe Material	Boro		Leak Check @ (in Hg)
Run No.ID	2	CO2, % by Vol	0.0	Pitot / Thermocouple ID	P706		Pitot leak check good
Test Method ID	M0010	O2, % by Vol	20.9	Pitot Coefficient	0.84 ✓		Pitot Inspection good
Date ID	10JUN2019	Temperature (°F)	99	Nozzle ID	.215		Method 3 System good
Source/Location	VEN Carbon Bed Outlet	Meter Temp (°F)	83	Nozzle Measurements	.215	.215 .215	**Temp Check**
Sample Date	6/13/19 ✓	Static Press (in H_2O)	3.7	Avg Nozzle Dia (in)	.215 ✓		Meter Box Temp
Baro. Press (in Hg)	29.88 ✓			Area of Stack (ft²)	~~6.31~~ 6.305		Reference Temp
Operator	KA/BB ✓	Ambient Temp (°F)	78	Sample Time	96 ✓		Pass/Fail (+/- 2°)
				Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 2.5

	Initial	Mid-Point	Final
	0.002	0.001	0.002
	10"	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	1442 ✓			7.874									
A 1	4		.66	1.7	10.7	93	83	~~116~~ 116	119	65	5	63		
2	8		.64	1.6	13.6	93	84	116	116	63	5	60		
3	12		.60	1.5	16.3	93	84	116	117	64	5	58		
4	16		.57	1.4	19.0	93	84	115	114	63	5	58		
5	20		.49	1.2	21.6	93	85	115	114	60	4	52		
6	24		.44	1.1	23.9	93	85	115	115	60	4	39		
7	28		.26	.65	25.7	93	85	116	115	57	3	40		
8	32		.22	.55	27.3	93	85	116	117	57	3	40		
9	36		.17	.43	28.8	93	86	116	114	59	3	42		
10	40		.15	.38	30.3	93	85	115	115	62	2	42		
11	44		.12	.30	31.5	93	85	115	116	63	2	42		
12	48	1530	.11	.28	32.632	93	85	114	115	63	2	42		
														32.725
B 1	4	1553	.26	.65	34.6	93	85	115	116	66	3	59		-.043
2	8		.28	.70	36.4	93	85	115	115	62	3	41		MPLC
3	12		.28	.70	38.2	93	86	115	116	63	3	41		
4	16		.28	.70	40.0	93	86	115	116	60	3	42		
5	20		.28	.70	420	93	86	115	115	63	3	41		
6	24		.34	.85	44.1	93	87	114	114	63	3	41		
7	28		.31	.78	46.0	94	87	115	115	62	3	41		
8	32		.30	.75	48.0	93	87	115	115	62	3	42		
9	36		.28	.70	49.9	93	87	115	115	61	3	42		
10	40		.26	.65	51.7	93	86	115	116	62	3	42		
11	44		.24	.60	53.4	93	86	116	115	63	3	43		
12	48	1641 ✓	.23	.58	55.128	93	86	115	115	63	3	44		
			Avg Delta P .324 ✓	Avg Delta H .810 ✓	Total Volume 47.161 ✓	Avg Ts 93.042	Avg Tm 85.417 ✓	Min/Max 114/116	Min/Max 114/119	Max 66	Max Vac 3	Min/Max 41/63		
			Avg Sqrt Delta P .554 ✓	Avg Sqrt Del H .876 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

mmd

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418.002.015.0001
Location/Plant	Fayetteville, NC	Source & Location	VE North Outlet

Run No. 1 Sample Date 6-12-19 Recovery Date 6-12-19

Sample I.D. Chemours - Carbon Bed - OUT - 1 - M0010 - Analyst AS Filter Number ✓

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	4	42100 (AS)	100	12				216	310.9	526.9
Initial	0	100	100	0				200	300	500
Gain	4	0	0	12				16 ✓	10.9	26.9

Impinger Color clear Labeled? ✓

Silica Gel Condition good Sealed? ✓

Run No. 3 Sample Date 6-13-19 Recovery Date 6-13-19

Sample I.D. Chemours - Carbon Bed - OUT - 2 - M0010 - Analyst AS Filter Number ✓

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	10	42100	108	Leak				224	313.2	537.2
Initial	0	100	100	0				200	300	500
Gain	10	0	8	Leak				24 ✓	13.2 ✓	37.2

Impinger Color clear Labeled? ✓

Silica Gel Condition good Sealed? ✓

Run No. 2 Sample Date 6-13-19 Recovery Date 6-13-19

Sample I.D. Chemours - Carbon Bed - OUT - 3 - M0010 - Analyst AS Filter Number ✓

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	4	104	102	4				214	313.2	527.2
Initial	0	100	100	0				200	300	500
Gain	4	4	2	4				14 ✓	13.2 ✓	27.2

Impinger Color Clear Labeled? ✓

Silica Gel Condition Good Sealed? ✓

Check COC for Sample IDs of Media Blanks

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

Test Data			
Run number	1	3*	2
Location	Divison Stack	Divison Stack	Divison Stack
Date	6/12/19	6/13/2019	6/13/2019
Time period	1109-1332	1108-1314	1442-1641
Operator	MW	MW	MW
Inputs For Calcs.			
Sq. rt. delta P	1.02234	1.01467	1.02233
Delta H	0.8211	0.8098	0.8270
Stack temp. (deg.F)	84.8	84.4	80.8
Meter temp. (deg.F)	76.1	76.0	84.0
Sample volume (act.)	46.185	45.911	46.445
Barometric press. (in.Hg)	30.06	29.90	29.88
Volume H_2O imp. (ml)	6.0	26.0	8.0
Weight change sil. gel (g)	10.9	11.5	7.7
% 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)	-0.55	-0.25	-0.35
Nozzle dia. (in.)	0.160	0.160	0.160
Meter box cal.	1.0107	1.0107	1.0107
Cp of pitot tube	0.84	0.84	0.84
Traverse points	12	12	12

*Run 3 conducted prior to Run 2

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions	Assumed	Actual				
Client	Chemours				Meter Box ID	26		
W.O.#	15418.002.015.0001				Meter Box Y	1.0107 ✓		
Project ID	Chemours	% Moisture	2.0		Meter Box Del H	2.3868		
Mode/Source ID	Division	Impinger Vol (ml)			Probe ID / Length	5'	Sample Train (ft^3)	
Samp. Loc. ID	STK	Silica gel (g)			Probe Material	Boro	Leak Check @ (in Hg)	
Run No.ID	1	CO_2, % by Vol	0		Pitot / Thermocouple ID	PNOD	Pitot leak check good	yes / no
Test Method ID	M0010	O_2, % by Vol	20.8		Pitot Coefficient	0.84 ✓	Pitot Inspection good	yes / no
Date ID	10JUN2019	Temperature (°F)	80		Nozzle ID	G160	Method 3 System good	yes / no
Source/Location	Division Stack	Meter Temp (°F)	70		Nozzle Measurements	0.160 / 0.160 / 0.160	**Temp Check**	Pre-Test Set / Post-Test Set
Sample Date	6/12/19 ✓	Static Press (in H_2O)	-0.70	-0.55 ✓	Avg Nozzle Dia (in)	0.160 ✓	Meter Box Temp	70 / 73
Baro. Press (in Hg)	30.08 ✓				Area of Stack (ft^2)	7.07 ✓	Reference Temp	70 / 73
Operator	MR WINKELER ✓	Ambient Temp (°F)	70		Sample Time	96 ✓	Pass/Fail (+/- 2°)	Pass / Fail / Pass / Fail
					Total Traverse Pts	12 ✓	Temp Change Response ?	yes / no / yes / no

K Factor 0.792

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.001	0.001	0.001
Leak Check @ (in Hg)	@15	@10	4
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

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	1109 ✓			852.835									
A 1	4		0.86	0.681	854.52	83	72	111	112	67	2	49		
1	8		0.88	0.697	856.41	83	72	110	110	66	2	49		
2	12		1.20	0.950	858.88	83	72	110	110	65	2	49		
2	16		1.20	0.936	860.62	83	73	110	112	62	2	49	←	K-FACTOR 0.780
3	20		1.30	1.01	862.63	83	73	110	112	62	2	49		
3	24		1.30	1.01	864.82	83	74	110	110	63	3	50		
4	28		1.10	0.858	866.63	83	74	110	114	63	3	50		23.185
4	32		1.10	0.858	868.90	83	74	110	112	63	3	51		
5	36		1.00	0.780	870.88	84	74	112	112	64	2	52		
5	40		1.00	0.780	872.41	84	74	110	112	64	2	52		
6	44		0.95	0.741	874.23	84	74	110	113	65	2	50		
6	48	1157 / 1214	0.95	0.741	876.020 / 876.150	84	74	110	113	65	2	52		
B 1	4		0.90	0.702	878.06	86	80	112	112	65	2	52		23.000
1	8		0.90	0.702	879.74	86	80	112	112	66	2	51		
2	12		1.20	0.936	881.74	87	80	112	111	65	2	52		
2	16		1.20	0.936	884.00	87	80	112	111	65	2	52		
3	20		1.30	1.01	885.70	87	80	112	116	64	3	52		
3	24		1.30	1.01	888.26	87	78	116	114	64	3	52		
4	28		1.10	0.858	890.27	86	78	116	117	64	3	52		
4	32		1.10	0.858	892.10	86	78	116	117	64	3	52		
5	36		0.90	0.702	894.27	86	78	116	116	65	2	49		
5	40		0.90	0.702	895.77	86	78	116	116	65	2	49		
6	44		0.80	0.624	897.33	86	78	116	116	65	2	49		
6	48	1332 ✓	0.80	0.624	899.150	86	78	116	116	65	2	51		
			Avg Delta P ✓ 1.05167	Avg Delta H 0.821083	Total Volume 46.125	Avg Ts 84.8	Avg Tm ✓ 76.0	Min/Max 110/116	Min/Max 110/117	Max 67	Max Vac 3	Min/Max 49/52		
			Avg Sqrt Delta P 1.02234	Avg Sqrt Del H 0.90339	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions	Assumed	Actual					
Client	Chemours				Meter Box ID	26		K Factor	0.782
W.O.#	15418.002.015.0001				Meter Box Y	1.0107 ✓		Initial	Mid-Point / Final
Project ID	Chemours	% Moisture	~2		Meter Box Del H	2.0868			
Mode/Source ID	Division	Impinger Vol (ml)			Probe ID / Length	5'	Sample Train (ft³)	0.001	0.001 / 0.001
Samp. Loc. ID	STK	Silica gel (g)			Probe Material	Boro	Leak Check @ (in Hg)	✓15	✓6 / ✓4
Run No.ID	3	CO2, % by Vol	0.1		Pitot / Thermocouple ID	PTOO	Pitot leak check good	yes / no	yes / no / yes / no
Test Method ID	M0010	O2, % by Vol	20.8		Pitot Coefficient	0.84 ✓	Pitot Inspection good	yes / no	yes / no / yes / no
Date ID	10JUN2019	Temperature (°F)			Nozzle ID	0.160	Method 3 System good	yes / no	yes / no / yes / no
Source/Location	Division Stack	Meter Temp (°F)	≥70		Nozzle Measurements	0.160 / 0.160 / 0.160	**Temp Check**	Pre-Test Set	Post-Test Set
Sample Date	6/13/19	Static Press (in H_2O)	-0.25	✓	Avg Nozzle Dia (in)	0.160 ✓	Meter Box Temp	71	81
Baro. Press (in Hg)	29.76				Area of Stack (ft²)	7.07 ✓	Reference Temp	70	81
Operator	MRJ WINKELER	Ambient Temp (°F)	≥ 70	68	Sample Time	96 ✓	Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
					Total Traverse Pts	12 ✓	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 (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	1108 ✓			925.521									
A 1	4		0.90	0.703	927.23	83	72	116	116	67	2	54		
1	8		0.90	0.703	929.29	83	72	116	115	66	2	54		
2	12		1.2	0.938	931.32	83	72	115	115	64	2	54		
2	16		1.2	0.938	933.26	83	72	115	115	64	2	54		23.079
3	20		1.3	1.01	935.54	83	72	115	115	64	2	54		
3	24		1.3	1.01	937.44	83	72	116	117	63	2	54		
4	28		1.1	0.860	939.42	83	72	116	116	63	2	54		
4	32		1.1	0.860	941.48	83	74	116	115	63	2	54		
5	36		0.95	0.742	943.37	83	74	116	115	62	1	55		
5	40		0.95	0.742	945.40	84	74	116	116	62	1	55		
6	44		0.80	0.625	946.91	84	74	115	115	63	1	56		
6	48	1156	0.80	0.625	948.600	84	74	115	115	63	1	56		
		1226			948.700									
B 1	4		0.95	0.742	950.650	85	79	115	115	67	2	54		
1	8		0.95	0.742	952.47	85	79	115	115	67	2	54		22.832
2	12		1.2	0.938	954.55	85	79	115	115	65	2	56		
2	16		1.2	0.938	956.65	85	79	115	115	59	2	56		
3	20		1.3	1.01	959.00	85	78	115	115	59	2	56		
3	24		1.3	1.01	960.70	86	79	116	116	59	2	56		
4	28		1.1	0.860	962.72	86	79	116	116	60	2	52		
4	32		1.1	0.860	964.62	86	79	116	116	60	2	52		
5	36		0.90	0.703	966.41	86	79	116	115	60	2	52		
5	40		0.90	0.703	968.62	86	80	116	116	60	1	53		
6	44		0.75	0.586	970.10	86	80	116	116	60	1	53		
6	48	1314 ✓	0.75	0.586	971.532	86	80 ✓	115	114	61	2	54		
			Avg Delta P ✓	Avg Delta H	Total Volume	Avg Ts	Avg Tm ✓	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			1.03750	0.80975	45.911	84 ✓	76.0 ✓	115 / 116	114 / 116	67	2	52 / 56		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			1.01467 ✓	0.89645 ✓										

EPA Method 0010 from EPA SW-846

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.#	15418.002.015.0001				Meter Box Y	1.0107 ✓
Project ID	Chemours	% Moisture	≈2		Meter Box Del H	2.0868
Mode/Source ID	Division	Impinger Vol (ml)			Probe ID / Length	P700 / 5'
Samp. Loc. ID	STK	Silica gel (g)			Probe Material	Boro
Run No.ID	(1) 2 3	CO2, % by Vol	0.1		Pitot / Thermocouple ID	P700
Test Method ID	M0010	O2, % by Vol	20.8		Pitot Coefficient	0.84 ✓
Date ID	10JUN2019	Temperature (°F)	≈		Nozzle ID	G160
Source/Location	Division Stack	Meter Temp (°F)	≈82		Nozzle Measurements	0.160 / 0.160 / 0.160
Sample Date	6/13/19 ✓	Static Press (in H_2O)	-0.135	✓	Avg Nozzle Dia (in)	0.160 ✓
Baro. Press (in Hg)	29.88 ✓				Area of Stack (ft^2)	1.07 ✓
Operator	MD WINKELER	Ambient Temp (°F)	≈81		Sample Time	96 ✓
					Total Traverse Pts	12 ✓

Sample Train (ft^3)	Leak Check @ (in Hg)	Pitot leak check good	Pitot Inspection good	Method 3 System good	Temp Check
Initial	0.001	≤.15	(yes) / no	(yes) / no	(yes) / no
Mid-Point	0.001	≤.15	(yes) / no	(yes) / no	(yes) / no
Final	0.001	≤.15	(yes) / no	(yes) / no	(yes) / no

K Factor 0.785

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	80	82
Reference Temp	80	82
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	1442 ✓			971.620									
1	4		0.85	0.667	973.120	80	82	116	110	67	2	67		
1	8		0.85	0.667	975.120	80	82	116	115	66	2	62		23.208
2	12		1.2	0.942	977.215	80	82	116	115	65	2	65		
2	16		1.2	0.942	979.31	80	82	116	116	65	2	65		
3	20		1.3	1.02	981.21	82	82	116	116	65	2	65		
3	24		1.3	1.02	983.21	82	82	115	115	65	2	65		
4	28		1.2	0.942	985.50	82	83	114	112	65	2	65		
4	32		1.2	0.942	987.82	82	83	113	113	65	2	60		
5	36		1.0	0.782	989.71	80	83	119	116	65	2	60		
5	40		1.0	0.782	991.50	80	83	116	115	62	2	55		
6	44		0.75	0.588	993.18	80	83	115	116	62	2	55		
6	48	1530	0.75	0.588	994.828	80	83	116	115	62	2	55		
		1553			994.915	MD								23.237
(B) 1	4		0.90	0.706	996.77	81	87	116	116	66	2	66		
1	8		0.90	0.706	998.52	81 MD	87	115	115	65	2	62		
2	12		1.2	0.942	1000.50	81	87	115	115	64	2	61		
3	16		1.2	0.942	1002.12	81	85	115	115	62	2	62		
3	20		1.3	1.02	1005.22	81	85	115	116	61	2	59		
3	24		1.3	1.02	1006.94	81	85	116	115	60	2	59		
4	28		1.2	0.942	1008.92	81	85	116	117	60	2	59		
4	32		1.2	0.942	1010.99	81	85	117	117	60	2	59		
5	36		0.95	0.745	1013.05	81	85	117	117	60	1	59		
5	40		0.95	0.745	1014.66	81	85	115	115	60	1	59		
6	44		0.80	0.628	1016.76	81	85	115	114	60	1	59		
6	48	1641 ✓	0.80	0.628	1018.152	81	85	115	114	60	1	59		
			Avg Delta P ✓	Avg Delta H ✓	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			1.05417	0.82700	46.445 ✓	80.8 ✓	84.9 ✓	113/119	110/117	67	2	59/67		
			Avg Sqrt Delta P ✓	Avg Sqrt Del H ✓	Comments:									
			1.02234	0.90549										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

MD

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418.002.015.0001
Location/Plant	Fayetteville, NC	Source & Location	Division Stack

Run No. 1 — Sample Date 6-12-19 — Recovery Date 6-12-19

Sample I.D. Chemours - Division - STK - 1 - M0010 - — Analyst AS — Filter Number —

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	0	100	104	2				206	310.9	516.9
Initial	0	100	100	0				200	300	500
Gain	0	0	4	2				6 ✓	10.9 ✓	16.9

Impinger Color Clear — Labeled? ✓

Silica Gel Condition good — Sealed? ✓

Run No. 23 — Sample Date 6-13-19 — Recovery Date 6-13-19

Sample I.D. Chemours - Division - STK - 2 - M0010 - — Analyst AS — Filter Number —

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	12	100	106	8				226	311.5	537.5
Initial	0	100	100	0				200	300	500
Gain	12	0	6	8				26 ✓	11.5 ✓	37.5

Impinger Color Clear — Labeled? ✓

Silica Gel Condition good — Sealed? ✓

Run No. 22 — Sample Date 6-13-19 — Recovery Date 6-13-19

Sample I.D. Chemours - Division - STK - 3 - M0010 - — Analyst AS — Filter Number —

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20	Empty					Silica Gel	
Final	6	100	100	2				208	307.7	515.7
Initial	0	100	100	0				200	300	500
Gain	6	0	0	2				8 ✓	7.7 ✓	15.7

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: **15418**
Operator: **AJS**
Date: **12 Jun 2019**

File: C:\DATA\Chemours\june 2019\061219 VE North Run 1.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, %	**17.1**

CALIBRATION DATA

Number 1

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

Project Number: **15418**
Operator: **AJS**
Date: **12 Jun 2019**

Start Time: 08:30

O_2

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

Calibration Standards

%	**Cylinder ID**
12.1	CC20577
21.0	CC112489

Calibration Results

Zero	10 mv
Span, 21.0 %	8008 mv

Curve Coefficients

Slope	**Intercept**
381.2	10

CO_2

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

Calibration Standards

%	**Cylinder ID**
9.0	CC20577
17.1	CC112489

Calibration Results

Zero	4 mv
Span, 17.1 %	8537 mv

Curve Coefficients

Slope	**Intercept**
500.5	4

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **12 Jun 2019**

Start Time: 08:30

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 381.2 **Intercept** 10.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.0	12.1	0.1	0.5	Pass
21.0	21.0	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 17.1 %
Slope 500.5 **Intercept** 4.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
9.0	8.9	-0.1	-0.6	Pass
17.0	17.0	0.0	0.0	Pass

BIAS

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **12 Jun 2019**

Start Time: 09:00

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	12.1	12.0	-0.1	-0.5	Pass

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	8.9	8.8	-0.1	-0.6	Pass

RUN DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **12 Jun 2019**

Time	O_2 %	CO_2 %
run 1 start at 11:09		
11:10	20.8	0.1
11:11	20.8	0.1
11:12	20.8	0.1
11:13	20.8	0.1
11:14	20.8	0.1
11:15	20.8	0.1
11:16	20.8	0.1
11:17	20.8	0.1
11:18	20.8	0.1
11:19	20.8	0.1
11:20	20.8	0.1
11:21	20.8	0.1
11:22	20.8	0.1
11:23	20.8	0.1
11:24	20.8	0.1
11:25	20.8	0.1
11:26	20.8	0.1
11:27	20.8	0.1
11:28	20.8	0.1
11:29	20.8	0.1
11:30	20.8	0.1
11:31	20.8	0.1
11:32	20.8	0.1
11:33	20.8	0.1
11:34	20.8	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

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **12 Jun 2019**

Time	O_2 %	CO_2 %
11:49	20.8	0.1
11:50	20.8	0.1
11:51	20.8	0.1
11:52	20.8	0.1
11:53	20.8	0.1
11:54	20.8	0.1
11:55	20.8	0.1
11:56	20.8	0.1
11:57	20.8	0.1
11:58	20.8	0.1
11:59	20.8	0.1
12:00	20.8	0.1
12:01	20.8	0.1
12:02	20.8	0.1
12:03	20.8	0.1
12:04	20.8	0.1
12:05	20.8	0.1
12:06	20.8	0.1
12:07	20.8	0.1
12:08	20.8	0.1
12:09	20.8	0.1
12:10	20.8	0.1
12:11	20.8	0.1
12:12	20.8	0.1
12:13	20.8	0.1
12:14	20.8	0.1
12:15	20.8	0.1
12:16	20.8	0.1
12:17	20.8	0.1
12:18	20.8	0.1
12:19	20.8	0.1
12:20	20.8	0.1
12:21	20.8	0.1
12:22	20.8	0.1
12:23	20.8	0.1
12:24	20.8	0.1
12:25	20.8	0.1
12:26	20.8	0.1
12:27	20.8	0.1
12:28	20.8	0.1

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **12 Jun 2019**

Time	O_2 %	CO_2 %
12:29	20.8	0.1
12:30	20.8	0.1
12:31	20.8	0.1
12:32	20.8	0.1
12:33	20.8	0.1
12:34	20.8	0.1
12:35	20.8	0.1
12:36	20.8	0.1
12:37	20.8	0.1
12:38	20.8	0.1
12:39	20.8	0.1
12:40	20.8	0.1
12:41	20.8	0.1
12:42	20.8	0.1
12:43	20.8	0.1
12:44	20.8	0.1
12:45	20.8	0.1
12:46	20.8	0.1
12:47	20.8	0.1
12:48	20.8	0.1
12:49	20.8	0.1
12:50	20.8	0.1
12:51	20.8	0.1
12:52	20.8	0.1
12:53	20.8	0.1
12:54	20.8	0.1
12:55	20.8	0.1
12:56	20.8	0.1
12:57	20.8	0.1
12:58	20.8	0.1
12:59	20.8	0.1
13:00	20.8	0.1
13:01	20.8	0.1
13:02	20.8	0.1
13:03	20.8	0.1
13:04	20.8	0.1
13:05	20.8	0.1
13:06	20.8	0.1
13:07	20.8	0.1
13:08	20.8	0.1

RUN DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **12 Jun 2019**

Time	O_2 %	CO_2 %
13:09	20.8	0.1
13:10	20.8	0.1
13:11	20.8	0.1
13:12	20.8	0.1
13:13	20.8	0.1
13:14	20.8	0.1
13:15	20.8	0.1
13:16	20.8	0.1
13:17	20.8	0.1
13:18	20.8	0.1
13:19	20.8	0.1
13:20	20.8	0.1
13:21	20.8	0.1
13:22	20.8	0.1
13:23	20.8	0.1
13:24	20.8	0.1
13:25	20.8	0.1
13:26	20.8	0.1
13:27	20.8	0.1
13:28	20.8	0.1
13:29	20.8	0.1
13:30	20.8	0.1
13:31	20.8	0.1
13:32	20.8	0.1
Avgs	**20.8**	**0.1**

RUN SUMMARY

Number 1

Client: **Chemours**			Project Number: **15418**
Location: **Fayetteville, NC**			Operator: **AJS**
Source: **VE North**	Calibration **1**		Date: **12 Jun 2019**

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

Time: 11:09 to 13:32

Run Averages

20.8	0.1

Pre-run Bias at 09:00

Zero Bias	0.1	0.1
Span Bias	12.0	8.8
Span Gas	12.1	9.0

Post-run Bias at 13:51

Zero Bias	0.1	0.1
Span Bias	12.1	8.9
Span Gas	12.1	9.0

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

20.9	0.0

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **12 Jun 2019**

Start Time: 13:51

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	12.1	12.1	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	12.0	12.1	0.1	0.5	Pass

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	8.9	8.9	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	8.8	8.9	0.1	0.6	Pass

*Bias No. 1

METHODS AND ANALYZERS

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Date: **12 Jun 2019**

s.A-F\Chemours Fayetteville\15418.002.015 June 2019 VEN PPA Testing\Data\chemours fayetteville june 2019\0613

Program Version: 2.1, built 19 May 2017 **File Version:** 2.03
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, %	**17.1**

CALIBRATION DATA

Number 1

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

Project Number: **15418**
Operator: **AJS**
Date: **13 Jun 2019**

Start Time: 07:27

O_2

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

Calibration Standards

%	**Cylinder ID**
12.1	CC20577
21.0	CC112489

Calibration Results

Zero	3 mv
Span, 21.0 %	7999 mv

Curve Coefficients

Slope	**Intercept**
381.1	3

CO_2

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

Calibration Standards

%	**Cylinder ID**
9.0	CC20577
17.1	CC112489

Calibration Results

Zero	20 mv
Span, 17.1 %	8536 mv

Curve Coefficients

Slope	**Intercept**
499.5	20

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Start Time: 07:27

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 381.1 **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. 17.1 %
Slope 499.5 **Intercept** 20.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
9.0	9.0	0.0	0.0	Pass
17.0	17.0	0.0	0.0	Pass

BIAS
Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Start Time: 07:34

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

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	9.0	9.0	0.0	0.0	Pass

RUN DATA

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Time	O_2 %	CO_2 %
Run 3 started at 11:08		
11:10	20.8	0.0
11:11	20.8	0.0
11:12	20.8	0.0
11:13	20.8	0.0
11:14	20.8	0.0
11:15	20.8	0.0
11:16	20.8	0.0
11:17	20.8	0.0
11:18	20.8	0.0
11:19	20.8	0.0
11:20	20.8	0.0
11:21	20.8	0.0
11:22	20.8	0.0
11:23	20.8	0.0
11:24	20.8	0.0
11:25	20.8	0.0
11:26	20.8	0.0
11:27	20.8	0.0
11:28	20.8	0.0
11:29	20.8	0.0
11:30	20.8	0.0
11:31	20.8	0.0
11:32	20.8	0.0
11:33	20.8	0.0
11:34	20.8	0.0
11:35	20.8	0.0
11:36	20.8	0.0
11:37	20.8	0.0
11:38	20.8	0.0
11:39	20.8	0.0
11:40	20.8	0.0
11:41	20.8	0.0
11:42	20.8	0.0
11:43	20.8	0.0
11:44	20.8	0.0
11:45	20.8	0.0
11:46	20.8	0.0
11:47	20.8	0.0
11:48	20.8	0.0

RUN DATA

Number 3

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

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **13 Jun 2019**

Time	O_2 %	CO_2 %
11:49	20.8	0.0
11:50	20.8	0.0
11:51	20.8	0.0
11:52	20.8	0.0
11:53	20.8	0.0
11:54	20.8	0.0
11:55	20.8	0.0
11:56	20.8	0.0
11:57	20.8	0.0
11:58	20.8	0.0
11:59	20.8	0.0
12:00	20.8	0.0
12:01	20.8	0.0
12:02	20.8	0.0
12:03	20.8	0.0
12:04	20.8	0.0
12:05	20.8	0.0
12:06	20.8	0.0
12:07	20.8	0.0
12:08	20.8	0.0
12:09	20.8	0.0
12:10	20.8	0.0
12:11	20.8	0.0
12:12	20.8	0.0
12:13	20.8	0.0
12:14	20.8	0.0
12:15	20.8	0.0
12:16	20.8	0.0
12:17	20.8	0.0
12:18	20.8	0.0
12:19	20.8	0.0
12:20	20.8	0.0
12:21	20.8	0.0
12:22	20.8	0.0
12:23	20.8	0.0
12:24	20.8	0.0
12:25	20.8	0.0
12:26	20.8	0.0
12:27	20.8	0.0
12:28	20.8	0.0

RUN DATA

Number 3

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

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **13 Jun 2019**

Time	O_2 %	CO_2 %
12:29	20.8	0.0
12:30	20.8	0.0
12:31	20.8	0.0
12:32	20.8	0.0
12:33	20.8	0.0
12:34	20.8	0.0
12:35	20.8	0.0
12:36	20.8	0.0
12:37	20.8	0.0
12:38	20.8	0.0
12:39	20.8	0.0
12:40	20.8	0.0
12:41	20.8	0.0
12:42	20.8	0.0
12:43	20.8	0.0
12:44	20.8	0.0
12:45	20.8	0.0
12:46	20.8	0.0
12:47	20.8	0.0
12:48	20.8	0.0
12:49	20.8	0.0
12:50	20.8	0.0
12:51	20.8	0.0
12:52	20.8	0.0
12:53	20.8	0.0
12:54	20.8	0.0
12:55	20.8	0.0
12:56	20.8	0.0
12:57	20.8	0.0
12:58	20.8	0.0
12:59	20.8	0.0
13:00	20.8	0.0
13:01	20.8	0.0
13:02	20.8	0.0
13:03	20.8	0.0
13:04	20.8	0.0
13:05	20.8	0.0
13:06	20.8	0.0
13:07	20.8	0.0
13:08	20.8	0.0

RUN DATA

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Time	O_2 %	CO_2 %
13:09	20.8	0.0
13:10	20.8	0.0
13:11	20.8	0.0
13:12	20.8	0.0
13:13	20.8	0.0
13:14	20.8	0.0
Avgs	**20.8**	**0.0**

RUN SUMMARY

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

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

Time: 11:09 to 13:14

Run Averages

20.8	0.0

Pre-run Bias at 07:34

Zero Bias	0.1	0.0
Span Bias	12.0	9.0
Span Gas	12.1	9.0

Post-run Bias at 13:22

Zero Bias	0.0	0.0
Span Bias	11.9	8.8
Span Gas	12.1	9.0

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

21.0	0.0

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Start Time: 13:22

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	11.9	-0.1	-0.5	Pass

Calibration Drift

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

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	9.0	8.8	-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	9.0	8.8	-0.2	-1.2	Pass

*Bias No. 1

RUN DATA

Number 2

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

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **13 Jun 2019**

Time	O_2 %	CO_2 %
15:37	20.8	0.0
15:38	20.8	0.0
15:39	20.8	0.0
15:40	20.8	0.0
15:41	20.8	0.0
15:42	20.8	0.0
15:43	20.8	0.0
15:44	20.8	0.0
15:45	20.8	0.0
15:46	20.8	0.0
15:47	20.8	0.0
15:48	20.8	0.0
15:49	20.8	0.0
15:50	20.8	0.0
15:51	20.8	0.0
15:52	20.8	0.0
15:53	20.8	0.0
15:54	20.8	0.0
15:55	20.8	0.0
15:56	20.8	0.0
15:57	20.7	0.0
15:58	20.7	0.0
15:59	20.7	0.0
16:00	20.7	0.0
16:01	20.7	0.0
16:02	20.7	0.0
16:03	20.7	0.0
16:04	20.7	0.0
16:05	20.7	0.0
16:06	20.7	0.0
16:07	20.7	0.0
16:08	20.7	0.0
16:09	20.7	0.0
16:10	20.7	0.0
16:11	20.7	0.0
16:12	20.7	0.0
16:13	20.7	0.0
16:14	20.7	0.0
16:15	20.7	0.0
16:16	20.7	0.0

RUN DATA

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Time	O_2 %	CO_2 %
16:17	20.7	0.0
16:18	20.7	0.0
16:19	20.7	0.0
16:20	20.7	0.0
16:21	20.7	0.0
16:22	20.7	0.0
16:23	20.7	0.0
16:24	20.8	0.0
16:25	20.8	0.0
16:26	20.8	0.0
16:27	20.8	0.0
16:28	20.8	0.0
16:29	20.8	0.0
16:30	20.8	0.0
16:31	20.8	0.0
16:32	20.8	0.0
16:33	20.8	0.0
16:34	20.8	0.0
16:35	20.8	0.0
16:36	20.8	0.0
16:37	20.8	0.0
16:38	20.8	0.0
16:39	20.8	0.0
16:40	20.8	0.0
16:41	20.8	0.0
Run complete at 16:42		
Avgs	**20.8**	**0.0**

RUN SUMMARY

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

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

Time: 15:36 to 16:41

Run Averages

20.8	0.0

Pre-run Bias at 13:22

Zero Bias	0.0	0.0
Span Bias	11.9	8.8
Span Gas	12.1	9.0

Post-run Bias at 17:12

Zero Bias	0.1	0.0
Span Bias	11.8	8.8
Span Gas	12.1	9.0

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

21.1	0.0

BIAS AND CALIBRATION DRIFT

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **VE North** | Calibration **1** | Date: **13 Jun 2019**

Start Time: 17:12

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	11.8	-0.2	-1.0	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	11.9	11.8	-0.1	-0.5	Pass

*Bias No. 2

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	9.0	8.8	-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	8.8	8.8	0.0	0.0	Pass

*Bias No. 2

APPENDIX C
LABORATORY ANALYTICAL REPORT

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

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Job Number: 140-15641-1

Job Description: VEN Carbon Bed Inlet - M0010

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
7/16/2019 12:58 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
07/16/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
D	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.
E	Result exceeded calibration range.
H	Sample was prepped or analyzed beyond the specified holding time
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

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 - M0010

Job ID: 140-15641-1

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 - M0010

Job ID: 140-15641-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-15641-1	D-2437,2438 DIV VEN CARBON BED INLET M0010 R1 FH	Air	06/12/19 00:00	06/14/19 14:00	
140-15641-2	D-2439,2440,2442 DIV VEN CARBON BED INLET M0010 R1 BH	Air	06/12/19 00:00	06/14/19 14:00	
140-15641-3	D-2441 DIV VEN CARBON BED INLET M0010 R IMP 1,2&3 CONDENSATE	Air	06/12/19 00:00	06/14/19 14:00	
140-15641-4	D-2443 DIV VEN CARBON BED INLET M0010 R BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/12/19 00:00	06/14/19 14:00	
140-15641-5	D-2444,2445 DIV VEN CARBON BED INLET M0010 R2 FH	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-6	D-2446,2447,2449 DIV VEN CARBON BED INLET M0010 R2 BH	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-7	D-2448 DIV VEN CARBON BED INLET M0010 R IMP 1,2&3 CONDENSATE	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-8	D-2450 DIV VEN CARBON BED INLET M0010 R BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-9	D-2451,2452 DIV VEN CARBON BED INLET M0010 R3 FH	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-10	D-2453,2454,2456 DIV VEN CARBON BED INLET M0010 R3 BH	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-11	D-2455 DIV VEN CARBON BED INLET M0010 R IMP 1,2&3 CONDENSATE	Air	06/13/19 00:00	06/14/19 14:00	
140-15641-12	D-2457 DIV VEN CARBON BED INLET M0010 R BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/13/19 00:00	06/14/19 14:00	

Job Narrative
140-15641-1

Sample Receipt

The samples were received on June 14, 2019 at 2:00 PM in good condition and properly preserved. The temperatures of the 3 coolers at receipt time were 0.4º C, 0.8º C and 1.1º C.

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.

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.

LCMS

Method 8321A: The method blank for preparation batch 280-462445 and analytical batch 280-463270 contained HFPO-DA above the method detection limit. This target analyte concentration was less than 1/2 the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

HFPO

Method 8321A: The Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: D-2437,2438 DIV VEN CARBON BED INLET M0010 R1 FH (140-15641-1), D-2439,2440,2442 DIV VEN CARBON BED INLET M0010 R1 BH (140-15641-2), D-2443 DIV VEN CARBON BED INLET M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE (140-15641-4), D-2444,2445 DIV VEN CARBON BED INLET M0010 R2 FH (140-15641-5), D-2446,2447,2449 DIV VEN CARBON BED INLET M0010 R2 BH (140-15641-6), D-2450 DIV VEN CARBON BED INLET M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE (140-15641-8), D-2451,2452 DIV VEN CARBON BED INLET M0010 R3 FH (140-15641-9), D-2453,2454,2456 DIV VEN CARBON BED INLET M0010 R3 BH (140-15641-10), D-2457 DIV VEN CARBON BED INLET M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE (140-15641-12), (LCS 280-462445/2-A), (LCS 280-462566/2-A), (MB 280-462445/1-A) and (MB 280-462566/1-A). 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 280-462445 and 280-462566 and analytical batch 280-463270 HFPO

Samples associated with this analytical batch were originally analyzed with an "E" flag to indicate that the HFPO-DA exceeded the calibration curve of the method. Project specific calculations are provided as an addendum to this narrative.

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

Organic Prep

All samples were originally extracted within holding time in the Knoxville Laboratory.

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.

Chemours VEN Carbon Bed Inlet Test Analytical Report
TestAmerica Job No. 140-15641-1
July 16, 2019

The following samples exceeded the Method 8321A calibration range for HFPO-DA and required that dilution of the extracts be performed:

- DIV VEN CB INLET R1 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)
- DIV VEN CB INLET R2 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)
- DIV VEN CB INLET R3 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

The original analysis concentration which displays the "E" flag is provided with the data set indicating that the value provided is estimated. The $^{13}C_3$ – HFPO-DA isotope dilution internal standard (IDA) recovery percentage (%) however, is provided with this analysis run.

A second analysis concentration displays an accurate concentration of the HFPO-DA in the diluted sample extract, but the value is uncorrected for the IDA recovery percentage from the original matrix. The recovery percentage presented with the second concentration represents a post-spike of IDA to benchmark the instrument quantification of native HFPO-DA.

Final recovery-corrected concentrations of the native HFPO-DA are provided by calculation using the original recovery value of the IDA and the diluted extract values of the native HFPO-DA. The final concentrations are calculated as follows:

- DIV VEN CB INLET R1 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

$$(2640\ ug)\ \times\ \left(\frac{81}{82}\right)\ =\ 2608\ ug$$

- DIV VEN CB INLET R2 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

$$(5510\ ug)\ \times\ \left(\frac{75}{76}\right)\ =\ 5437\ ug$$

- DIV VEN CB INLET R3 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

$$(6480\ ug)\ \times\ \left(\frac{80}{61}\right)\ =\ 8498\ ug$$

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: 462445

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-1	D-2437,2438 DIV VEN CARBON BED INLET M0	Total/NA	Air	None	
140-15641-5	D-2444,2445 DIV VEN CARBON BED INLET M0	Total/NA	Air	None	
140-15641-9	D-2451,2452 DIV VEN CARBON BED INLET M0	Total/NA	Air	None	
MB 280-462445/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462445/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-2	D-2439,2440,2442 DIV VEN CARBON BED INLE	Total/NA	Air	None	
140-15641-4	D-2443 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	None	
140-15641-6	D-2446,2447,2449 DIV VEN CARBON BED INLE	Total/NA	Air	None	
140-15641-8	D-2450 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	None	
140-15641-10	D-2453,2454,2456 DIV VEN CARBON BED INLE	Total/NA	Air	None	
140-15641-12	D-2457 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	None	
MB 280-462566/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462566/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-3	D-2441 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	None	
140-15641-7	D-2448 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	None	
140-15641-11	D-2455 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	None	
MB 280-462636/13-A	Method Blank	Total/NA	Air	None	
MB 280-462636/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462636/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 463046

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-3	D-2441 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	8321A	462636
140-15641-7	D-2448 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	8321A	462636
140-15641-11	D-2455 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	8321A	462636
MB 280-462636/13-A	Method Blank	Total/NA	Air	8321A	462636
MB 280-462636/1-A	Method Blank	Total/NA	Air	8321A	462636
LCS 280-462636/2-A	Lab Control Sample	Total/NA	Air	8321A	462636

Analysis Batch: 463435

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-463435/13	Lab Control Sample	Total/NA	Air	8321A	

Analysis Batch: 464014

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-1	D-2437,2438 DIV VEN CARBON BED INLET M0	Total/NA	Air	8321A	462445
140-15641-2	D-2439,2440,2442 DIV VEN CARBON BED INLE	Total/NA	Air	8321A	462566
140-15641-4	D-2443 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	8321A	462566
140-15641-5	D-2444,2445 DIV VEN CARBON BED INLET M0	Total/NA	Air	8321A	462445
140-15641-6	D-2446,2447,2449 DIV VEN CARBON BED INLE	Total/NA	Air	8321A	462566
140-15641-8	D-2450 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	8321A	462566

LCMS (Continued)

Analysis Batch: 464014 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-9	D-2451,2452 DIV VEN CARBON BED INLET M0	Total/NA	Air	8321A	462445
140-15641-10	D-2453,2454,2456 DIV VEN CARBON BED INLE	Total/NA	Air	8321A	462566
140-15641-12	D-2457 DIV VEN CARBON BED INLET M0010 R	Total/NA	Air	8321A	462566
MB 280-462445/1-A	Method Blank	Total/NA	Air	8321A	462445
MB 280-462566/1-A	Method Blank	Total/NA	Air	8321A	462566
LCS 280-462445/2-A	Lab Control Sample	Total/NA	Air	8321A	462445
LCS 280-462566/2-A	Lab Control Sample	Total/NA	Air	8321A	462566

Prep Batch: 464120

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-2 - REDL	D-2439,2440,2442 DIV VEN CARBON BED INLE	Total/NA	Air	None	
140-15641-6 - REDL	D-2446,2447,2449 DIV VEN CARBON BED INLE	Total/NA	Air	None	
140-15641-10 - REDL	D-2453,2454,2456 DIV VEN CARBON BED INLE	Total/NA	Air	None	

Analysis Batch: 464589

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-464589/13	Lab Control Sample	Total/NA	Air	8321A	

Analysis Batch: 464590

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15641-2 - REDL	D-2439,2440,2442 DIV VEN CARBON BED INLE	Total/NA	Air	8321A	464120
140-15641-6 - REDL	D-2446,2447,2449 DIV VEN CARBON BED INLE	Total/NA	Air	8321A	464120
140-15641-10 - REDL	D-2453,2454,2456 DIV VEN CARBON BED INLE	Total/NA	Air	8321A	464120

Client Sample ID: D-2437,2438 DIV VEN CARBON BED INLET M0010 R1 FH

Lab Sample ID: 140-15641-1

Date Collected: 06/12/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	37.4	B	1.02	0.110	ug/Sample		06/24/19 13:15	07/09/19 11:54	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*101*	*D*	*50 - 200*	*06/24/19 13:15*	*07/09/19 11:54*	*10*

Client Sample ID: D-2439,2440,2442 DIV VEN CARBON BED INLET M0010 R1 BH

Lab Sample ID: 140-15641-2

Date Collected: 06/12/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	3130	E	12.5	2.50	ug/Sample		06/25/19 14:05	07/09/19 12:37	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*	*D*	*50 - 200*	*06/25/19 14:05*	*07/09/19 12:37*	*50*

Method: 8321A - PFOA and PFOS - REDL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2640	H	250	50.0	ug/Sample		07/10/19 10:53	07/15/19 13:14	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*81*	*D*	*50 - 200*	*07/10/19 10:53*	*07/15/19 13:14*	*10*

Client Sample ID: D-2441 DIV VEN CARBON BED INLET M0010 R1 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15641-3

Date Collected: 06/12/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	231		2.02	0.103	ug/Sample		06/25/19 12:37	06/28/19 10:10	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*67*	*D*	*50 - 200*	*06/25/19 12:37*	*06/28/19 10:10*	*10*

Client Sample ID: D-2443 DIV VEN CARBON BED INLET M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15641-4

Date Collected: 06/12/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.848		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 12:40	1

Client Sample ID: D-2443 DIV VEN CARBON BED INLET M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15641-4

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	60		50 - 200	06/25/19 14:05	07/09/19 12:40	1

Client Sample ID: D-2444,2445 DIV VEN CARBON BED INLET M0010 R2 FH

Lab Sample ID: 140-15641-5

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	49.1	B	1.01	0.109	ug/Sample		06/24/19 13:15	07/09/19 11:57	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	94	D	50 - 200	06/24/19 13:15	07/09/19 11:57	10

Client Sample ID: D-2446,2447,2449 DIV VEN CARBON BED INLET M0010 R2 BH

Lab Sample ID: 140-15641-6

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	5900	E	10.0	2.00	ug/Sample		06/25/19 14:05	07/09/19 12:44	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	76	D	50 - 200	06/25/19 14:05	07/09/19 12:44	50

Method: 8321A - PFOA and PFOS - REDL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	5510	H	500	100	ug/Sample		07/10/19 10:53	07/15/19 13:17	25

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	75	D	50 - 200	07/10/19 10:53	07/15/19 13:17	25

Client Sample ID: D-2448 DIV VEN CARBON BED INLET M0010 R2 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15641-7

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	222		2.16	0.110	ug/Sample		06/25/19 12:37	06/28/19 10:13	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	61	D	50 - 200	06/25/19 12:37	06/28/19 10:13	10

Client Sample ID: D-2450 DIV VEN CARBON BED INLET M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15641-8

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	28.3		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 12:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*		*50 - 200*	*06/25/19 14:05*	*07/09/19 12:47*	*1*

Client Sample ID: D-2451,2452 DIV VEN CARBON BED INLET M0010 R3 FH

Lab Sample ID: 140-15641-9

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	40.2	B	1.01	0.109	ug/Sample		06/24/19 13:15	07/09/19 12:00	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*95*	*D*	*50 - 200*	*06/24/19 13:15*	*07/09/19 12:00*	*10*

Client Sample ID: D-2453,2454,2456 DIV VEN CARBON BED INLET M0010 R3 BH

Lab Sample ID: 140-15641-10

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	9000	E	11.3	2.25	ug/Sample		06/25/19 14:05	07/09/19 12:50	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*61*	*D*	*50 - 200*	*06/25/19 14:05*	*07/09/19 12:50*	*50*

Method: 8321A - PFOA and PFOS - REDL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	6480	H	563	113	ug/Sample		07/10/19 10:53	07/15/19 13:20	25

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*80*	*D*	*50 - 200*	*07/10/19 10:53*	*07/15/19 13:20*	*25*

Client Sample ID: D-2455 DIV VEN CARBON BED INLET M0010 R3 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15641-11

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	84.2		2.14	0.109	ug/Sample		06/25/19 12:37	06/28/19 10:20	10

Client Sample ID: D-2455 DIV VEN CARBON BED INLET M0010 R3 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15641-11

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	55	D	50 - 200	06/25/19 12:37	06/28/19 10:20	10

Client Sample ID: D-2457 DIV VEN CARBON BED INLET M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15641-12

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	28.5		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 12:54	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	58		50 - 200	06/25/19 14:05	07/09/19 12:54	1

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ANALYTICAL REPORT

Job Number: 140-15642-1

Job Description: VEN Carbon Bed Outlet - M0010

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
7/16/2019 12:41 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
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07/16/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
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 - M0010

Job ID: 140-15642-1

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 - M0010

Job ID: 140-15642-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-15642-1	E-1237,1238 DIV VEN CARBON BED OUTLET M0010 R1 FH	Air	06/12/19 00:00	06/14/19 14:00	
140-15642-2	E-1239,1240,1242 DIV VEN CARBON BED OUTLET M0010 R1 BH	Air	06/12/19 00:00	06/14/19 14:00	
140-15642-3	E-1241 DIV VEN CARBON BED OUTLET M001(R1 IMP 1,2&3 CONDENSATE	Air	06/12/19 00:00	06/14/19 14:00	
140-15642-4	E-1243 DIV VEN CARBON BED OUTLET M001(R1 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/12/19 00:00	06/14/19 14:00	
140-15642-5	E-1244,1245 DIV VEN CARBON BED OUTLET M0010 R2 FH	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-6	E-1246,1247,1249 DIV VEN CARBON BED OUTLET M0010 R2 BH	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-7	E-1248 DIV VEN CARBON BED OUTLET M001(R2 IMP 1,2&3 CONDENSATE	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-8	E-1250 DIV VEN CARBON BED OUTLET M001(R2 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-9	E-1251,1252 DIV VEN CARBON BED OUTLET M0010 R3 FH	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-10	E-1253,1254,1256 DIV VEN CARBON BED OUTLET M0010 R3 BH	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-11	E-1255 DIV VEN CARBON BED OUTLET M001(R3 IMP 1,2&3 CONDENSATE	Air	06/13/19 00:00	06/14/19 14:00	
140-15642-12	E-1257 DIV VEN CARBON BED OUTLET M001(R3 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/13/19 00:00	06/14/19 14:00	

Job Narrative
140-15642-1

Sample Receipt

The samples were received on June 14, 2019 at 2:00 PM in good condition and properly preserved.

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.

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.

LCMS

Method 8321A: The Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: E-1241 DIV VEN CARBON BED OUTLET M0010 R1 IMP 1,2&3 CONDENSATE (140-15642-3), E-1248 DIV VEN CARBON BED OUTLET M0010 R2 IMP 1,2&3 CONDENSATE (140-15642-7) and E-1255 DIV VEN CARBON BED OUTLET M0010 R3 IMP 1,2&3 CONDENSATE (140-15642-11). 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.

Method 8321A: The method blank for preparation batch 280-462445 and analytical batch 280-463270 contained HFPO-DA above the method detection limit. This target analyte concentration was less than 1/2 the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

Method 8321A: The Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: E-1253,1254,1256 DIV VEN CARBON BED OUTLET M0010 R3 BH (140-15642-10). 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).

Method 8321A: The method blank for preparation batch 280-462445 and analytical batch 280-464014 contained HFPO-DA above the method detection limit (MDL). Associated sample(s) were not re-extracted and/or re-analyzed because results were greater than 10X the value found in the method blank.

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

Organic Prep

All samples were originally extracted within holding time in the Knoxville Laboratory.

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.

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: 462445

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-1	E-1237,1238 DIV VEN CARBON BED OUTLET M	Total/NA	Air	None	
140-15642-5	E-1244,1245 DIV VEN CARBON BED OUTLET M	Total/NA	Air	None	
140-15642-9	E-1251,1252 DIV VEN CARBON BED OUTLET M	Total/NA	Air	None	
MB 280-462445/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462445/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-2	E-1239,1240,1242 DIV VEN CARBON BED OUT	Total/NA	Air	None	
140-15642-4	E-1243 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	None	
140-15642-6	E-1246,1247,1249 DIV VEN CARBON BED OUT	Total/NA	Air	None	
140-15642-8	E-1250 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	None	
140-15642-10	E-1253,1254,1256 DIV VEN CARBON BED OUT	Total/NA	Air	None	
140-15642-12	E-1257 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	None	
MB 280-462566/13-A	Method Blank	Total/NA	Air	None	
MB 280-462566/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462566/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-3	E-1241 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	None	
140-15642-7	E-1248 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	None	
140-15642-11	E-1255 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	None	
MB 280-462636/13-A	Method Blank	Total/NA	Air	None	
MB 280-462636/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462636/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 463046

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-3	E-1241 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	8321A	462636
140-15642-7	E-1248 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	8321A	462636
140-15642-11	E-1255 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	8321A	462636
MB 280-462636/13-A	Method Blank	Total/NA	Air	8321A	462636
MB 280-462636/1-A	Method Blank	Total/NA	Air	8321A	462636
LCS 280-462636/2-A	Lab Control Sample	Total/NA	Air	8321A	462636

Analysis Batch: 463435

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-463435/13	Lab Control Sample	Total/NA	Air	8321A	

Analysis Batch: 464014

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-1	E-1237,1238 DIV VEN CARBON BED OUTLET M	Total/NA	Air	8321A	462445
140-15642-2	E-1239,1240,1242 DIV VEN CARBON BED OUT	Total/NA	Air	8321A	462566
140-15642-4	E-1243 DIV VEN CARBON BED OUTLET M001C	Total/NA	Air	8321A	462566
140-15642-5	E-1244,1245 DIV VEN CARBON BED OUTLET M	Total/NA	Air	8321A	462445
140-15642-6	E-1246,1247,1249 DIV VEN CARBON BED OUT	Total/NA	Air	8321A	462566

LCMS (Continued)

Analysis Batch: 464014 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-8	E-1250 DIV VEN CARBON BED OUTLET M001(	Total/NA	Air	8321A	462566
140-15642-9	E-1251,1252 DIV VEN CARBON BED OUTLET M	Total/NA	Air	8321A	462445
140-15642-12	E-1257 DIV VEN CARBON BED OUTLET M001(	Total/NA	Air	8321A	462566
MB 280-462445/1-A	Method Blank	Total/NA	Air	8321A	462445
MB 280-462566/13-A	Method Blank	Total/NA	Air	8321A	462566
MB 280-462566/1-A	Method Blank	Total/NA	Air	8321A	462566
LCS 280-462445/2-A	Lab Control Sample	Total/NA	Air	8321A	462445
LCS 280-462566/2-A	Lab Control Sample	Total/NA	Air	8321A	462566

Analysis Batch: 464312

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15642-10	E-1253,1254,1256 DIV VEN CARBON BED OUT	Total/NA	Air	8321A	462566

Client Sample ID: E-1237,1238 DIV VEN CARBON BED OUTLET M0010 R1 FH

Lab Sample ID: 140-15642-1

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.436	B	0.0760	0.00821	ug/Sample		06/24/19 13:15	07/09/19 12:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*99*		*50 - 200*	*06/24/19 13:15*	*07/09/19 12:04*	*1*

Client Sample ID: E-1239,1240,1242 DIV VEN CARBON BED OUTLET M0010 R1 BH

Lab Sample ID: 140-15642-2

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	10.1		0.250	0.0500	ug/Sample		06/25/19 14:05	07/09/19 13:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*56*		*50 - 200*	*06/25/19 14:05*	*07/09/19 13:00*	*1*

Client Sample ID: E-1241 DIV VEN CARBON BED OUTLET M0010 R1 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15642-3

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.408		0.210	0.0107	ug/Sample		06/25/19 12:37	06/28/19 10:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*48*	*X*	*50 - 200*	*06/25/19 12:37*	*06/28/19 10:23*	*1*

Client Sample ID: E-1243 DIV VEN CARBON BED OUTLET M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15642-4

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.245		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 13:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*57*		*50 - 200*	*06/25/19 14:05*	*07/09/19 13:03*	*1*

Client Sample ID: E-1244,1245 DIV VEN CARBON BED OUTLET M0010 R2 FH

Lab Sample ID: 140-15642-5

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.595	B	0.0760	0.00821	ug/Sample		06/24/19 13:15	07/09/19 12:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*101*		*50 - 200*	*06/24/19 13:15*	*07/09/19 12:08*	*1*

Client Sample ID: E-1246,1247,1249 DIV VEN CARBON BED OUTLET M0010 R2 BH

Lab Sample ID: 140-15642-6

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	50.4		2.50	0.500	ug/Sample		06/25/19 14:05	07/09/19 13:07	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*85*	*D*	*50 - 200*	*06/25/19 14:05*	*07/09/19 13:07*	*10*

Client Sample ID: E-1248 DIV VEN CARBON BED OUTLET M0010 R2 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15642-7

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	3.83		0.210	0.0107	ug/Sample		06/25/19 12:37	06/28/19 10:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*47*	*X*	*50 - 200*	*06/25/19 12:37*	*06/28/19 10:26*	*1*

Client Sample ID: E-1250 DIV VEN CARBON BED OUTLET M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15642-8

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.04		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 13:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*69*		*50 - 200*	*06/25/19 14:05*	*07/09/19 13:10*	*1*

Client Sample ID: E-1251,1252 DIV VEN CARBON BED OUTLET M0010 R3 FH

Lab Sample ID: 140-15642-9

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.451	B	0.0765	0.00826	ug/Sample		06/24/19 13:15	07/09/19 12:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*105*		*50 - 200*	*06/24/19 13:15*	*07/09/19 12:11*	*1*

Client Sample ID: E-1253,1254,1256 DIV VEN CARBON BED OUTLET M0010 R3 BH

Lab Sample ID: 140-15642-10

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	39.6		0.225	0.0450	ug/Sample		06/25/19 14:05	07/11/19 12:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*41*	*X*	*50 - 200*	*06/25/19 14:05*	*07/11/19 12:49*	*1*

Client Sample ID: E-1255 DIV VEN CARBON BED OUTLET M0010 R3 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15642-11

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.971		0.206	0.0105	ug/Sample		06/25/19 12:37	06/28/19 10:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*46*	*X*	*50 - 200*	*06/25/19 12:37*	*06/28/19 10:29*	*1*

Client Sample ID: E-1257 DIV VEN CARBON BED OUTLET M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15642-12

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.459		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 13:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*64*		*50 - 200*	*06/25/19 14:05*	*07/09/19 13:20*	*1*

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ANALYTICAL REPORT

Job Number: 140-15643-1

Job Description: VEN Stack - M0010

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
7/15/2019 11:49 AM

Courtney M Adkins, Project Manager I
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(865)291-3000
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07/15/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
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 Stack - M0010

Job ID: 140-15643-1

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 Stack - M0010

Job ID: 140-15643-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-15643-1	Q-2737,2738 DIV STACK M0010 R1 FH	Air	06/12/19 00:00	06/14/19 14:00	
140-15643-2	Q-2739,2740,2742 DIV STACK M0010 R1 BH	Air	06/12/19 00:00	06/14/19 14:00	
140-15643-3	Q-2741 DIV STACK M0010 R1 IMP 1,2&3 CONDENSATE	Air	06/12/19 00:00	06/14/19 14:00	
140-15643-4	Q-2743 DIV STACK M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/12/19 00:00	06/14/19 14:00	
140-15643-5	Q-2744,2745 DIV STACK M0010 R2 FH	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-6	Q-2746,2747,2749 DIV STACK M0010 R2 BH	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-7	Q-2748 DIV STACK M0010 R2 IMP 1,2&3 CONDENSATE	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-8	Q-2750 DIV STACK M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-9	Q-2751,2752 DIV STACK M0010 R3 FH	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-10	Q-2753,2754,2756 DIV STACK M0010 R3 BH	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-11	Q-2755 DIV STACK M0010 R3 IMP 1,2&3 CONDENSATE	Air	06/13/19 00:00	06/14/19 14:00	
140-15643-12	Q-2757 DIV STACK M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/13/19 00:00	06/14/19 14:00	

Job Narrative
140-15643-1

Sample Receipt

The samples were received on June 14, 2019 at 2:00 PM in good condition and properly preserved. The temperatures of the 3 coolers at receipt time were 0.4º C, 0.8º C and 1.1º C.

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

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.

LCMS

Method 8321A: The Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: Q-2741 DIV STACK M0010 R1 IMP 1,2&3 CONDENSATE (140-15643-3) and Q-2748 DIV STACK M0010 R2 IMP 1,2&3 CONDENSATE (140-15643-7). 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.

Method 8321A: The method blank for preparation batch 280-462445 and analytical batch 280-463270 contained HFPO-DA above the method detection limit. This target analyte concentration was less than 1/2 the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

Method 8321A: The Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: Q-2737,2738 DIV STACK M0010 R1 FH (140-15643-1), Q-2739,2740,2742 DIV STACK M0010 R1 BH (140-15643-2), Q-2743 DIV STACK M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE (140-15643-4), Q-2744,2745 DIV STACK M0010 R2 FH (140-15643-5), Q-2746,2747,2749 DIV STACK M0010 R2 BH (140-15643-6), Q-2750 DIV STACK M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE (140-15643-8), Q-2751,2752 DIV STACK M0010 R3 FH (140-15643-9), Q-2753,2754,2756 DIV STACK M0010 R3 BH (140-15643-10), Q-2757 DIV STACK M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE (140-15643-12), (LCS 280-462445/2-A), (LCS 280-462566/2-A), (MB 280-462445/1-A), (MB 280-462566/1-A) and (MB 280-462566/13-A). 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.

Q-2739,2740,2742 DIV STACK M0010 R1 BH (140-15643-2), Q-2743 DIV STACK M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE (140-15643-4), Q-2746,2747,2749 DIV STACK M0010 R2 BH (140-15643-6), Q-2750 DIV STACK M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE (140-15643-8), Q-2753,2754,2756 DIV STACK M0010 R3 BH (140-15643-10), Q-2757 DIV STACK M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE (140-15643-12) and (MB 280-462566/13-A)

Method 8321A: The method blank for preparation batch 280-462445 and analytical batch 280-464014 contained HFPO-DA above the method detection limit (MDL). Associated sample(s) were not re-extracted and/or re-analyzed because results were greater than 10X the value found in the method blank.

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.

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: 462445

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15643-1	Q-2737,2738 DIV STACK M0010 R1 FH	Total/NA	Air	None	
140-15643-5	Q-2744,2745 DIV STACK M0010 R2 FH	Total/NA	Air	None	
140-15643-9	Q-2751,2752 DIV STACK M0010 R3 FH	Total/NA	Air	None	
MB 280-462445/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462445/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15643-2	Q-2739,2740,2742 DIV STACK M0010 R1 BH	Total/NA	Air	None	
140-15643-4	Q-2743 DIV STACK M0010 R1 BREAKTHROUG	Total/NA	Air	None	
140-15643-6	Q-2746,2747,2749 DIV STACK M0010 R2 BH	Total/NA	Air	None	
140-15643-8	Q-2750 DIV STACK M0010 R2 BREAKTHROUG	Total/NA	Air	None	
140-15643-10	Q-2753,2754,2756 DIV STACK M0010 R3 BH	Total/NA	Air	None	
140-15643-12	Q-2757 DIV STACK M0010 R3 BREAKTHROUG	Total/NA	Air	None	
MB 280-462566/13-A	Method Blank	Total/NA	Air	None	
MB 280-462566/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462566/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15643-3	Q-2741 DIV STACK M0010 R1 IMP 1,2&3 COND	Total/NA	Air	None	
140-15643-7	Q-2748 DIV STACK M0010 R2 IMP 1,2&3 COND	Total/NA	Air	None	
140-15643-11	Q-2755 DIV STACK M0010 R3 IMP 1,2&3 COND	Total/NA	Air	None	
MB 280-462636/13-A	Method Blank	Total/NA	Air	None	
MB 280-462636/1-A	Method Blank	Total/NA	Air	None	
LCS 280-462636/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 463046

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15643-3	Q-2741 DIV STACK M0010 R1 IMP 1,2&3 COND	Total/NA	Air	8321A	462636
140-15643-7	Q-2748 DIV STACK M0010 R2 IMP 1,2&3 COND	Total/NA	Air	8321A	462636
140-15643-11	Q-2755 DIV STACK M0010 R3 IMP 1,2&3 COND	Total/NA	Air	8321A	462636
MB 280-462636/13-A	Method Blank	Total/NA	Air	8321A	462636
MB 280-462636/1-A	Method Blank	Total/NA	Air	8321A	462636
LCS 280-462636/2-A	Lab Control Sample	Total/NA	Air	8321A	462636

Analysis Batch: 463435

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
DLCK 280-463435/13	Lab Control Sample	Total/NA	Air	8321A	

Analysis Batch: 464014

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15643-1	Q-2737,2738 DIV STACK M0010 R1 FH	Total/NA	Air	8321A	462445
140-15643-2	Q-2739,2740,2742 DIV STACK M0010 R1 BH	Total/NA	Air	8321A	462566
140-15643-4	Q-2743 DIV STACK M0010 R1 BREAKTHROUG	Total/NA	Air	8321A	462566
140-15643-5	Q-2744,2745 DIV STACK M0010 R2 FH	Total/NA	Air	8321A	462445
140-15643-6	Q-2746,2747,2749 DIV STACK M0010 R2 BH	Total/NA	Air	8321A	462566

LCMS (Continued)

Analysis Batch: 464014 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15643-8	Q-2750 DIV STACK M0010 R2 BREAKTHROUG	Total/NA	Air	8321A	462566
140-15643-9	Q-2751,2752 DIV STACK M0010 R3 FH	Total/NA	Air	8321A	462445
140-15643-10	Q-2753,2754,2756 DIV STACK M0010 R3 BH	Total/NA	Air	8321A	462566
140-15643-12	Q-2757 DIV STACK M0010 R3 BREAKTHROUG	Total/NA	Air	8321A	462566
MB 280-462445/1-A	Method Blank	Total/NA	Air	8321A	462445
MB 280-462566/13-A	Method Blank	Total/NA	Air	8321A	462566
MB 280-462566/1-A	Method Blank	Total/NA	Air	8321A	462566
LCS 280-462445/2-A	Lab Control Sample	Total/NA	Air	8321A	462445
LCS 280-462566/2-A	Lab Control Sample	Total/NA	Air	8321A	462566

Client Sample ID: Q-2737,2738 DIV STACK M0010 R1 FH

Lab Sample ID: 140-15643-1

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.10	B	0.127	0.0137	ug/Sample		06/24/19 13:15	07/09/19 12:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*113*		*50 - 200*	*06/24/19 13:15*	*07/09/19 12:14*	*1*

Client Sample ID: Q-2739,2740,2742 DIV STACK M0010 R1 BH

Lab Sample ID: 140-15643-2

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	51.7		2.00	0.400	ug/Sample		06/25/19 14:05	07/09/19 13:23	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*77*	*D*	*50 - 200*	*06/25/19 14:05*	*07/09/19 13:23*	*10*

Client Sample ID: Q-2741 DIV STACK M0010 R1 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15643-3

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.269		0.202	0.0103	ug/Sample		06/25/19 12:37	06/28/19 10:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*45*	*X*	*50 - 200*	*06/25/19 12:37*	*06/28/19 10:36*	*1*

Client Sample ID: Q-2743 DIV STACK M0010 R1 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15643-4

Date Collected: 06/12/19 00:00
Date Received: 06/14/19 14:00
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		06/25/19 14:05	07/09/19 13:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*73*		*50 - 200*	*06/25/19 14:05*	*07/09/19 13:26*	*1*

Client Sample ID: Q-2744,2745 DIV STACK M0010 R2 FH

Lab Sample ID: 140-15643-5

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.34	B	0.0760	0.00821	ug/Sample		06/24/19 13:15	07/09/19 12:18	1

Client Sample ID: Q-2744,2745 DIV STACK M0010 R2 FH
Lab Sample ID: 140-15643-5

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	103		50 - 200	06/24/19 13:15	07/09/19 12:18	1

Client Sample ID: Q-2746,2747,2749 DIV STACK M0010 R2 BH
Lab Sample ID: 140-15643-6

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	71.6		2.50	0.500	ug/Sample		06/25/19 14:05	07/09/19 13:29	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	74	D	50 - 200	06/25/19 14:05	07/09/19 13:29	10

Client Sample ID: Q-2748 DIV STACK M0010 R2 IMP 1,2&3 CONDENSATE
Lab Sample ID: 140-15643-7

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.17		0.210	0.0107	ug/Sample		06/25/19 12:37	06/28/19 10:39	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	49	X	50 - 200	06/25/19 12:37	06/28/19 10:39	1

Client Sample ID: Q-2750 DIV STACK M0010 R2 BREAKTHROUGH XAD-2 RESIN TUBE
Lab Sample ID: 140-15643-8

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.491		0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 13:36	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	86		50 - 200	06/25/19 14:05	07/09/19 13:36	1

Client Sample ID: Q-2751,2752 DIV STACK M0010 R3 FH
Lab Sample ID: 140-15643-9

Date Collected: 06/13/19 00:00
Matrix: Air
Date Received: 06/14/19 14:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.55	B	0.101	0.0109	ug/Sample		06/24/19 13:15	07/09/19 12:24	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	104		50 - 200	06/24/19 13:15	07/09/19 12:24	1

Client Sample ID: Q-2753,2754,2756 DIV STACK M0010 R3 BH

Lab Sample ID: 140-15643-10

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	63.1		2.25	0.450	ug/Sample		06/25/19 14:05	07/09/19 13:39	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*	*D*	*50 - 200*	*06/25/19 14:05*	*07/09/19 13:39*	*10*

Client Sample ID: Q-2755 DIV STACK M0010 R3 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15643-11

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	8.79		0.196	0.00999	ug/Sample		06/25/19 12:37	06/28/19 10:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*51*		*50 - 200*	*06/25/19 12:37*	*06/28/19 10:42*	*1*

Client Sample ID: Q-2757 DIV STACK M0010 R3 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15643-12

Date Collected: 06/13/19 00:00
Date Received: 06/14/19 14:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0502	J	0.200	0.0400	ug/Sample		06/25/19 14:05	07/09/19 13:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*74*		*50 - 200*	*06/25/19 14:05*	*07/09/19 13:43*	*1*

APPENDIX D
SAMPLE CALCULATIONS

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 1	Test Date: 6/12/19
Test Location: VEN-Carbon Bed Inlet	Test Period: 1109-1332

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

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

$$Vm(std) = \frac{17.64 \times 0.9834 \times 41.698 \times \left(30.06 + \frac{0.566}{13.6} \right)}{74.54 + 460} = 40.734$$

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.

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

$$Vw(std) = (0.04707 \times 16.0) + (0.04715 \times 10.7) = 1.26$$

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

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

$$bws = \frac{1.26}{1.26 + 40.734} = 0.030$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.030 = 0.970$$

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.

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

$$MWs = (28.84 \times 0.970) +(18 (1 - 0.970)) = 28.51$$

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.

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

$$Vs = 85.49 \times 0.84 \times 0.52664 \times \left(\frac{543}{29.58 \times 28.51} \right)^{\wedge}1/2 = 30.3$$

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.

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

$$Qs(act) = 60 \times 30.3 \times 6.31 = 11480$$

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.

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

$$Qs(std) = 17.64 \times 0.970 \times \frac{29.58}{543.1} \times 11480$$

$$Qs(std) = 10701$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 543 \times 40.734}{30.3 \times 96 \times 29.58 \times 0.970 \times (0.215)^{\wedge}2} = 99.2$$

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: 6/12/19**
Test Location: CBed Inlet | **Test Period: 1109-1332**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{2877.2 \times 2.2046 \times 10\text{-}9}{40.734}$$

Conc1 = 1.56E-07

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 = 2877.2 / (40.734 x 0.02832)

Conc2 = 2493.9

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

$MR1_{(Inlet)}$ = 1.56E-07 x 10701 x 60

$MR1_{(Inlet)}$ = 1.00E-01

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

$MR2_{(Inlet)}$ = 1.00E-01 x 453.59 /3600

$MR2_{(Inlet)}$ = 1.26E-02

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, %

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

$$RE = \frac{(1.00E\text{-}01) - (3.60E\text{-}04)}{1.00E\text{-}01}$$

RE = 99.6

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.

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 1 | **Test Date: 6/12/19**
Test Location: CBed Outlet | **Test Period: 1109-1332**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$C_1 = \frac{11.2 \times 2.2046 \times 10\text{-}9}{47.643}$$

$$= 5.18E\text{-}10$$

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.

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

$C_2 = 11.2 / (47.643 \times 0.02832)$

$= 8.29E+00$

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 = 5.18E-10 x 11548 x 60

= 3.60E-04

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 = 3.60E-04 x 453.59 /3600

= 4.53E-05

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.

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 2	Test Date:6/13/2019
Test Location: Division Stack	Test Period: 1442-1641

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

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

$$Vm(std) = \frac{17.64 \times 1.0107 \times 46.445 \times \left(29.88 + \frac{0.827}{13.6} \right)}{84.00 + 460} = 45.575$$

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.

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

$$Vw(std) = (0.04707 \times 8.0) + (0.04715 \times 7.7) = 0.74$$

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

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

$$bws = \frac{0.74}{0.74 + 45.575} = 0.016$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.016 = 0.984$$

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.

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

$$MWs = (28.84 \times 0.984) +(18 (1 - 0.984)) = 28.66$$

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.

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

$$Vs = 85.49 \times 0.84 \times 1.02233 \times \left(\frac{541}{29.85 \times 28.66} \right)^{\wedge}1/2 = 58.4$$

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.

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

$$Qs(act) = 60 \times 58.4 \times 7.07 = 24758$$

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.

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

$$Qs(std) = 17.64 \times 0.984 \times \frac{29.85}{540.8} \times 24758$$

$$Qs(std) = 23723$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 541 \times 45.575}{58.4 \times 96 \times 29.85 \times 0.984 \times (0.160)\text{^}2} = 101.4$$

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 2 | **Test Date: 6/13/2019**
Test Location: Divison Stack | **Test Period: 1442-1641**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{75.6 \times 2.2046 \times 10\text{-}9}{45.575}$$

Conc1 = 3.66E-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 = 75.6 / (45.575 x 0.02832)

Conc2 = 5.86E+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

$MR1_{(Outlet)}$ = 3.66E-09 x 23723 x 60

$MR1_{(Outlet)}$ = 5.21E-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

$MR2_{(Outlet)}$ = 5.21E-03 x 453.59 /3600

$MR2_{(Outlet)}$ = 6.55E-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.

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:	82-401356855-1
Cylinder Number:	CC20577	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:	Nov 26, 2018

Expiration Date: Nov 26, 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 %	8.973 %	G1	+/- 0.7% NIST Traceable	11/26/2018
OXYGEN	12.00 %	12.05 %	G1	+/- 0.5% NIST Traceable	11/26/2018
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
NTRM	09060236	CC263114	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 05, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA 510-CO2-19GYCXEG	NDIR	Nov 06, 2018
Horiba MPA 510-O2-7TWMJ041	Paramagnetic	Nov 07, 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:	82-401196512-1
Cylinder Number:	CC112489	Cylinder Volume:	157.2 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	May 12, 2018

Expiration Date: May 12, 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	17.00 %	17.05 %	G1	+/- 0.7% NIST Traceable	05/12/2018
OXYGEN	21.00 %	20.98 %	G1	+/- 0.5% NIST Traceable	05/12/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060731	CC413777	16.939 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 08, 2019
NTRM	09061420	CC273671	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	Apr 19, 2018
Horiba MPA 510-O2-7TWMJ041	Paramagnetic	Apr 19, 2018

Triad Data Available Upon Request

Signature on file
Approved for Release

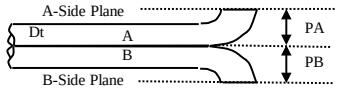
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-705**

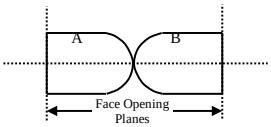
Inspection Date 2/19/19 Individual Conducting Inspection KS

If all Criteria PASS Cp is equal to 0.84

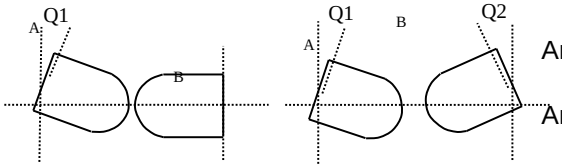
		PASS/FAIL
Distance to A Plane (PA) - inches	0.454	PASS
Distance to B Plane (PB) - inches	0.454	PASS
Pitot OD (D_t) - inches	0.375	



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



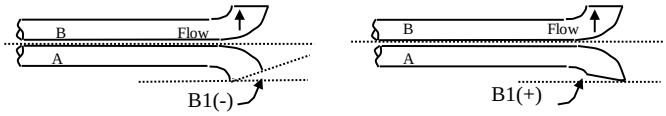
Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



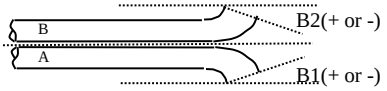
Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS

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

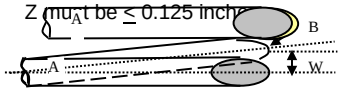


Angle of B1 from vertical B Tube- degrees (absolute) 0 PASS

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

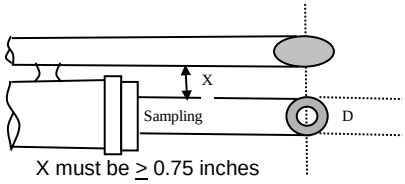
Horizontal offset between A and B Tubes (Z) - inches 0.009 PASS

Z must be $\leq$ 0.125 inches



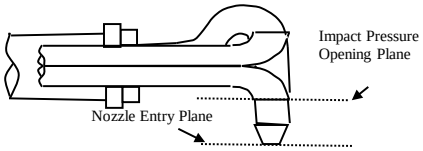
Vertical offset between A and B Tubes (W) - inches 0.016 PASS

W must be $\leq$ 0.03125 inches

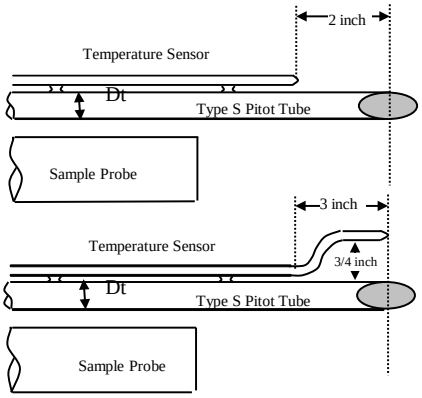


Distance between Sample Nozzle and Pitot (X) - inches 0.89 PASS

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

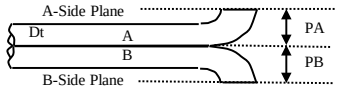
Thermocouple meets the Distance Criteria in the adjacent figure: ( ) YES ( ) NO (●) NA

Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-710**

Inspection Date 2/19/19 Individual Conducting Inspection ks

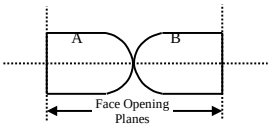
If all Criteria PASS Cp is equal to 0.84



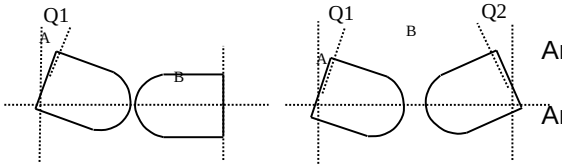
		PASS/FAIL
Distance to A Plane (PA) - inches	0.453	PASS
Distance to B Plane (PB) - inches	0.453	PASS
Pitot OD (D_t) - inches	0.375	

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

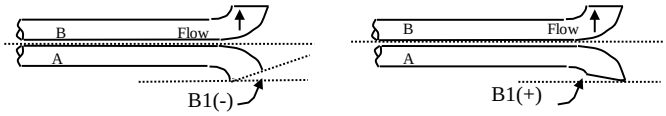


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS

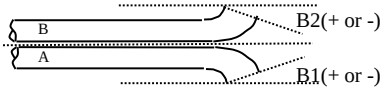


Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

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



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

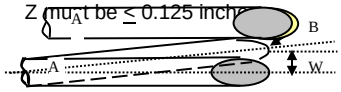


Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

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

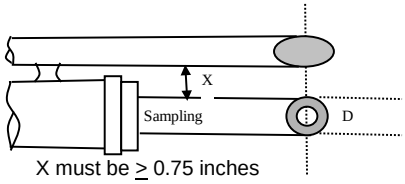
Horizontal offset between A and B Tubes (Z) - inches	0.012	PASS

Z must be $\leq$ 0.125 inches



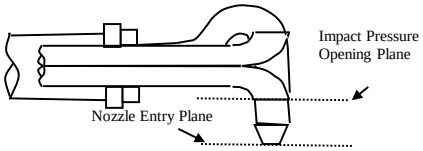
Vertical offset between A and B Tubes (W) - inches	0.022	PASS

W must be $\leq$ 0.03125 inches

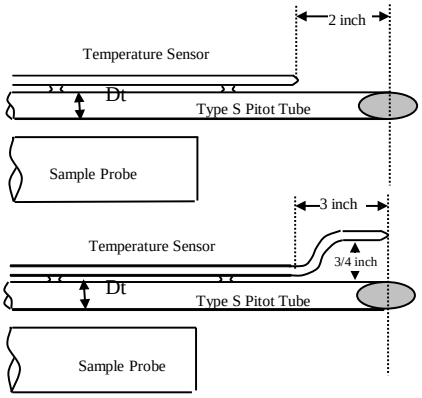


Distance between Sample Nozzle and Pitot (X) - inches	0.87	PASS

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

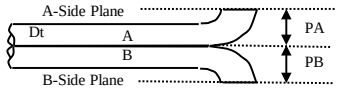
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-706**

Inspection Date 2/19/19 Individual Conducting Inspection KS

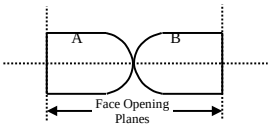
If all Criteria PASS
Cp is equal to 0.84

		PASS/FAIL
Distance to A Plane (PA) - inches	0.45	PASS
Distance to B Plane (PB) - inches	0.45	PASS
Pitot OD (D_t) - inches	0.375	

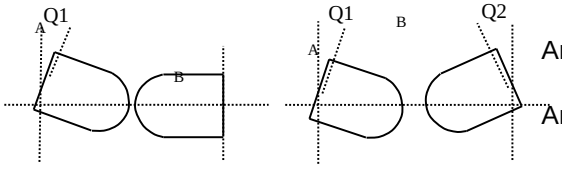


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



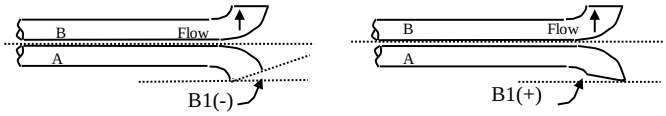
Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



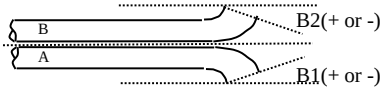
Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS

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

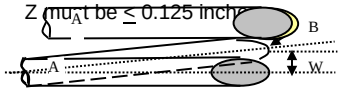


Angle of B1 from vertical B Tube- degrees (absolute) 0 PASS

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

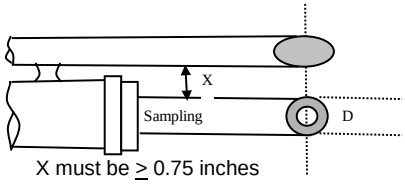
Horizontal offset between A and B Tubes (Z) - inches 0.006 PASS

Z must be ≤ 0.125 inches



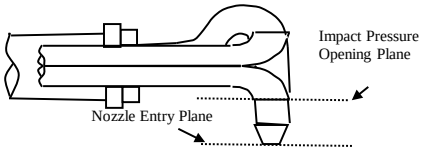
Vertical offset between A and B Tubes (W) - inches 0.012 PASS

W must be ≤ 0.03125 inches

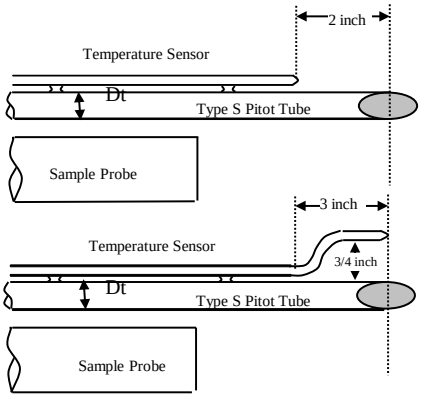


Distance between Sample Nozzle and Pitot (X) - inches 0.79 PASS

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

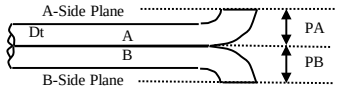
Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection ks

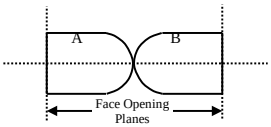
If all Criteria PASS
Cp is equal to 0.84

		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	

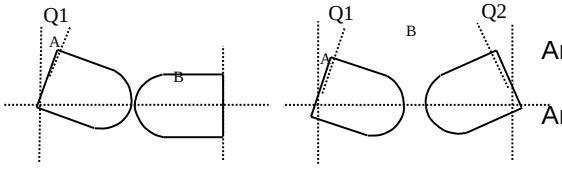


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

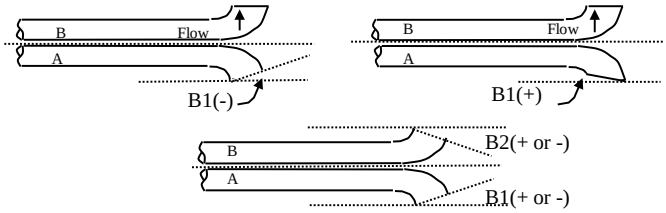


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



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 $\leq 10^o$

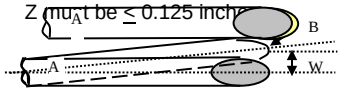


Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

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

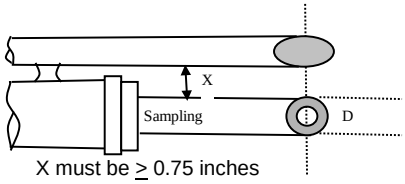
Horizontal offset between A and B Tubes (Z) - inches	0.003	PASS

Z must be $\leq$ 0.125 inches



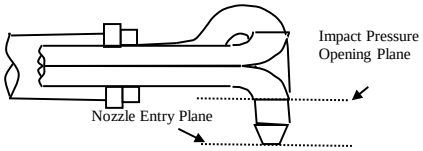
Vertical offset between A and B Tubes (W) - inches	0.012	PASS

W must be $\leq$ 0.03125 inches

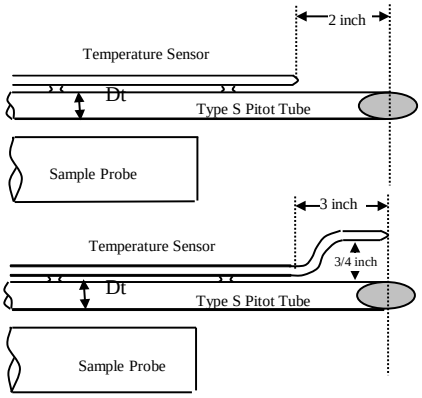


Distance between Sample Nozzle and Pitot (X) - inches	0.93	PASS

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

DRY GAS METER CALIBRATION REPORT

Customer: Weston Solutions Date: March 27, 2019

Console Serial # 2381 Console Model # C-5000 SOL

DGM Model # S-275 DGM SN # 18100293 Reference Meter S/N 16300942

Barometric Pressure, P_b: 30.12 in. Hg Tested at: 0 in. Hg - Vacuum

Standard Pressure : 29.92 in. Hg Standard Temperature : 528 °R

	1	2	3	Units
Orifice Manometer Setting, ΔH	2.00	0.75	6.00	in. H_2O
Elapsed Time	14	22	8	min.
Reference Meter				
Final Volume Reading	069.903	081.075	092.929	ft^3
Initial Volume Reading	058.660	070.214	081.710	ft^3
Total Gas Volume, V_w	11.243	10.861	11.219	ft^3
Temperature, Initial	66.8	66.8	67.7	°F
Temperature, Final	66.8	67.5	67.8	°F
Avg Temperature, T_w	66.8	67.2	67.8	°F
Dry Gas Meter				
Final Volume Reading	082.220	093.515	105.476	ft^3
Initial Volume Reading	070.874	082.530	094.149	ft^3
Total Gas Volume, V_m	11.346	10.985	11.327	ft^3
Average Temperature, Initial	67.4	67.9	68.1	°F
Average Temperature, Final	67.9	68.1	68.4	°F
Avg Temperature, T_m	67.7	68.0	68.3	°F
ΔH (a)	1.7295	1.7174	1.7057	**Avg. ΔH(a) 1.7175**
ΔH (a) Tolerance Check	OK	OK	OK	
Gamma, Y	0.9867	0.9875	0.9761	**Avg. Y 0.9834**
Gamma Tolerance Check	OK	OK	OK	

Calibration Performed By:

$$\Delta H_{(a)} = \frac{0.0319\,\Delta H}{P_b\,(T_m + 460)}\left[\frac{(T_w + 460)\,\theta}{V_w}\right]^2 \qquad Y = \frac{V_w P_b\,(T_m + 460)}{V_m\,(P_b + \Delta H/13.6)\,(T_w + 460)}$$

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN
CARBON BED INLET
METER BOX NO. 32
6/12/19 and 6/13/19

	Run 1	Run 3	Run 2
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.	74.5	73.8	83.9

$$Tma = Ts + 460$$

$$Tma = 74.54 + 460$$

Tma =	534.54	533.75	543.88

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	0.57	0.51	0.53
Pb = Barometric Pressure, in Hg.	30.06	29.90	29.88

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

$$Pm = 30.06 + (0.565833333333333 / 13.6)$$

Pm =	30.10	29.94	29.92

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.	41.698	39.865	41.015
Y = Dry gas meter calibration factor (based on full calibration)	0.9834	0.9834	0.9834
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.7175	1.7175	1.7175
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.7515	0.7117	0.7268
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 41.70) * SQRT (0.0319 * 534.54 * 29) / (1.72 * 30.10 * 28.84) * 0.75$$

$$Yqa = 2.302 * SQRT 494.504 / 1,490.727 * 0.75$$

Yqa =	0.996	0.989	0.991

Diff = Absolute difference between Yqa and Y	1.28	0.57	0.77

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

$$Diff = ((0.9834 - 0.996) / 0.9834) * 100$$

Average Diff = 0.87

Allowable = 5.0

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_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	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	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	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 %

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

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN
CARBON BED OUTLET
METER BOX NO. WC 25
6/12/2019 + 6/13/2019

	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.	75.2	75.5	85.4

$$Tma = Ts + 460$$

$$Tma = 75.21 + 460$$

Tma =	535.21	535.54	545.42

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	0.83	0.81	0.81
Pb = Barometric Pressure, in Hg.	30.06	29.90	29.88

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

$$Pm = 30.06 + (0.83375 / 13.6)$$

Pm =	30.12	29.96	29.94

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.	47.889	46.960	47.161
Y = Dry gas meter calibration factor (based on full calibration)	1.0021	1.0021	1.0021
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.9757	1.9757	1.9757
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.8910	0.8753	0.8759
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 47.89) * SQRT (0.0319 * 535.21 * 29) / (1.98 * 30.12 * 28.84) * 0.89$$

$$Yqa = 2.005 * SQRT 495.121 / 1,715.975 * 0.89$$

Yqa =	0.9594	0.9640	0.9697

Diff = Absolute difference between Yqa and Y	4.26	3.80	3.23

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

$$Diff = ((1.0021 - 0.959) / 1.0021) * 100$$

Average Diff = 3.76

Allowable = 5.0

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

DIVISION STACK

METER BOX NO. 26

6/12/2019 + 6/13/2019

	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.	76.1	76.0	84.0

$$Tma = Ts + 460$$

$$Tma = 76.08 + 460$$

Tma =	536.08	536.00	544.00

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	0.82	0.81	0.83
Pb = Barometric Pressure, in Hg.	30.06	29.90	29.88

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

$$Pm = 30.06 + (0.821083333333333 / 13.6)$$

Pm =	30.12	29.96	29.94

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.	46.185	45.911	46.445
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	0.9034	0.8965	0.9055
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 46.18) * SQRT (0.0319 * 536.08 * 29) / (2.09 * 30.12 * 28.84) * 0.90$$

$$Yqa = 2.079 * SQRT 495.931 / 1,812.470 * 0.90$$

Yqa =	0.9823	0.9831	0.9892

Diff = Absolute difference between Yqa and Y	2.81	2.73	2.13

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

$$Diff = ((1.0107 - 0.982) / 1.0107) * 100$$

Average Diff = 2.56

Allowable = 5.0

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
Brandon Berger	Team Member
Kris Ansley	Team Member