PPA MANUFACTURING PROCESS
CARBON BED INLET AND OUTLET STACK
EMISSIONS TEST REPORT
TEST DATES: 10-11 JUNE 2019

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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. The Chemours operating areas on the site include the Fluoromonomers, IXM and Polymer Processing Aid (PPA) manufacturing areas, Wastewater Treatment, and Powerhouse.

Chemours contracted Weston Solutions, Inc. (Weston) to perform HFPO Dimer Acid emission testing on the PPA process stack (outlet) and PPA carbon bed inlet. Testing was performed on 10-11 June 2019 and generally followed the "Emissions 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 from the PPA process stack and PPA carbon bed inlet which are located in the PPA process area.
- Calculate the carbon bed removal efficiency for HFPO Dimer Acid.
- Monitor and record process 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 on the PPA process stack and the PPA carbon bed inlet.

Tables 1-1 provides 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 PPA Carbon Bed

Sampling Point & Location	**PPA Carbon Bed**				
Number of Tests:	6 (3 inlet, 3 outlet)				
Parameters To Be Tested:	HFPO Dimer Acid (HFPO-DA)	Volumetric Flow Rate and Gas Velocity	Carbon Dioxide	Oxygen	Water Content
Sampling or Monitoring Method	EPA M-0010	EPA M1, M2, M3A, and M4 in conjunction with M-0010 tests	EPA M3A		EPA M4 in conjunction with M-0010 tests
Sample Extraction/ Analysis Method(s):	LC/MS/MS	NA[6]	NA		NA
Sample Size	> 1m^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.

2. SUMMARY OF TEST RESULTS

A total of three test runs were performed on the PPA process stack (outlet) and on the PPA carbon bed inlet. Table 2-1 provides a summary of the HFPO Dimer Acid emission test results. 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 on Table 2-1 and in this report include a percentage of each of the three compounds.

Table 2-1
Summary of HFPO Dimer Acid Test Results

	Inlet		Outlet (Process Stack)		Removal Efficiency
	g/sec	lb/hr	g/sec	lb/hr	%
PPA Carbon Bed					
R1	2.81E-04	2.23E-03	1.36E-05	1.08E-04	95.2
R2	4.87E-04	3.87E-03	6.09E-06	4.84E-05	98.7
R3	2.15E-04	1.71E-03	1.73E-05	1.37E-04	92.0
Average	3.28E-04	2.60E-03	1.23E-05	9.78E-05	95.3

3. PROCESS DESCRIPTIONS

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

3.1 POLYMER PROCESSING AID (PPA) AREA

The PPA facility produces surfactants used to produce fluoropolymer products, such as Teflon®, at other Chemours facilities, as well as sales to outside producers of fluoropolymers.

Process streams are vented to a caustic wet scrubber (ACD-A1), carbon bed and vented to a process stack (AEP-A1). The process inside the building is under negative pressure and the building air is vented to the carbon bed and the process stack (AEP-A1).

3.2 PROCESS OPERATIONS AND PARAMETERS

Source	Operation/Product	Batch or Continuous
PPA	AF Column Reboiler/Virgin	Continuous once it starts taking off to feed tank
	Pressure Transfers/Virgin or Purified	Batch (pressure transfers from one vessel to another – every 2 hours)

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

- PPA Process
  - Caustic Wet Scrubber (ACD-A1)
    - Caustic recirculation flow rate
    - Differential pressure across the packing

4. DESCRIPTION OF TEST LOCATIONS

4.1 PPA PROCESS STACK

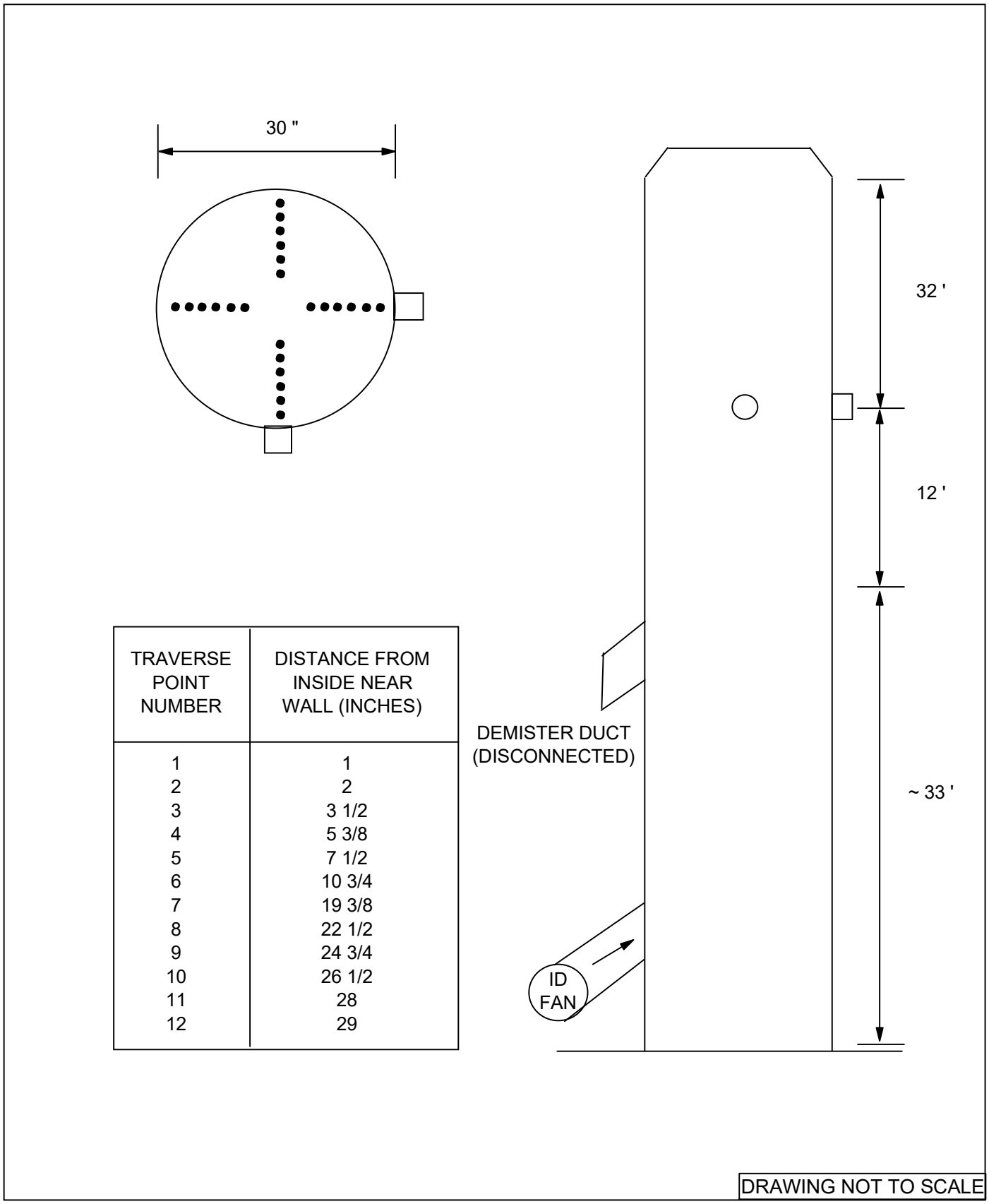
Two 4-inch ID test ports are in place on the 30-inch ID fiberglass stack. The ports are 12 feet (4.8 diameters) from the nearest downstream disturbance (carbon bed outlet) and 32 feet (12.8 diameters) from the nearest upstream disturbance (stack exit).

Per EPA Method 1, a total of 24 traverse points (12 per axis) were used for M-0010 isokinetic sampling. See Figure 4-1 for a schematic of the test port and traverse point locations.

Note: All measurements at the test location were confirmed prior to sampling.

4.2 PPA CARBON BED INLET

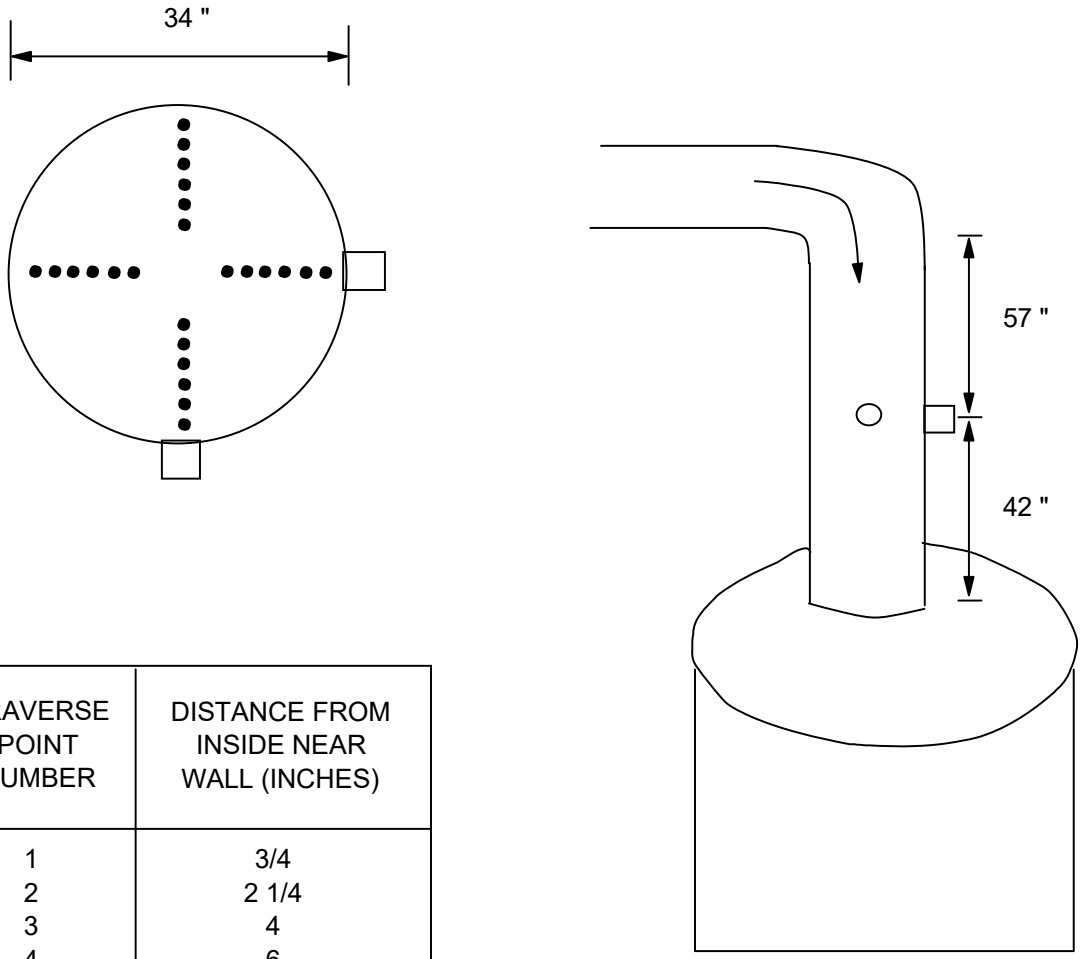
The fiberglass reinforced plastic (FRP) duct at the inlet of the PPA carbon bed is 34-inch ID. The test ports are located a minimum of 42 inches (> 1.2 duct diameters) from the nearest downstream disturbance and at least 57 inches (> 1.7 diameters) from the nearest upstream disturbance. Based on EPA Method 1, a total of 24 traverse points (12 per port) were used for HFPO Dimer Acid sampling. Figure 4-2 provides a schematic of the test port and traverse port locations.



TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	1
2	2
3	3 1/2
4	5 3/8
5	7 1/2
6	10 3/4
7	19 3/8
8	22 1/2
9	24 3/4
10	26 1/2
11	28
12	29

FIGURE 4-1
PPA EXHAUST STACK TEST PORT
AND TRAVERSE POINT LOCATION

IASDATA\CHEMOURS\15418.002.012\FIGURE 4-1 PPA EXHAUST 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
PPA PROCESS CARBON BED INLET
TEST PORT AND TRAVERSE POINT LOCATION

IASDATA\CHEMOURS\15418.002.012\FIGURE 4-2 PPA PROCESS SCHEMATIC

5. SAMPLING AND ANALYTICAL METHODS

5.1 STACK GAS SAMPLING PROCEDURES

The purpose of this section is to describe the stack gas emissions sampling train 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 was obtained at the 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 the test locations. The cyclonic flow check was negative (< 20°) verifying that the sources 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 was an EPA Method 0010 train (see Figure 5-1). The Method 0010 consisted of a borosilicate nozzle that attached directly to a heated borosilicate probe. In order to minimize possible thermal degradation of the HFPO Dimer Acid, the probe and particulate filter were heated above stack temperature to minimize water vapor condensation before the filter. The probe was connected directly to a heated borosilicate filter holder containing a solvent extracted glass fiber filter.

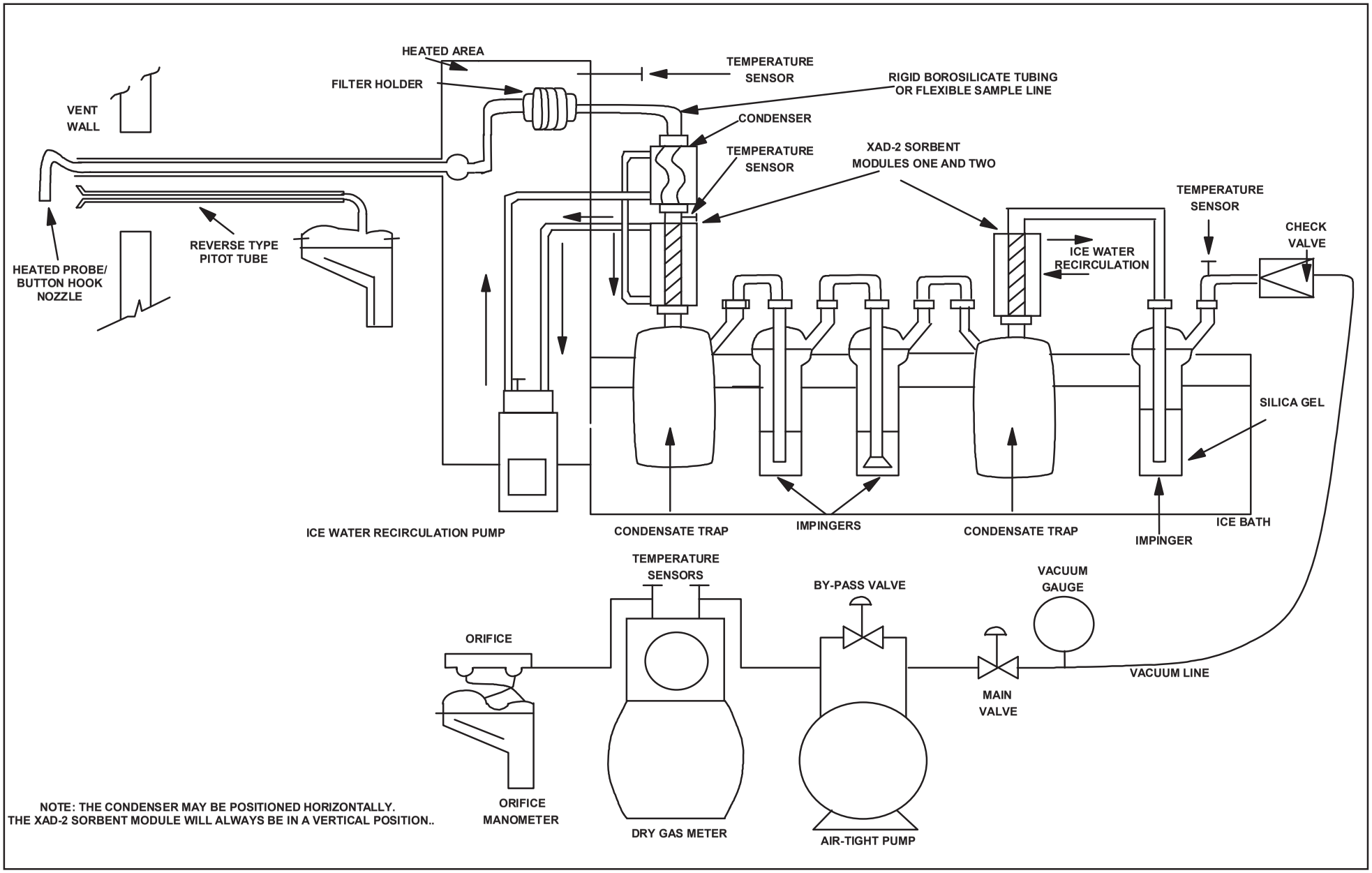


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

IASDATA\CHEMOURS\15418.002.015\FIGURE 5-1 METHOD 0010

A section of borosilicate glass (or flexible polyethylene tubing) connected the filter holder exit to a Grahm (spiral) type ice water-cooled condenser and 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-L 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 undergoes hydrolysis instantaneously in water in the sampling train and during the sample recovery step and will be converted to HFPO Dimer Acid such that the amount of HFPO Dimer Acid emissions represents 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 each test campaign, an M-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 M-0010 sample recovery process.

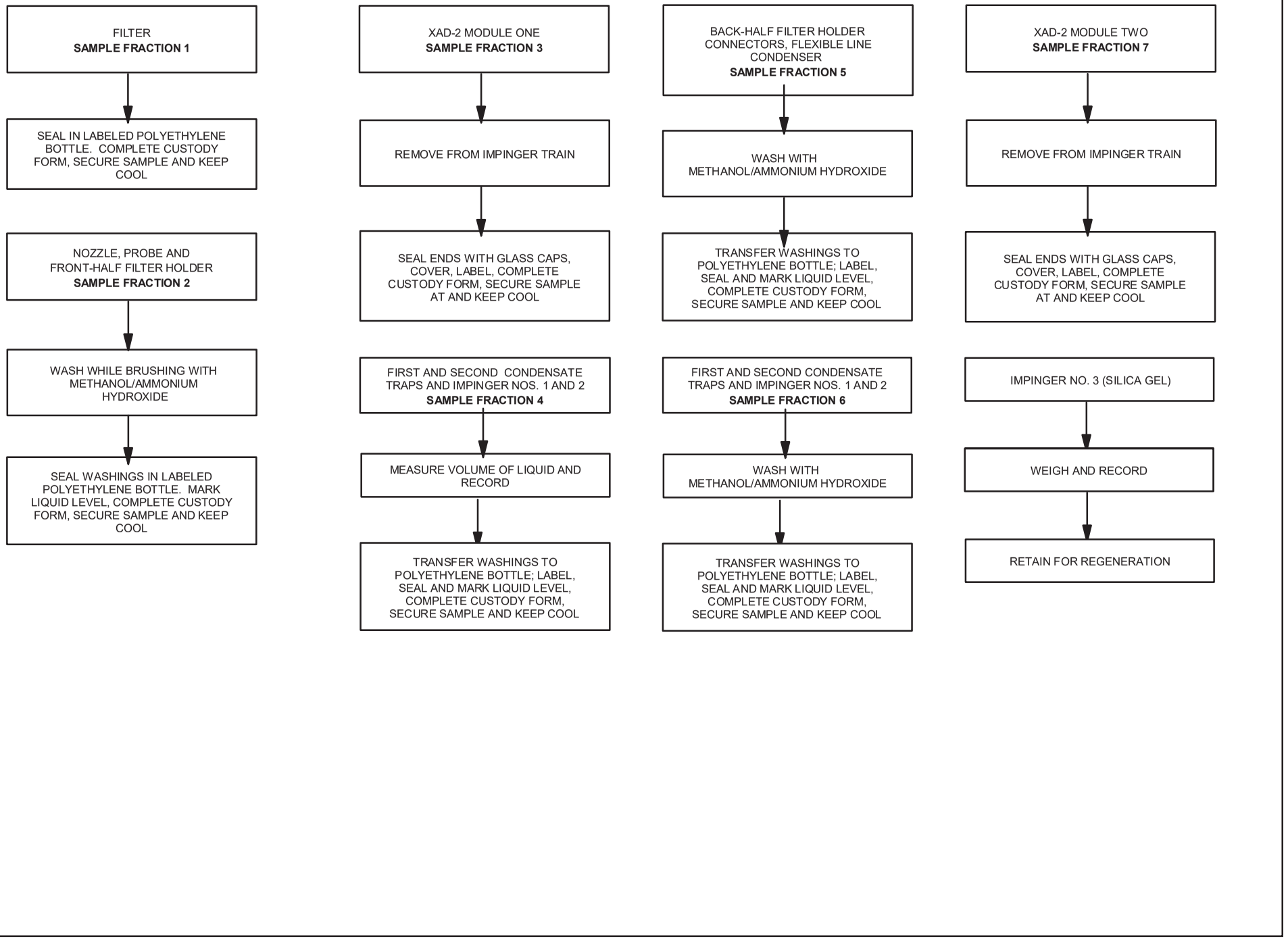


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.015\FIGURE 5-2 EPA 0010

5.2.3 EPA Method 0010 – Sample Analysis

The 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.

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.

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 maintains 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 ensure 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.

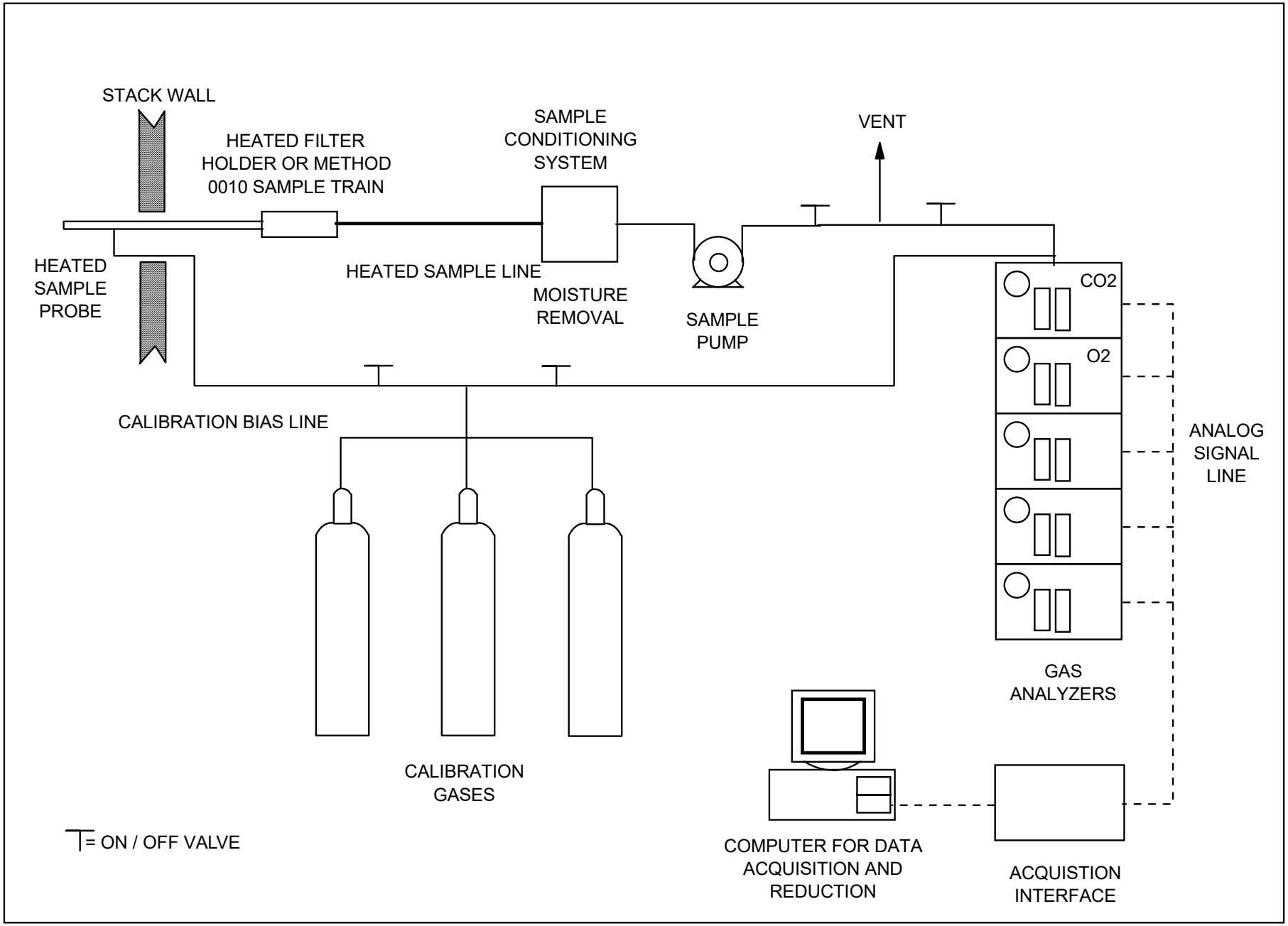


FIGURE 5-3
WESTON SAMPLING SYSTEM

IASDATA\CHEMOURS\15418.002.015\FIGURE 5-3 WESTON SAMPLING SYSTEM

6. DETAILED TEST RESULTS AND DISCUSSION

Preliminary testing and the associated analytical results required significant sample dilution to bring the HFPO Dimer Acid concentration within instrument calibration, therefore, sample times and sample volumes were reduced for the formal test program. This was approved by the North Carolina Department of Environmental Quality (NCDEQ).

Each test was a minimum of 96 minutes in duration. A total of three test runs were performed on the PPA process stack and on the PPA carbon bed inlet.

Tables 6-1 and 6-2 provide detailed test data and test results for the PPA process stack and PPA carbon bed inlet, respectively.

The Method 3A sampling at the PPA 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 carbon bed removal efficiency was calculated based upon the HFPO Dimer Acid inlet and outlet mass emission rates in lb/hr.

TABLE 6-1
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
PPA PROCESS STACK

Test Data			
Run number	1	2	3
Location	PPA Stack	PPA Stack	PPA Stack
Date	06/10/19	06/11/19	06/11/19
Time period	1353-1553	0900-1046	1208-1353
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.190	0.190	0.190
Cross sectional nozzle area, sq.ft.	0.000197	0.000197	0.000197
Barometric pressure, in. Hg	29.98	30.01	30.00
Avg. orifice press. diff., in H_2O	1.00	0.89	0.89
Avg. dry gas meter temp., deg F	90.7	78.0	83.4
Avg. abs. dry gas meter temp., deg. R	551	538	543
Total liquid collected by train, ml	33.0	28.1	25.1
Std. vol. of H_2O vapor coll., cu.ft.	1.6	1.3	1.2
Dry gas meter calibration factor	1.0107	1.0107	1.0107
Sample vol. at meter cond., dcf	49.655	47.486	47.320
Sample vol. at std. cond., dscf [(1)]	48.316	47.332	46.676
Percent of isokinetic sampling	99.8	102.0	100.6
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.031	0.027	0.025
Mole fraction of dry gas	0.969	0.973	0.975
Molecular wt. of wet gas, lb/lb mole	28.50	28.54	28.57
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-2.50	-2.50	-2.50
Absolute pressure, in. Hg	29.80	29.83	29.82
Avg. temperature, deg. F	88	81	80
Avg. absolute temperature, deg.R	548	541	540
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	46.0	43.3	43.1
Stack/duct cross sectional area, sq.ft.	4.90	4.90	4.90
Avg. gas stream volumetric flow, wacf/min.	13511	12720	12661
Avg. gas stream volumetric flow, dscf/min.	12558	12029	12030

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

TABLE 6-1 (cont.)
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
PPA PROCESS STACK

TEST DATA			
Run number	1	2	3
Location	PPA Stack	PPA Stack	PPA Stack
Date	06/10/19	06/11/19	06/11/19
Time period	1353-1553	0900-1046	1208-1353
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	3.1410	1.4391	4.0210
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	2.30	1.07	3.04
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	1.43E-10	6.70E-11	1.90E-10
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	1.08E-04	4.84E-05	1.37E-04
HFPO Dimer Acid (From Inlet Data)	2.23E-03	3.87E-03	1.71E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	1.36E-05	6.09E-06	1.73E-05
Carbon Bed Removal Efficiency, %	95.2	98.7	92.0

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

Test Data			
Run number	1	2	3
Location	PPA CB Inlet	PPA CB Inlet	PPA CB Inlet
Date	06/10/19	06/11/19	06/11/19
Time period	1353-1553	0900-1046	1208-1353
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.250	0.250	0.250
Cross sectional nozzle area, sq.ft.	0.000341	0.000341	0.000341
Barometric pressure, in. Hg	29.95	29.97	30.03
Avg. orifice press. diff., in H_2O	1.14	1.19	1.18
Avg. dry gas meter temp., deg F	79.7	74.4	80.8
Avg. abs. dry gas meter temp., deg. R	540	534	541
Total liquid collected by train, ml	40.0	39.1	18.9
Std. vol. of H_2O vapor coll., cu.ft.	1.9	1.8	0.9
Dry gas meter calibration factor	0.9834	0.9834	0.9834
Sample vol. at meter cond., dcf	58.936	59.865	60.273
Sample vol. at std. cond., dscf [(1)]	56.898	58.408	58.223
Percent of isokinetic sampling	100.3	101.6	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.	0.032	0.031	0.015
Mole fraction of dry gas	0.968	0.969	0.985
Molecular wt. of wet gas, lb/lb mole	28.49	28.50	28.67
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-2.00	-2.00	-2.00
Absolute pressure, in. Hg	29.80	29.82	29.88
Avg. temperature, deg. F	82	79	82
Avg. absolute temperature, deg.R	542	539	542
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	30.8	31.0	31.0
Stack/duct cross sectional area, sq.ft.	6.31	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	11646	11720	11750
Avg. gas stream volumetric flow, dscf/min.	10938	11087	11246

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

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

TEST DATA			
Run number	1	2	3
Location	PPA CB Inlet	PPA CB Inlet	PPA CB Inlet
Date	06/10/19	06/11/19	06/11/19
Time period	1353-1553	0900-1046	1208-1353
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	87.8530	154.0560	66.8023
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	54.52	93.12	40.51
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	3.40E-09	5.81E-09	2.53E-09
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	2.23E-03	3.87E-03	1.71E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	2.81E-04	4.87E-04	2.15E-04

APPENDIX A
PROCESS OPERATIONS DATA

Date								6/10/2019									
Time	1200				1300			1400					1500				
Stack Testing								RUN1 1353-1553									
A/F column Feed Ratev (pounds per hour)								x	x	x	x	x	x	x	x		
Charging water to Hyd - venting																	
Charging Sulfuric acid - venting																	
Hydrolysis - Wash Tank pressure Transfer to Hydrolysis																	
Hydrolysis - Phase Settle								x	x	x							
Vap heels pressure transfer																	
Vap cycle								x	x	x	x	x	x	x	x	x	
Venting after press tran from North/South Acid tank to Hyd																x	
DAF tran to Hyd - venting during transfer																	
Hydrolysis - transfer to Waste Acid Trailer														x			
Scrubber Recirculation Flow								37.2 gpm									
Scrubber dP								-0.1 inwc									

Date													6/11/2019														
Time	800				900				1000			1100				1200			1300				1400				
Stack Testing					RUN 2 900-1046											RUN 3 1208-1353											
A/F column Feed Ratev (pounds per hour)							x	x	x	x	x					x	x	x	x	x	x	x	x	x	x	x	x
Charging water to Hyd - venting																											
Charging Sulfuric acid - venting																											
Hydrolysis - Wash Tank pressure Transfer to Hydrolysis																		x									
Hydrolysis - Phase Settle																			x								
Vap heels pressure transfer									x	x	x																
Vap cycle																											
Venting after press tran from North/South Acid tank to Hyd																											
DAF tran to Hyd - venting during transfer							x	x									x										
Hydrolysis - transfer to Waste Acid Trailer																x											
Scrubber Recirculation Flow							37.2 gpm									37 gpm											
Scrubber dP							-0.1 inwc									-0.25 inwc											

APPENDIX B
RAW AND REDUCED TEST DATA

Sample and Velocity Traverse Point Data Sheet - Method 1

Client: Chemours
Location/Plant: Fayetteville NC
Source: P/A Stack

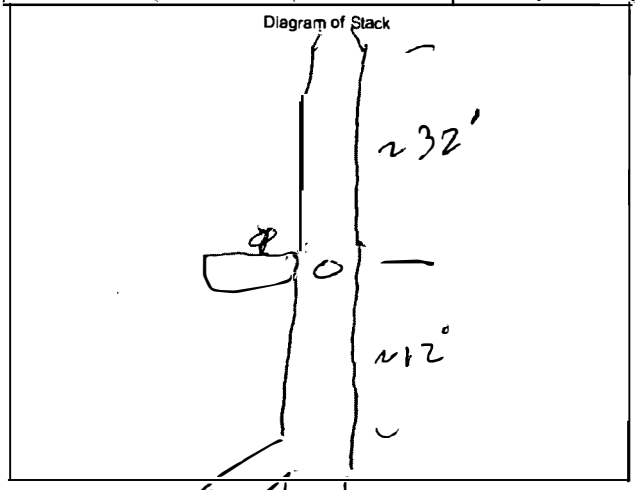
Operator: Paul
Date: 11/8/18
W.O. Number: 15418.002.007

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

Distance from far wall to outside of port (in.) = C	45
Port Depth (in.) = D	15
Depth of Duct, diameter (in.) = C-D	30
Area of Duct (ft²)	4.90
Total Traverse Points	24
Total Traverse Points per Port	12
Port Diameter (in.) —(Flange-Threaded-Hole)	4"
Monorail Length	—
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	n/a
Total Ports (rectangular duct only)	n/a
Equivalent Diameter = (2*L*W)/(L+W)	n/a

Flow Disturbances	
Upstream - A (ft)	~32
Downstream - B (ft)	~12
Upstream - A (duct diameters)	~12.8
Downstream - B (duct diameters)	~4.8

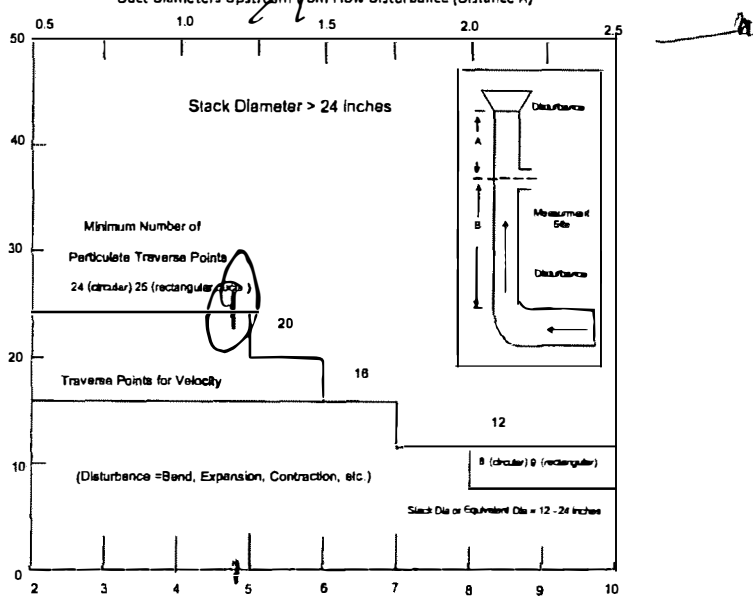
Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	2.1	6.3	16
2	6.7	20	17
3	10.8	3.5	18 1/2
4	17.7	5.3	20 3/8
5	25	7.5	22 1/2
6	35.6	10.7	7.5 3/4
7	64.4	19.3	34 3/8
8	75	22.5	37 1/2
9	82.3	24.7	39 3/4
10	93.2	26.6	41 1/2
11	93.3	28.0	43
12	97.9	29.4	44
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



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

Sample and Velocity Traverse Point Data Sheet - Method 1

Client Chemours
Loaction/Plant Fayetteville, NC
Source PFAS Catpoon Bed inlet

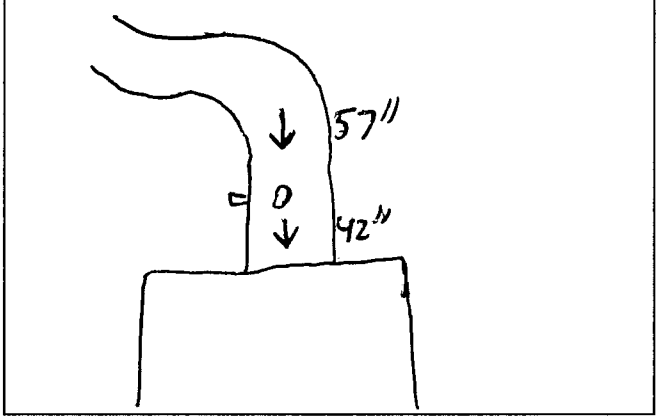
Operator KS
Date 6/11/18
W.O. Number

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	51
Port Depth (in.) = D	~~14~~ 17
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)	3.50
Downstream - B (ft)	4.75
Upstream - A (duct diameters)	1.24
Downstream - B (duct diameters)	1.70

Diagram of Stack



Traverse Point Locations

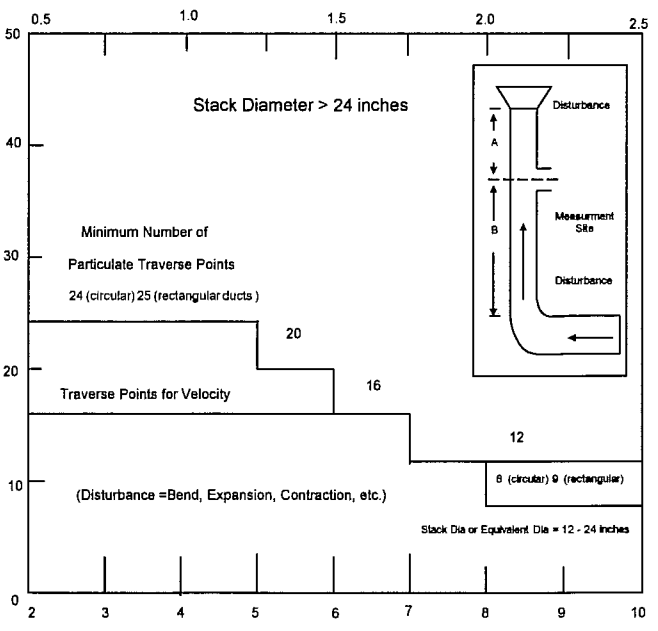
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	2.1	0.714	17.41	18
2	6.7	2.28	19.28	19 1/3
3	11.8	4.01	21.01	21
4	17.7	6.02	23.02	23
5	25	8.50	25.5	25 1/2
6	35.6	12.10	29.10	29
7	64.4	21.90	38.9	39
8	75	25.5	42.5	42 1/2
9	82.3	27.98	44.98	45
10	88.2	29.98	46.98	47
11	93.3	31.72	48.72	48 3/4
12	97.9	33.30	50.3	50

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 (Distanca 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												
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4												
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6												
7							92.9	81.3	72.2	65.0	59.1	54.2
8												
9									94.4	85.0	77.3	70.8
10												
11											95.5	87.5
12												

WESTON MANAGERS DESIGNERS/CONSULTANTS

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

Test Data			
Run number	1	2	3
Location	PPA Stack	PPA Stack	PPA Stack
Date	06/10/19	06/11/19	06/11/19
Time period	1353-1553	0900-1046	1208-1353
Operator	MW	MW	MW
Inputs For Calcs.			
Sq. rt. delta P	0.79671	0.75562	0.75328
Delta H	0.9988	0.8913	0.8863
Stack temp. (deg.F)	87.8	81.2	79.9
Meter temp. (deg.F)	90.7	78.0	83.4
Sample volume (act.)	49.655	47.486	47.320
Barometric press. (in.Hg)	29.98	30.01	30.00
Volume H_2O imp. (ml)	22.0	16.0	18.0
Weight change sil. gel (g)	11.0	12.1	7.1
% 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.)	4.900	4.900	4.900
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	-2.50	-2.50	-2.50
Nozzle dia. (in.)	0.190	0.190	0.190
Meter box cal.	1.0107	1.0107	1.0107
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	Assumed	Actual
Client	Chemours	% Moisture	~2	
W.O.#	15418.002.015.0001	Impinger Vol (ml)		22
Project ID	Chemours	Silica gel (g)		11
Mode/Source ID	PPA	CO2, % by Vol	0.0	
Samp. Loc. ID	STK	O2, % by Vol	20.9	
Run No.ID	1	Temperature (°F)	88	
Test Method ID	M0010	Meter Temp (°F)	88	
Date ID	10JUN2019	Static Press (in H_2O)	-2.5	✓
Source/Location	PPA Stack ✓	Ambient Temp (°F)	~82	
Sample Date	6/10/19 ✓			
Baro. Press (in Hg)	29.93 ✓			
Operator	MB, WINKELS ✓			

Meter Box ID	26		
Meter Box Y	1.0107 ✓		
Meter Box Del H	2.0868		
Probe ID / Length	A700	Sample Train (ft³)	0.504 / 0.001 / 0.001
Probe Material	Boro	Leak Check @ (in Hg)	✓3 / ✓3 / ✓4
Pitot / Thermocouple ID	700	Pitot leak check good	yes no / yes no / yes no
Pitot Coefficient	0.84 ✓	Pitot Inspection good	yes no / yes no / yes no
Nozzle ID	67 90	Method 3 System good	yes / no / yes / no / yes / no
Nozzle Measurements	0.190 / 0.190 / 0.190	**Temp Check**	Pre-Test Set / Post-Test Set
Avg Nozzle Dia (in)	0.190 ✓	Meter Box Temp	88 / 79
Area of Stack (ft²)	4.90 ✓	Reference Temp	87 / 88
Sample Time	96 ✓	Pass/Fail (+/- 2°)	Pass / Fail / Pass / Fail
Total Traverse Pts	24 ✓	Temp Change Response ?	yes / no / yes / no

K Factor 1.56

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	1353			707.280									
A1	4		0.60	0.93	709.250	89	88	100	100	67	~~2~~ 2	64		
2	8		0.70	1.09	711.26	89	88	100	100	66	2	61		25.52
3	12		0.72	1.12	713.45	89	88	100	100	62	2	61		
4	16		0.72	1.12	715.82	89	88	100	100	62	2	61		
5	20		0.87	1.35	718.52	88	89	101	99	66	2	61		
6	24		0.86	1.34	721.01	88	89	101	99	66	2	61		
7	28		0.90	1.40	723.00	88	87	100	100	66	2	63		24.135
8	32		0.80	1.24	725.20	88	83	100	100	66	2	62		
9	36		0.60	0.93	727.35	88	83	100	100	65	2	60		
10	40		0.55	0.85	729.30	87	83	100	100	64	2	60		
11	44		0.50	0.78	731.10	87	83	100	100	61	2	61		
12	48	1441	0.40	0.62	732.80	87	81	100	101	61	1	61		
	0	1505			733.285									
1	4		0.60	0.93	735.30	87	89	100	100	59	2	54		
2	8		0.65	1.01	737.00	87	90	99	99	57	2	53		
3	12		0.70	1.09	739.44	87	93	99	99	57	2	53		
4	16		0.70	1.09	741.50	87	96	99	99	57	2	52		
5	20		0.81	1.26	743.82	88	96	99	99	57	2	52		
6	24		0.70	1.09	746.83	88	96	99	99	58	2	53		
7	28		0.60	0.93	748.72	88	96	100	100	58	2	53		
8	32		0.60	0.93	750.10	88	97	100	100	59	2	53		
9	36		0.55	0.85	752.30	88	98	100	99	60	2	54		
10	40		0.50	0.78	754.00	88	98	100	99	62	2	59		
11	44		0.40	0.62	755.70	88	98	100	99	62	2	59		
12	48	1553	0.40	0.62	757.420	87	99	100	99	63	2	60		
			Avg Delta P ✓	Avg Delta H	Total Volume ✓	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.64292	~~0.04042~~	49.655	87	90							
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.79671	~~1.07065~~	.99875		87.83	90.67						
					.99295									

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EPA Method 0010 from EPA SW-846

and

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page ____ of ____

		Stack Conditions	Assumed	Actual				
Client	Chemours				Meter Box ID	36		
W.O.#	15418.002.015.0001				Meter Box Y	1.0107 ✓		
Project ID	Chemours	% Moisture	≈2		Meter Box Del H	2.0862		
Mode/Source ID	PPA	Impinger Vol (ml)			Probe ID / Length	#700	Sample Train (ft^3)	0.001 / 0.001 / 0.001
Samp. Loc. ID	STK	Silica gel (g)			Probe Material	Boro	Leak Check @ (In Hg)	≤.15 / ≤.6 / ≤.7
Run No.ID	2	CO2, % by Vol	0		Pitot / Thermocouple ID	700 ✓	Pitot leak check good	(yes) / no / (yes) / no / (yes) / no
Test Method ID	M0010	O2, % by Vol	20.9		Pitot Coefficient	0.84 ✓	Pitot Inspection good	(yes) / no / (yes) / no / (yes) / no
Date ID	10JUN2019	Temperature (°F)	≈81		Nozzle ID	G-190	Method 3 System good	yes / no / yes / no / yes / no
Source/Location	PPA Stack	Meter Temp (°F)	275		Nozzle Measurements	0.190 / 0.190 / 0.190	**Temp Check**	Pre-Test Set / Post-Test Set
Sample Date	6/11/19 ✓	Static Press (in H_2O)	-2.5	✓	Avg Nozzle Dia (in)	0.190 ✓	Meter Box Temp	74 / 77
Baro. Press (in Hg)	30.01 ✓				Area of Stack (ft^2)	4.90 ✓	Reference Temp	75 / 77
Operator	MJ, WINEBERG ✓	Ambient Temp (°F)	≈75		Sample Time	96 ✓	Pass/Fail (+/- 2°)	(Pass) / Fail / (Pass) / Fail
					Total Traverse Pts	24 ✓	Temp Change Response ?	yes / no / yes / no

K Factor 1.55

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	0900 ✓	0.62		757.455									
(A) 1	4	0.63	~~0.96~~	0.96	759.42	81	74	100	100	66	2	54		
2	8	~~0.60~~	0.60	0.93	761.67	81	74	95	95	65	2	54		
3	12	0.	0.63	0.97	763.77	81	74	95	95	64	2	54		24.165
4	16		0.63	0.97	765.65	81	75	95	95	61	2	54		
5	20		0.73	1.13	768.02	81	75	95	95	61	2	56		
6	24		0.70	1.08	770.32	81	75	94	94	61	2	56		
7	28		0.61	0.94	772.30	81	77	94	94	61	2	57		
8	32		0.62	0.96	774.10	81	77	94	94	61	2	57		
9	36		0.60	0.93	776.24	81	77	94	94	61	2	54		
10	40		0.55	0.85	778.20	81	77	94	94	61	2	55		
11	44		0.40	0.62	780.45	81	77	95	95	62	2	56		
12	48	0948	0.40	0.62	781.550	81	78	95	95	63	2	56		
		0958			781.620									
(B) 1	4		0.62	0.96	783.61	81	78	95	95	63	2	56		23.391
2	8		0.63	0.97	785.74	81	78	95	95	63	2	56		
3	12		0.63	0.97	787.84	81	79	95	95	63	2	56		
4	16		0.62	0.96	790.82	81	79	95	95	61	2	54		
5	20		0.62	1.05	792.00	82	80	95	95	61	2	54		
6	24		0.67	1.03	794.00	82	81	95	95	61	2	52		
7	28		0.60	0.93	796.12	82	82	95	95	60	2	53		
8	32		0.60	0.93	797.92	82	82	95	90	60	2	53		
9	36		0.60	0.93	800.04	82	82	95	93	62	2	53		
10	40		0.40	0.62	801.91	81	80	90	90	61	2	54		
11	44		0.35	0.54	803.21	81	80	90	90	63	2	55		
12	48	1046 ✓	0.35	0.54	805.011	81	80	90	90	63	2	55		
			Avg Delta P ✓	Avg Delta H ✓	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.57667	0.89125	46.782	81.2	77.9	90/100	90/100	66	2	52/57		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:		✓							
			0.75562 ✓	0.9394N	47.486									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

amd

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.015.0001
Project ID	Chemours
Mode/Source ID	PPA
Samp. Loc. ID	STK
Run No.ID	3
Test Method ID	M0010
Date ID	10JUN2019
Source/Location	PPA Stack
Sample Date	6/11/19 ✓
Baro. Press (in Hg)	30.00 ✓
Operator	MP WENKELER ✓

Stack Conditions	Assumed	Actual
% Moisture	≈2	
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol	0	
O2, % by Vol	20.9	
Temperature (°F)	≈	
Meter Temp (°F)	≈ 80	
Static Press (in H_2O)	-2.5	
Ambient Temp (°F)	≈ 80	

Meter Box ID	26		
Meter Box Y	1.0107 ✓		
Meter Box Del H	2.0268		
Probe ID / Length	P710		
Probe Material	Boro		
Pitot / Thermocouple ID	710		
Pitot Coefficient	0.84 ✓		
Nozzle ID	0.190		
Nozzle Measurements	0.190	0.190	0.190
Avg Nozzle Dia (in)	0.190 ✓		
Area of Stack (ft^2)	4.90 ✓		
Sample Time	96 ✓		
Total Traverse Pts	24 ✓		

K Factor 1.55

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.001	0.008	0.021
Leak Check @ (in Hg)	≥5	≥5	≥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

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	80	80
Reference Temp	80	79
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	1208 ✓			805.170									
(B) 1	4		0.63	0.97	807.26	80	83	110	110	67	2	66		
2	8		0.65	1.00	809.33	80	83	111	112	66	2	62		24.078
3	12		0.65	1.00	811.50	80	82	111	111	65	2	60		
4	16		0.66	1.02	813.60	80	82	111	112	65	2	60		
5	20		0.69	1.05	815.87	80	83	109	109	65	2	60		
6	24		0.68	1.05	818.00	80	83	109	109	62	2	58		
7	28		0.65	1.00	819.80	80	84	109	108	62	2	58		
8	32		0.60	0.93	822.00	80	83	106	106	62	2	58		
9	36		0.60	0.93	824.47	80	83	110	110	62	2	58		
10	40		0.54	0.84	826.04	79	83	110	110	61	2	58		
11	44		0.40	0.62	827.81	79	83	110	110	61	2	58		
12	48	1256	0.35	0.54	829.248	79	83	110	110	61	2	58		
		1305			829.458									
(A) 1	4		0.70	1.08	831.30	80	83	110	110	66	2	65		23.242
2	8		0.65	1.00	833.82	80	83	109	109	65	2	64		
3	12		0.65	1.00	835.75	80	83	110	110	62	2	54		
4	16		0.64	0.99	837.74	80	85	110	110	61	2	54		
5	20		0.64	0.99	840.25	80	85	110	110	61	2	53		
6	24		0.60	0.93	841.83	80	84	109	109	61	2	53		
7	28		0.60	0.93	844.00	80	84	109	109	61	2	54		
8	32		0.55	0.85	846.03	80	84	108	108	62	2	55		
9	36		0.55	0.85	848.21	80	84	108	108	62	2	55		
10	40		0.41	0.64	849.50	80	84	108	108	62	2	55		
11	44		0.35	0.54	850.90	80	84	107	107	62	2	55		
12	48	1353 ✓	0.34	0.52	852.700	80	84	109	109	62	2	55		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.57375	0.88625	47.320	79.9	83.4	107/111	106/112	67	2	53/66		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments: ✓									
			0.75328 ✓	0.93623 ✓										

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	PPA Stack

Run No. 1 — Sample Date 6-10-19 — Recovery Date 6-10-19

Sample I.D. Chemours - PPA - 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	18	100	98	6			222	~~224~~	311	~~535~~ 533
Initial	0	100	100	0				200	300	500
Gain	18	0	-2	6			22	~~24~~	11	~~35~~ 33

Impinger Color Clear — Labeled? ✓

Silica Gel Condition Good — Sealed? ✓

Run No. 2 — Sample Date 6-11-19 — Recovery Date 6-11-19

Sample I.D. Chemours - PPA - 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	14	94	164	4				216	312.1	528.1
Initial	0	100	100	0				200	300	500
Gain	14	-6	4	4				16	12.1	28.1

Impinger Color Clear — Labeled? ✓

Silica Gel Condition good — Sealed? ✓

Run No. 3 — Sample Date 6-11-19 — Recovery Date 6-11-19

Sample I.D. Chemours - PPA - STK - 3 - M0010 - — Analyst — 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	96	104	8				218	307.1	525.1
Initial	6	100	100	8				200	300	500
Gain	10	-4	4	8				18 ✓	7.1 ✓	25.1

Impinger Color Clear — Labeled? ✓

Silica Gel Condition good — Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

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

Test Data			
Run number	1	2	3
Location	PPA CB Inlet	PPA CB Inlet	PPA CB Inlet
Date	06/10/19	06/11/19	06/11/19
Time period	1353-1553	0900-1046	1208-1353
Operator	JL/KA	KA/JL	KA/JL
Inputs For Calcs.			
Sq. rt. delta P	0.53622	0.54130	0.54315
Delta H	1.1446	1.1904	1.1804
Stack temp. (deg.F)	81.8	79.1	82.5
Meter temp. (deg.F)	79.7	74.4	80.8
Sample volume (act.)	58.936	59.865	60.273
Barometric press. (in.Hg)	29.95	29.97	30.03
Volume H_2O imp. (ml)	24.0	18.0	8.0
Weight change sil. gel (g)	16.0	21.1	10.9
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	6.310	6.310	6.310
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	-2.00	-2.00	-2.00
Nozzle dia. (in.)	0.250	0.250	0.250
Meter box cal.	0.9834	0.9834	0.9834
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	Stack Conditions	Assumed	Actual	Meter Box ID	#32			K Factor	3.9	
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					
Mode/Source ID	PPA	Impinger Vol (ml)		24	Probe ID / Length	P706		Sample Train (ft^3)	0.000	0.000	0.003
Samp. Loc. ID	C-Bed	Silica gel (g)		16	Probe Material	Boro		Leak Check @ (in Hg)	10"	6"	
Run No.ID	1	CO2, % by Vol	0		Pitot / Thermocouple ID	P706		Pitot leak check good	yes / no	yes / no	yes / no
Test Method ID	M0010	O2, % by Vol	20.9		Pitot Coefficient	0.84 ✓		Pitot Inspection good	yes / no	yes / no	yes / no
Date ID	10JUN2019	Temperature (°F)	88	91.833	Nozzle ID	.250		Method 3 System good	yes / no	yes / no	yes / no
Source/Location	PPA Carbon Bed Inlet	Meter Temp (°F)	88	79.667	Nozzle Measurements	.250 .250 .250		**Temp Check**	Pre-Test Set		Post-Test Set
Sample Date	6/10/19 ✓	Static Press (in H_2O)	-2	-2 ✓	Avg Nozzle Dia (in)	.250 ✓		Meter Box Temp			
Baro. Press (in Hg)	29.95 ✓				Area of Stack (ft^2)	6.31 ✓		Reference Temp			
Operator	JL/KA	Ambient Temp (°F)	83		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) 475.595 ~~475.475~~ ~~475.564~~ KA	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	1353 ✓												
A 1	4		.40	1.6	478.4	84	79	118	115	65	5	60		
2	8		.39	1.5	481.3	82	80	115	115	65	5	60		
3	12		.37	1.4	484.1	81	80	115	115	60	5	54		
4	16		.37	1.4	486.9	81	81	115	115	61	5	55		
5	20		.37	1.4	489.7	81	81	115	115	61	5	50		
6	24		.34	1.3	492.3	80	80	115	115	61	5	48		
7	28		.32	1.2	494.9	80	80	115	115	62	4	50		
8	32		.30	1.1	497.2	80	79	115	115	62	4	52		
9	36		.28	1.1	499.7	80	78	115	115	62	4	53		
10	40		.26	1.0	502.0	80	78	115	115	63	4	53		
11	44		.26	1.0	504.3	80	78	115	115	62	4	53		
12	48	1441	.24	.94	506.602	80	77	116	115	63	4	53		506.713
														~~506.648~~
B 1	4	1505	.43	1.7	509.7	80	77	116	115	65	7	59	KA	~~.046~~
2	8		.42	1.6	512.7	82	78	116	115	64	6	56		.111
3	12		.40	1.6	515.6	82	78	116	114	62	6	53		MPLC
4	16		.37	1.4	518.4	82	79	116	115	62	5	53		
5	20		.34	1.3	521.0	83	79	115	115	63	5	50		
6	24		.33	1.3	523.7	83	80	115	115	62	5	49		
7	28		.21	.82	525.9	83	80	115	115	62	4	50		
8	32		.18	.70	527.8	83	81	114	115	63	3	52		
9	36		.16	.62	529.8	84	81	115	115	63	3	51		
10	40		.13	.51	531.4	84	82	116	115	64	3	56		
11	44		.13	.51	533.0	84	83	116	115	64	3	58		
12	48	1553 ✓	.12	.47	534.642	85	83	115	115	65	3	58		
			Avg Delta P .247 ✓	Avg Delta H 1.145 ✓	Total Volume ~~59.047~~	Avg Ts 81.833 ✓	Avg Tm 79.667 ✓	Min/Max 114/118	Min/Max 114/115	Max 65	Max Vac 7	Min/Max 49/60		
			Avg Sqrt Delta P .536 ✓	Avg Sqrt Del H 1.053 ✓	Comments: 58.936 ✓									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

amd

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

			Assumed	Actual
Client	Chemours	**Stack Conditions**		
W.O.#	15418.002.015.0001			
Project ID	Chemours	% Moisture	2	
Mode/Source ID	PPA	Impinger Vol (ml)		
Samp. Loc. ID	C-Bed	Silica gel (g)		
Run No.ID	2	CO2, % by Vol	0.0	
Test Method ID	M0010	O2, % by Vol	20.9	
Date ID	10JUN2019	Temperature (°F)	75	
Source/Location	PPA Carbon Bed Inlet	Meter Temp (°F)	75	
Sample Date	6/11/19 ✓	Static Press (in H_2O)	-2	-2 ✓
Baro. Press (in Hg)	29.47 ✓			
Operator	KA/DL ✓	Ambient Temp (°F)	73	

Meter Box ID	32		K Factor	3.9
Meter Box Y	.9834 ✓			
Meter Box Del H	1.7175			
Probe ID / Length	P706		Sample Train (ft³)	0.004 / 0.002 / 0.000
Probe Material	Boro		Leak Check @ (in Hg)	10" / 8" / 8"
Pitot / Thermocouple ID	P706		Pitot leak check good	yes / no
Pitot Coefficient	0.84 ✓		Pitot Inspection good	yes / no
Nozzle ID	.250		Method 3 System good	yes / no
Nozzle Measurements	.250 .250 .250		**Temp Check**	Pre-Test Set / Post-Test Set
Avg Nozzle Dia (in)	.250 ✓		Meter Box Temp	
Area of Stack (ft²)	6.31 ✓		Reference Temp	
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 (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	0900 ✓			534.802									
A 1	4		.41	1.6	537.5	77	71	115	115	65	6	64		
2	8		.40	1.6	540.6	79	72	115	115	64	6	56		
3	12		.38	1.5	543.5	79	72	115	115	64	5	59		
4	16		.37	1.4	546.2	79	72	115	115	62	5	52		
5	20		.39	1.5	549.0	79	73	115	115	62	5	50		
6	24		.35	1.4	551.8	79	73	115	115	60	5	50		
7	28		.33	1.3 KA	544.1 554.1	79	73	115	115	60	5	50		
8	32		.29	1.1	556.9	79	74	115	115	61	4	50		
9	36		.29	1.1	559.5	78	74	115	115	62	4	52		
10	40		.27	1.1	562.0	78	74	114	115	61	4	51		
11	44		.20	.78	564.0	79	74	115	116	60	4	51		
12	48	0948	.17	.66	565.776	79	74	115	115	60	3	52		
														565.903
B 1	4	0958 KA	.42 .45 KA	1.6 1.8	570.0	79	74	115	115	65	6	54		.127
2	8		.44	1.7	572.0	79	75	114	115	59	6	55		MPLC
3	12		.43	1.7	575.2	79	75	115	115	58	6	52		
4	16		.40	1.6	578.0	79	76	116	114	60	6	57		
5	20		.39	1.5	580.9	79	76	116	115	61	6	58		
6	24		.35	1.4	583.7	79	76	115	115	63	5	58		
7	28		.24	.94	586.0	79	76	115	116	63	4	52		
8	32		.18	.70	587.9	80	76	114	115	63	3	52		
9	36		.16	.62	589.8	80	76	115	115	63	3	52		
10	40		.15	.59	591.5	80	76	116	114	64	3	53		
11	44		.13	.51	593.3	81	77	115	115	64	2	55		
12	48	1046 ✓	.12	.47	594.794	81	77	115	115	65	2	56		
			Avg Delta P .304 ✓	Avg Delta H 1.190 ✓	Total Volume 59.865 ✓	Avg Ts 79.125 ✓	Avg Tm 74.417 ✓	Min/Max 114/116	Min/Max 114/116	Max 65	Max Vac 6	Min/Max 50/64		
			Avg Sqrt Delta P .541 ✓	Avg Sqrt Del H 1.071 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

amd

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.015.0001
Project ID	Chemours
Mode/Source ID	PPA
Samp. Loc. ID	C-Bed
Run No.ID	3
Test Method ID	M0010
Date ID	10JUN2019
Source/Location	PPA Carbon Bed Inlet
Sample Date	6/11/19 ✓
Baro. Press (in Hg)	30.03 ✓
Operator	KA/JL ✓

Stack Conditions	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		
Silica gel (g)		
CO2, % by Vol	0.0	
O2, % by Vol	20.9	
Temperature (°F)	80	92-468
Meter Temp (°F)	80	80.833
Static Press (in H_2O)	-2	-2 ✓
Ambient Temp (°F)	80	

Meter Box ID	32
Meter Box Y	.9834 ✓
Meter Box Del H	1.75
Probe ID / Length	P706
Probe Material	Boro
Pitot / Thermocouple ID	P706
Pitot Coefficient	0.84 ✓
Nozzle ID	.250
Nozzle Measurements	.250 .250 .250
Avg Nozzle Dia (in)	.250 ✓
Area of Stack (ft^2)	6.31 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

K Factor 3.9	Initial	Mid-Point	Final
Sample Train (ft^3)	0.006	0.005	0.009
Leak Check @ (in Hg)	10"	8"	8"
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 (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	1208 ✓			594.931									
A 1	4		.42	1.6	597.9	83	79	115	115	65	5	62		
2	8		.40	1.6	600.9	82	79	115	115	62	5	45		
3	12		.38	1.5	603.8	82	79	115	115	64	5	49		
4	16		.37	1.4	606.6	82	79	117	115	63	5	50		
5	20		KA ~~.55~~ .35	1.4	609.2	82	79	115	116	61	5	50		
6	24		.29	1.1	611.7	82	80	116	116	59	5	48		
7	28		.28	1.1	614.2	82	80	115	114	59	4	47		
8	32		.30	1.1	616.5	82	80	114	114	59	4	48		
9	36		.30	1.1	619.1	82	80	114	115	60	4	47		
10	40		.27	1.1	621.6	83	81	115	115	60	4	49		
11	44		.25	.98	623.9	83	81	116	115	61	4	48		
12	48	1256	.26	1.0	626.234	82	81	114	114	60	4	50		
B 1	4	1305	.44	1.7	629.4	82	81	115	115	64	5	60		626.387
2	8		.44	1.7	632.5	83	81	116	115	62	5	52		.153
3	12		.44	1.7	635.5	83	81	115	114	60	5	50		MPLC
4	16		.38	1.5	638.4	83	82	115	115	60	5	51		
5	20		.36	1.4	641.2	82	82	116	115	61	5	50		
6	24		~~.36~~ KA	1.4	644.1	83	82	114	116	58	5	49		
7	28		.23	.90	646.3	82	83	114	114	57	4	47		
8	32		.20	.78	648.3	82	82	114	114	57	3	48		
9	36		.17	.66	650.1	83	82	114	116	57	3	48		
10	40		.14	.55	652.0	83	82	115	116	57	3	47		
11	44		.14	.55	653.7	83	82	116	115	58	3	48		
12	48	1353 ✓	.13	.51	655.357	83	82	115	115	58	3	49		
			Avg Delta P .304 ✓	Avg Delta H 1.180 ✓	Total Volume 60.273 ✓	Avg Ts 82.458 ✓	Avg Tm 80.833 ✓	Min/Max 114/117	Min/Max 114/116	Max 57/65	Max Vac 5	Min/Max 45/62		
			Avg Sqrt Delta P .543 ✓	Avg Sqrt Del H 1.071 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

AMC

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418.002.015.0001
Location/Plant	Fayetteville, NC	Source & Location	PPA Carbon Bed Inlet

Run No. 1 — Sample Date 6-10-19 — Recovery Date 6-10-19

Sample I.D. Chemours - PPA - C-Bed - 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	16	94	108	6				224	316	540
Initial	0	100	100	0				200	300	500
Gain	16	-6	8	6				24 ✓	16 ✓	40

Impinger Color clear — Labeled? ✓

Silica Gel Condition good — Sealed? ✓

Run No. 2 — Sample Date 6-11-19 — Recovery Date 6-11-19

Sample I.D. Chemours - PPA - C-Bed - 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	94	110	4				218	321.1	539.1
Initial	0	100	100	0				200	300	500
Gain	10	-6	10	4				18 ✓	21.1 ✓	39.1

Impinger Color Clear — Labeled? ✓

Silica Gel Condition good — Sealed? ✓

Run No. 3 — Sample Date 6-11-19 — Recovery Date 6-11-19

Sample I.D. Chemours - PPA - C-Bed - 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	10	94	100	4				208	310.9	518.9
Initial	0	100	100	0				200	300	500
Gain	10	-6	0	4				8 ✓	10.9 ✓	18.9

Impinger Color Clear — Labeled? ✓

Silica Gel Condition good — Sealed? –

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

METHODS AND ANALYZERS

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Project Number: **15418**
Operator: **AJS**
Date: **10 Jun 2019**

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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: **PPA**

Project Number: **15418**
Operator: **AJS**
Date: **10 Jun 2019**

Start Time: 10:34

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	19 mv
Span, 21.0 %	8004 mv

Curve Coefficients

Slope	**Intercept**
380.6	19

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	5 mv
Span, 17.1 %	8541 mv

Curve Coefficients

Slope	**Intercept**
500.6	5

WESTON SOLUTIONS℠

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **10 Jun 2019**

Start Time: 10:34

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 380.6 **Intercept** 19.0

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 500.6 **Intercept** 5.0

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: **PPA** | Calibration **1** | Date: **10 Jun 2019**

Start Time: 10:40

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	12.1	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	0.0	0.0	0.0	Pass
Span	9.0	8.8	-0.2	-1.2	Pass

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **10 Jun 2019**

Time	O_2 %	CO_2 %
PPA Run #1		
13:52	20.8	0.2
13:53	20.8	0.2
13:54	20.8	0.2
13:55	20.9	0.2
13:56	20.9	0.2
13:57	20.9	0.2
13:58	20.9	0.2
13:59	20.9	0.2
14:00	20.9	0.2
14:01	20.9	0.2
14:02	20.9	0.2
14:03	20.9	0.2
14:04	20.9	0.2
14:05	20.9	0.2
14:06	20.9	0.2
14:07	20.9	0.2
14:08	20.9	0.2
14:09	20.9	0.2
14:10	20.9	0.2
14:11	20.9	0.2
14:12	20.9	0.2
14:13	20.9	0.2
14:14	20.9	0.2
14:15	20.9	0.2
14:16	20.8	0.2
14:17	20.8	0.2
14:18	20.8	0.2
14:19	20.8	0.2
14:20	20.8	0.2
14:21	20.8	0.2
14:22	20.8	0.2
14:23	20.8	0.2
14:24	20.8	0.2
14:25	20.8	0.2
14:26	20.8	0.2
14:27	20.8	0.2
14:28	20.8	0.2
14:29	20.8	0.2
14:30	20.8	0.2

WESTON SOLUTIONS℠

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **10 Jun 2019**

Time	O_2 %	CO_2 %
14:31	20.8	0.2
14:32	20.9	0.2
14:33	20.8	0.2
14:34	20.8	0.2
14:35	20.8	0.2
14:36	20.8	0.2
14:37	20.8	0.2
14:38	20.8	0.2
14:39	20.8	0.2
14:40	20.8	0.2
14:41	20.9	0.2
14:42	20.9	0.2
14:43	20.9	0.2
14:44	20.8	0.2
14:45	20.8	0.2
14:46	20.8	0.2
14:47	20.8	0.2
14:48	20.8	0.2
14:49	20.8	0.2
14:50	20.8	0.2
14:51	20.8	0.2
14:52	20.8	0.2
14:53	20.8	0.2
14:54	20.8	0.2
14:55	20.8	0.2
14:56	20.8	0.2
14:57	20.8	0.2
14:58	20.8	0.2
14:59	20.8	0.2
15:00	20.8	0.2
15:01	20.8	0.2
15:02	20.8	0.2
15:03	20.8	0.2
15:04	20.8	0.2
15:05	20.8	0.2
15:06	20.8	0.2
15:07	20.8	0.2
15:08	20.8	0.2
15:09	20.8	0.2
15:10	20.8	0.2

WESTON SOLUTIONS

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **10 Jun 2019**

Time	O_2 %	CO_2 %
15:11	20.8	0.2
15:12	20.8	0.2
15:13	20.8	0.2
15:14	20.8	0.2
15:15	20.8	0.2
15:16	20.8	0.2
15:17	20.8	0.2
15:18	20.8	0.2
15:19	20.8	0.2
15:20	20.8	0.2
15:21	20.8	0.2
15:22	20.8	0.2
15:23	20.8	0.2
15:24	20.8	0.2
15:25	20.8	0.2
15:26	20.8	0.2
15:27	20.8	0.2
15:28	20.8	0.2
15:29	20.8	0.2
15:30	20.8	0.2
15:31	20.8	0.2
15:32	20.8	0.2
15:33	20.8	0.2
15:34	20.8	0.2
15:35	20.8	0.2
15:36	20.8	0.2
15:37	20.8	0.2
15:38	20.8	0.2
15:39	20.8	0.2
15:40	20.8	0.2
15:41	20.8	0.2
15:42	20.8	0.2
15:43	20.8	0.2
15:44	20.8	0.2
15:45	20.8	0.2
15:46	20.8	0.2
15:47	20.8	0.2
15:48	20.8	0.2
15:49	20.8	0.2
15:50	20.8	0.2

WESTON SOLUTIONS

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **10 Jun 2019**

Time	O_2 %	CO_2 %
15:51	20.8	0.2
15:52	20.8	0.2
15:53	20.8	0.2
Avgs	**20.8**	**0.2**

RUN SUMMARY

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **10 Jun 2019**

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

Time: 13:51 to 15:53

Run Averages

20.8	0.2

Pre-run Bias at 10:40

Zero Bias	0.0	0.0
Span Bias	12.0	8.8
Span Gas	12.1	9.0

Post-run Bias at 16:02

Zero Bias	0.0	0.2
Span Bias	12.0	8.8
Span Gas	12.1	9.0

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

20.9	0.1

WESTON SOLUTIONS℠

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **10 Jun 2019**

Start Time: 16:02

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	12.1	12.0	-0.1	-0.5	Pass

Calibration Drift

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

*Bias No. 1

CO_2

Method: EPA 3A
Span Conc. 17.1 %

Bias Results

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

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.2	0.2	1.2	Pass
Span	8.8	8.8	0.0	0.0	Pass

*Bias No. 1

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **11 Jun 2019**

Start Time: 07:47

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	0.0	0.1	0.1	0.5	Pass
Span	12.0	12.1	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	0.2	0.2	1.2	Pass
Span	9.0	9.0	0.0	0.0	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.2	0.2	0.0	0.0	Pass
Span	8.8	9.0	0.2	1.2	Pass

*Bias No. 2

WESTON SOLUTIONS

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

Time	O_2 %	CO_2 %
PPA Run #2		
09:00	20.8	0.3
09:01	20.9	0.2
09:02	20.9	0.2
09:03	20.9	0.2
09:04	20.9	0.2
09:05	20.9	0.2
09:06	20.9	0.2
09:07	20.9	0.2
09:08	20.9	0.2
09:09	20.9	0.2
09:10	20.9	0.2
09:11	20.9	0.2
09:12	20.9	0.2
09:13	20.9	0.2
09:14	20.9	0.2
09:15	20.9	0.2
09:16	20.9	0.2
09:17	20.9	0.2
09:18	20.9	0.2
09:19	20.9	0.2
09:20	20.9	0.2
09:21	20.9	0.2
09:22	20.9	0.2
09:23	20.9	0.2
09:24	20.9	0.2
09:25	20.9	0.2
09:26	20.9	0.2
09:27	20.9	0.2
09:28	20.9	0.2
09:29	20.9	0.2
09:30	20.9	0.2
09:31	20.9	0.2
09:32	20.9	0.2
09:33	20.9	0.2
09:34	20.9	0.2
09:35	20.9	0.2
09:36	20.9	0.2
09:37	20.9	0.2
09:38	20.9	0.2

WESTON SOLUTIONS

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

Time	O_2 %	CO_2 %
09:39	20.9	0.2
09:40	20.9	0.2
09:41	20.9	0.2
09:42	20.9	0.2
09:43	20.9	0.2
09:44	20.9	0.2
09:45	20.9	0.2
09:46	20.9	0.2
09:47	20.9	0.2
09:48	20.9	0.2
09:49	20.9	0.2
09:50	20.9	0.2
09:51	20.9	0.2
09:52	20.9	0.2
09:53	20.9	0.2
09:54	20.9	0.2
09:55	20.9	0.2
09:56	20.9	0.2
09:57	20.9	0.2
09:58	20.9	0.2
09:59	20.9	0.2
10:00	20.9	0.2
10:01	20.9	0.2
10:02	20.9	0.2
10:03	20.9	0.2
10:04	20.9	0.2
10:05	20.9	0.2
10:06	20.9	0.2
10:07	20.9	0.2
10:08	20.9	0.2
10:09	20.9	0.2
10:10	20.9	0.2
10:11	20.9	0.2
10:12	20.9	0.2
10:13	20.9	0.2
10:14	20.9	0.2
10:15	20.9	0.2
10:16	20.9	0.2
10:17	20.9	0.2
10:18	20.9	0.2

WESTON SOLUTIONS

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

Time	O_2 %	CO_2 %
10:19	20.9	0.2
10:20	20.9	0.2
10:21	20.9	0.2
10:22	20.9	0.2
10:23	20.9	0.2
10:24	20.9	0.2
10:25	20.9	0.2
10:26	20.9	0.2
10:27	20.9	0.2
10:28	20.9	0.2
10:29	20.9	0.2
10:30	20.9	0.2
10:31	20.9	0.2
10:32	20.9	0.2
10:33	20.9	0.2
10:34	20.9	0.2
10:35	20.9	0.2
10:36	20.9	0.2
10:37	20.9	0.2
10:38	20.9	0.2
10:39	20.9	0.2
10:40	20.9	0.2
10:41	20.9	0.2
10:42	20.9	0.2
10:43	20.9	0.2
10:44	20.9	0.2
10:45	20.9	0.2
10:46	20.9	0.2
Avgs	**20.9**	**0.2**

WESTON SOLUTIONS

RUN SUMMARY

Number 3

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

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

Time: 08:59 to 10:46

Run Averages

20.9	0.2

Pre-run Bias at 07:47

Zero Bias	0.1	0.2
Span Bias	12.1	9.0
Span Gas	12.1	9.0

Post-run Bias at 11:02

Zero Bias	0.0	0.2
Span Bias	12.0	9.2
Span Gas	12.1	9.0

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

20.9	0.0

WESTON SOLUTIONS℠

BIAS AND CALIBRATION DRIFT

Number 4

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **11 Jun 2019**

Start Time: 11:02

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	12.1	12.0	-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	12.1	12.0	-0.1	-0.5	Pass

*Bias No. 3

CO_2

Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.2	0.2	1.2	Pass
Span	9.0	9.2	0.2	1.2	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.2	0.2	0.0	0.0	Pass
Span	9.0	9.2	0.2	1.2	Pass

*Bias No. 3

RUN DATA

Number 4

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

Time	O_2 %	CO_2 %
PPA Run #3		
12:08	20.9	0.2
12:09	20.9	0.2
12:10	20.9	0.2
12:11	20.9	0.2
12:12	20.9	0.2
12:13	20.9	0.2
12:14	20.9	0.2
12:15	20.9	0.2
12:16	20.9	0.2
12:17	20.9	0.2
12:18	20.9	0.2
12:19	20.9	0.2
12:20	20.9	0.2
12:21	20.9	0.2
12:22	20.9	0.2
12:23	20.9	0.2
12:24	20.9	0.2
12:25	20.9	0.2
12:26	20.9	0.2
12:27	20.9	0.2
12:28	20.9	0.2
12:29	20.9	0.2
12:30	20.9	0.2
12:31	20.9	0.2
12:32	20.9	0.2
12:33	20.9	0.2
12:34	20.9	0.2
12:35	20.9	0.2
12:36	20.9	0.2
12:37	20.9	0.2
12:38	20.9	0.2
12:39	20.9	0.2
12:40	20.9	0.2
12:41	20.9	0.2
12:42	20.9	0.2
12:43	20.9	0.2
12:44	20.9	0.2
12:45	20.9	0.2
12:46	20.9	0.2

WESTON SOLUTIONS℠

RUN DATA

Number 4

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

Time	O_2 %	CO_2 %
12:47	20.9	0.2
12:48	20.9	0.2
12:49	20.9	0.2
12:50	20.9	0.2
12:51	20.9	0.2
12:52	20.9	0.2
12:53	20.9	0.2
12:54	20.9	0.2
12:55	20.9	0.2
12:56	20.9	0.2
12:57	20.9	0.2
12:58	20.9	0.2
12:59	20.9	0.2
13:00	20.9	0.2
13:01	20.9	0.2
13:02	20.9	0.2
13:03	20.9	0.2
13:04	20.9	0.2
13:05	20.9	0.2
13:06	20.9	0.2
13:07	20.9	0.2
13:08	20.9	0.2
13:09	20.9	0.2
13:10	20.9	0.2
13:11	20.9	0.2
13:12	20.9	0.2
13:13	20.9	0.2
13:14	20.9	0.2
13:15	20.9	0.2
13:16	20.9	0.2
13:17	20.9	0.2
13:18	20.9	0.2
13:19	20.9	0.2
13:20	20.9	0.2
13:21	20.9	0.2
13:22	20.9	0.2
13:23	20.9	0.2
13:24	20.9	0.2
13:25	20.9	0.2
13:26	20.9	0.2

WESTON SOLUTIONS℠

RUN DATA

Number 4

Client: **Chemours**
Location: **Fayetteville, NC**
Source: **PPA**

Calibration **1**

Project Number: **15418**
Operator: **AJS**
Date: **11 Jun 2019**

Time	O_2 %	CO_2 %
13:27	20.9	0.2
13:28	20.9	0.2
13:29	20.9	0.2
13:30	20.9	0.2
13:31	20.9	0.2
13:32	20.9	0.2
13:33	20.9	0.2
13:34	20.9	0.2
13:35	20.9	0.2
13:36	20.9	0.2
13:37	20.9	0.2
13:38	20.9	0.2
13:39	20.9	0.2
13:40	20.9	0.2
13:41	20.9	0.2
13:42	20.9	0.2
13:43	20.9	0.2
13:44	20.9	0.2
13:45	20.9	0.2
13:46	20.9	0.2
13:47	20.9	0.2
13:48	20.9	0.2
13:49	20.9	0.2
13:50	20.9	0.2
13:51	20.9	0.2
13:52	20.9	0.2
13:53	20.9	0.2
Avgs	**20.9**	**0.2**

WESTON SOLUTIONS

RUN SUMMARY

Number 4

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **11 Jun 2019**

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

Time: 12:07 to 13:53

Run Averages

20.9	0.2

Pre-run Bias at 11:02

Zero Bias	0.0	0.2
Span Bias	12.0	9.2
Span Gas	12.1	9.0

Post-run Bias at 14:22

Zero Bias	0.0	0.2
Span Bias	12.0	9.1
Span Gas	12.1	9.0

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

21.0	0.0

WESTON SOLUTIONS℠

BIAS AND CALIBRATION DRIFT

Number 5

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville, NC** | Operator: **AJS**
Source: **PPA** | Calibration **1** | Date: **11 Jun 2019**

Start Time: 14:22

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	12.1	12.0	-0.1	-0.5	Pass

Calibration Drift

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

*Bias No. 4

CO_2

Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.2	0.2	1.2	Pass
Span	9.0	9.1	0.1	0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.2	0.2	0.0	0.0	Pass
Span	9.2	9.1	-0.1	-0.6	Pass

*Bias No. 4

APPENDIX C
LABORATORY ANALYTICAL REPORT

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

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Job Number: 140-15589-1

Job Description: PPA 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
7/5/2019 10:15 AM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
07/05/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
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.
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
Job ID: 140-15589-1
Project/Site: PPA Carbon Bed Outlet - M0010

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
Split	Source Air Split	None	TAL DEN

Protocol References:

None = None

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: PPA Carbon Bed Outlet - M0010

Job ID: 140-15589-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-15589-1	Q-1701,1702 PPA OUTLET R1 M0010 FH	Air	06/10/19 00:00	06/11/19 18:45	
140-15589-2	Q-1703,1704,1706 PPA OUTLET R1 M0010 BH	Air	06/10/19 00:00	06/11/19 18:45	
140-15589-3	Q-1705 PPA OUTLET R1 M0010 IMP 1,2&3 CONDENSATE	Air	06/10/19 00:00	06/11/19 18:45	
140-15589-4	Q-1707 PPA OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/10/19 00:00	06/11/19 18:45	
140-15589-5	Q-1708,1709 PPA OUTLET R2 M0010 FH	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-6	Q-1710,1711,1713 PPA OUTLET R2 M0010 BH	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-7	Q-1712 PPA OUTLET R2 M0010 IMP 1,2&3 CONDENSATE	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-8	Q-1714 PPA OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-9	Q-1715,1716 PPA OUTLET R3 M0010 FH	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-10	Q-1717,1718,1720 PPA OUTLET R3 M0010 BH	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-11	Q-1719 PPA OUTLET R3 M0010 IMP 1,2&3 CONDENSATE	Air	06/11/19 00:00	06/11/19 18:45	
140-15589-12	Q-1721 PPA OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	06/11/19 00:00	06/11/19 18:45	

Job Narrative
140-15589-1

Sample Receipt

The samples were received on June 11, 2019 at 6:45 PM in good condition and properly preserved. The temperatures of the 3 coolers at receipt time were 0.7º C, 1.2º C and 2.4º 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-1719 PPA OUTLET R3 M0010 IMP 1,2&3 CONDENSATE (140-15589-11). 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 Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: Q-1717,1718,1720 PPA OUTLET R3 M0010 BH (140-15589-10). 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). All detection limits are below the lower calibration.

Organic Prep

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

Comments

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

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

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: 462463

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-1	Q-1701,1702 PPA OUTLET R1 M0010 FH	Total/NA	Air	None	
140-15589-5	Q-1708,1709 PPA OUTLET R2 M0010 FH	Total/NA	Air	None	
140-15589-9	Q-1715,1716 PPA OUTLET R3 M0010 FH	Total/NA	Air	None	
MB 280-462463/1-B	Method Blank	Total/NA	Air	None	
LCS 280-462463/2-B	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462491

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-2	Q-1703,1704,1706 PPA OUTLET R1 M0010 BH	Total/NA	Air	None	
140-15589-4	Q-1707 PPA OUTLET R1 M0010 BREAKTHROU	Total/NA	Air	None	
140-15589-6	Q-1710,1711,1713 PPA OUTLET R2 M0010 BH	Total/NA	Air	None	
140-15589-8	Q-1714 PPA OUTLET R2 M0010 BREAKTHROU	Total/NA	Air	None	
140-15589-10	Q-1717,1718,1720 PPA OUTLET R3 M0010 BH	Total/NA	Air	None	
140-15589-12	Q-1721 PPA OUTLET R3 M0010 BREAKTHROU	Total/NA	Air	None	
MB 280-462491/13-B	Method Blank	Total/NA	Air	None	
MB 280-462491/1-B	Method Blank	Total/NA	Air	None	
LCS 280-462491/2-B	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-3	Q-1705 PPA OUTLET R1 M0010 IMP 1,2&3 CON	Total/NA	Air	None	
140-15589-7	Q-1712 PPA OUTLET R2 M0010 IMP 1,2&3 CON	Total/NA	Air	None	
140-15589-11	Q-1719 PPA OUTLET R3 M0010 IMP 1,2&3 CON	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
140-15589-3	Q-1705 PPA OUTLET R1 M0010 IMP 1,2&3 CON	Total/NA	Air	8321A	462636
140-15589-7	Q-1712 PPA OUTLET R2 M0010 IMP 1,2&3 CON	Total/NA	Air	8321A	462636
140-15589-11	Q-1719 PPA OUTLET R3 M0010 IMP 1,2&3 CON	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

Cleanup Batch: 463063

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-2	Q-1703,1704,1706 PPA OUTLET R1 M0010 BH	Total/NA	Air	Split	462491
140-15589-4	Q-1707 PPA OUTLET R1 M0010 BREAKTHROU	Total/NA	Air	Split	462491
140-15589-6	Q-1710,1711,1713 PPA OUTLET R2 M0010 BH	Total/NA	Air	Split	462491
140-15589-8	Q-1714 PPA OUTLET R2 M0010 BREAKTHROU	Total/NA	Air	Split	462491
140-15589-10	Q-1717,1718,1720 PPA OUTLET R3 M0010 BH	Total/NA	Air	Split	462491
140-15589-12	Q-1721 PPA OUTLET R3 M0010 BREAKTHROU	Total/NA	Air	Split	462491
MB 280-462491/13-B	Method Blank	Total/NA	Air	Split	462491
MB 280-462491/1-B	Method Blank	Total/NA	Air	Split	462491
LCS 280-462491/2-B	Lab Control Sample	Total/NA	Air	Split	462491

LCMS

Cleanup Batch: 463285

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-1	Q-1701,1702 PPA OUTLET R1 M0010 FH	Total/NA	Air	Split	462463
140-15589-5	Q-1708,1709 PPA OUTLET R2 M0010 FH	Total/NA	Air	Split	462463
140-15589-9	Q-1715,1716 PPA OUTLET R3 M0010 FH	Total/NA	Air	Split	462463
MB 280-462463/1-B	Method Blank	Total/NA	Air	Split	462463
LCS 280-462463/2-B	Lab Control Sample	Total/NA	Air	Split	462463

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: 463498

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-2	Q-1703,1704,1706 PPA OUTLET R1 M0010 BH	Total/NA	Air	8321A	463063
140-15589-4	Q-1707 PPA OUTLET R1 M0010 BREAKTHROU	Total/NA	Air	8321A	463063
140-15589-6	Q-1710,1711,1713 PPA OUTLET R2 M0010 BH	Total/NA	Air	8321A	463063
140-15589-8	Q-1714 PPA OUTLET R2 M0010 BREAKTHROU	Total/NA	Air	8321A	463063
140-15589-10	Q-1717,1718,1720 PPA OUTLET R3 M0010 BH	Total/NA	Air	8321A	463063
140-15589-12	Q-1721 PPA OUTLET R3 M0010 BREAKTHROU	Total/NA	Air	8321A	463063
MB 280-462491/13-B	Method Blank	Total/NA	Air	8321A	463063
MB 280-462491/1-B	Method Blank	Total/NA	Air	8321A	463063
LCS 280-462491/2-B	Lab Control Sample	Total/NA	Air	8321A	463063

Analysis Batch: 463499

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15589-1	Q-1701,1702 PPA OUTLET R1 M0010 FH	Total/NA	Air	8321A	463285
140-15589-5	Q-1708,1709 PPA OUTLET R2 M0010 FH	Total/NA	Air	8321A	463285
140-15589-9	Q-1715,1716 PPA OUTLET R3 M0010 FH	Total/NA	Air	8321A	463285
MB 280-462463/1-B	Method Blank	Total/NA	Air	8321A	463285
LCS 280-462463/2-B	Lab Control Sample	Total/NA	Air	8321A	463285

Client Sample ID: Q-1701,1702 PPA OUTLET R1 M0010 FH

Lab Sample ID: 140-15589-1

Date Collected: 06/10/19 00:00
Date Received: 06/11/19 18:45
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.97	H	0.102	0.0110	ug/Sample		06/24/19 13:15	07/03/19 11:35	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*121*		*50 - 200*	*06/24/19 13:15*	*07/03/19 11:35*	*1*

Client Sample ID: Q-1703,1704,1706 PPA OUTLET R1 M0010 BH

Lab Sample ID: 140-15589-2

Date Collected: 06/10/19 00:00
Date Received: 06/11/19 18:45
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0790	J H	0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*57*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:24*	*1*

Client Sample ID: Q-1705 PPA OUTLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15589-3

Date Collected: 06/10/19 00:00
Date Received: 06/11/19 18:45
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0920	J H	0.114	0.00581	ug/Sample		06/25/19 12:37	06/28/19 09:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*52*		*50 - 200*	*06/25/19 12:37*	*06/28/19 09:50*	*1*

Client Sample ID: Q-1707 PPA OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15589-4

Date Collected: 06/10/19 00:00
Date Received: 06/11/19 18:45
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND	H	0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*68*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:27*	*1*

Client Sample ID: Q-1708,1709 PPA OUTLET R2 M0010 FH

Lab Sample ID: 140-15589-5

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.33		0.0770	0.00831	ug/Sample		06/24/19 13:15	07/03/19 11:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*116*		*50 - 200*	*06/24/19 13:15*	*07/03/19 11:38*	*1*

Client Sample ID: Q-1710,1711,1713 PPA OUTLET R2 M0010 BH

Lab Sample ID: 140-15589-6

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0529	J	0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*53*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:34*	*1*

Client Sample ID: Q-1712 PPA OUTLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15589-7

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0562	J H	0.118	0.00602	ug/Sample		06/25/19 12:37	06/28/19 09:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*51*		*50 - 200*	*06/25/19 12:37*	*06/28/19 09:54*	*1*

Client Sample ID: Q-1714 PPA OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15589-8

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:37	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:37*	*1*

Client Sample ID: Q-1715,1716 PPA OUTLET R3 M0010 FH
Lab Sample ID: 140-15589-9

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.981		0.0770	0.00831	ug/Sample		06/24/19 13:15	07/03/19 11:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*112*		*50 - 200*	*06/24/19 13:15*	*07/03/19 11:42*	*1*

Client Sample ID: Q-1717,1718,1720 PPA OUTLET R3 M0010 BH
Lab Sample ID: 140-15589-10

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.39		0.226	0.0452	ug/Sample		06/24/19 15:10	07/03/19 10:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*44*	*X*	*50 - 200*	*06/24/19 15:10*	*07/03/19 10:43*	*1*

Client Sample ID: Q-1719 PPA OUTLET R3 M0010 IMP 1,2&3 CONDENSATE
Lab Sample ID: 140-15589-11

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.650	H	0.0980	0.00500	ug/Sample		06/25/19 12:37	06/28/19 09:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*47*	*X*	*50 - 200*	*06/25/19 12:37*	*06/28/19 09:57*	*1*

Client Sample ID: Q-1721 PPA OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE
Lab Sample ID: 140-15589-12

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:47*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Job ID: 140-15589-1
Project/Site: PPA Carbon Bed Outlet - M0010

Method: 8321A - HFPO-DA

Prep: None

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

Method: 8321A - PFOA and PFOS

Prep: None

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

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ANALYTICAL REPORT

Job Number: 140-15588-1

Job Description: PPA 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
7/5/2019 10:11 AM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
07/05/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
D	Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples.
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.
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: PPA Carbon Bed Inlet - M0010

Job ID: 140-15588-1

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
Split	Source Air Split	None	TAL DEN

Protocol References:

None = None

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: PPA Carbon Bed Inlet - M0010

Job ID: 140-15588-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-15588-1	D-2701,2702 PPA INLET R1 M0010 FH	Air	06/10/19 00:00	06/11/19 18:45	
140-15588-2	D-2703,2704,2706 PPA INLET R1 M0010 BH	Air	06/10/19 00:00	06/11/19 18:45	
140-15588-3	D-2705 PPA INLET R1 M0010 IMP 1,2&3 CONDENSATE	Air	06/10/19 00:00	06/11/19 18:45	
140-15588-4	D-2707 PPA INLET R1 M0010 BREAKTHROUGI XAD-2 RESIN TUBE	Air	06/10/19 00:00	06/11/19 18:45	
140-15588-5	D-2708,2709 PPA INLET R2 M0010 FH	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-6	D-2710,2711,2713 PPA INLET R2 M0010 BH	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-7	D-2712 PPA INLET R2 M0010 IMP 1,2&3 CONDENSATE	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-8	D-2714 PPA INLET R2 M0010 BREAKTHROUGI XAD-2 RESIN TUBE	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-9	D-2715,2716 PPA INLET R3 M0010 FH	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-10	D-2717,2718,2720 PPA INLET R3 M0010 BH	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-11	D-2719 PPA INLET R3 M0010 IMP 1,2&3 CONDENSATE	Air	06/11/19 00:00	06/11/19 18:45	
140-15588-12	D-2721 PPA INLET R3 M0010 BREAKTHROUGI XAD-2 RESIN TUBE	Air	06/11/19 00:00	06/11/19 18:45	

Job Narrative
140-15588-1

Sample Receipt

The samples were received on June 11, 2019 at 6:45 PM in good condition and properly preserved. The temperatures of the 2 coolers at receipt time were 0.7º C and 2.4º 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: D-2705 PPA INLET R1 M0010 IMP 1,2&3 CONDENSATE (140-15588-3) and D-2712 PPA INLET R2 M0010 IMP 1,2&3 CONDENSATE (140-15588-7). 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 Surrogate/Isotope Dilution Analyte (IDA) recovery associated with the following samples is below the method recommended limit: D-2703,2704,2706 PPA INLET R1 M0010 BH (140-15588-2) and D-2707 PPA INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE (140-15588-4). 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.

Organic Prep

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

Comments

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

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

LCMS

Analysis Batch: 436957

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

Prep Batch: 462463

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-1	D-2701,2702 PPA INLET R1 M0010 FH	Total/NA	Air	None	
140-15588-5	D-2708,2709 PPA INLET R2 M0010 FH	Total/NA	Air	None	
140-15588-9	D-2715,2716 PPA INLET R3 M0010 FH	Total/NA	Air	None	
MB 280-462463/1-B	Method Blank	Total/NA	Air	None	
LCS 280-462463/2-B	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462491

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-2	D-2703,2704,2706 PPA INLET R1 M0010 BH	Total/NA	Air	None	
140-15588-4	D-2707 PPA INLET R1 M0010 BREAKTHROUGI	Total/NA	Air	None	
140-15588-6	D-2710,2711,2713 PPA INLET R2 M0010 BH	Total/NA	Air	None	
140-15588-8	D-2714 PPA INLET R2 M0010 BREAKTHROUGI	Total/NA	Air	None	
140-15588-10	D-2717,2718,2720 PPA INLET R3 M0010 BH	Total/NA	Air	None	
140-15588-12	D-2721 PPA INLET R3 M0010 BREAKTHROUGI	Total/NA	Air	None	
MB 280-462491/1-B	Method Blank	Total/NA	Air	None	
LCS 280-462491/2-B	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 462636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-3	D-2705 PPA INLET R1 M0010 IMP 1,2&3 COND	Total/NA	Air	None	
140-15588-7	D-2712 PPA INLET R2 M0010 IMP 1,2&3 COND	Total/NA	Air	None	
140-15588-11	D-2719 PPA INLET R3 M0010 IMP 1,2&3 COND	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
140-15588-3	D-2705 PPA INLET R1 M0010 IMP 1,2&3 COND	Total/NA	Air	8321A	462636
140-15588-7	D-2712 PPA INLET R2 M0010 IMP 1,2&3 COND	Total/NA	Air	8321A	462636
140-15588-11	D-2719 PPA INLET R3 M0010 IMP 1,2&3 COND	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

Cleanup Batch: 463063

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-2	D-2703,2704,2706 PPA INLET R1 M0010 BH	Total/NA	Air	Split	462491
140-15588-4	D-2707 PPA INLET R1 M0010 BREAKTHROUGI	Total/NA	Air	Split	462491
140-15588-6	D-2710,2711,2713 PPA INLET R2 M0010 BH	Total/NA	Air	Split	462491
140-15588-8	D-2714 PPA INLET R2 M0010 BREAKTHROUGI	Total/NA	Air	Split	462491
140-15588-10	D-2717,2718,2720 PPA INLET R3 M0010 BH	Total/NA	Air	Split	462491
140-15588-12	D-2721 PPA INLET R3 M0010 BREAKTHROUGI	Total/NA	Air	Split	462491
MB 280-462491/1-B	Method Blank	Total/NA	Air	Split	462491
LCS 280-462491/2-B	Lab Control Sample	Total/NA	Air	Split	462491

Cleanup Batch: 463285

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-1	D-2701,2702 PPA INLET R1 M0010 FH	Total/NA	Air	Split	462463

LCMS (Continued)

Cleanup Batch: 463285 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-5	D-2708,2709 PPA INLET R2 M0010 FH	Total/NA	Air	Split	462463
140-15588-9	D-2715,2716 PPA INLET R3 M0010 FH	Total/NA	Air	Split	462463
MB 280-462463/1-B	Method Blank	Total/NA	Air	Split	462463
LCS 280-462463/2-B	Lab Control Sample	Total/NA	Air	Split	462463

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: 463498

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-2	D-2703,2704,2706 PPA INLET R1 M0010 BH	Total/NA	Air	8321A	463063
140-15588-4	D-2707 PPA INLET R1 M0010 BREAKTHROUGI	Total/NA	Air	8321A	463063
140-15588-6	D-2710,2711,2713 PPA INLET R2 M0010 BH	Total/NA	Air	8321A	463063
140-15588-8	D-2714 PPA INLET R2 M0010 BREAKTHROUGI	Total/NA	Air	8321A	463063
140-15588-10	D-2717,2718,2720 PPA INLET R3 M0010 BH	Total/NA	Air	8321A	463063
140-15588-12	D-2721 PPA INLET R3 M0010 BREAKTHROUGI	Total/NA	Air	8321A	463063
MB 280-462491/1-B	Method Blank	Total/NA	Air	8321A	463063
LCS 280-462491/2-B	Lab Control Sample	Total/NA	Air	8321A	463063

Analysis Batch: 463499

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15588-1	D-2701,2702 PPA INLET R1 M0010 FH	Total/NA	Air	8321A	463285
140-15588-5	D-2708,2709 PPA INLET R2 M0010 FH	Total/NA	Air	8321A	463285
140-15588-9	D-2715,2716 PPA INLET R3 M0010 FH	Total/NA	Air	8321A	463285
MB 280-462463/1-B	Method Blank	Total/NA	Air	8321A	463285
LCS 280-462463/2-B	Lab Control Sample	Total/NA	Air	8321A	463285

Client Sample ID: D-2701,2702 PPA INLET R1 M0010 FH

Lab Sample ID: 140-15588-1

Date Collected: 06/10/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	83.7	H	0.770	0.0831	ug/Sample		06/24/19 13:15	07/03/19 11:25	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*104*	*D*	*50 - 200*	*06/24/19 13:15*	*07/03/19 11:25*	*10*

Client Sample ID: D-2703,2704,2706 PPA INLET R1 M0010 BH

Lab Sample ID: 140-15588-2

Date Collected: 06/10/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	3.84	H	0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*48*	*X*	*50 - 200*	*06/24/19 15:10*	*07/03/19 10:05*	*1*

Client Sample ID: D-2705 PPA INLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15588-3

Date Collected: 06/10/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.313	H	0.117	0.00597	ug/Sample		06/25/19 12:37	06/28/19 09:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*47*	*X*	*50 - 200*	*06/25/19 12:37*	*06/28/19 09:41*	*1*

Client Sample ID: D-2707 PPA INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15588-4

Date Collected: 06/10/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND	H	0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*39*	*X*	*50 - 200*	*06/24/19 15:10*	*07/03/19 10:08*	*1*

Client Sample ID: D-2708,2709 PPA INLET R2 M0010 FH

Lab Sample ID: 140-15588-5

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	88.0		0.768	0.0830	ug/Sample		06/24/19 13:15	07/03/19 11:29	10

Client Sample ID: D-2708,2709 PPA INLET R2 M0010 FH

Lab Sample ID: 140-15588-5

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	110	D	50 - 200	06/24/19 13:15	07/03/19 11:29	10

Client Sample ID: D-2710,2711,2713 PPA INLET R2 M0010 BH

Lab Sample ID: 140-15588-6

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	55.9		2.26	0.452	ug/Sample		06/24/19 15:10	07/03/19 10:11	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	69	D	50 - 200	06/24/19 15:10	07/03/19 10:11	10

Client Sample ID: D-2712 PPA INLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15588-7

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	9.79	H	0.0850	0.00434	ug/Sample		06/25/19 12:37	06/28/19 09:44	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	47	X	50 - 200	06/25/19 12:37	06/28/19 09:44	1

Client Sample ID: D-2714 PPA INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15588-8

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.366		0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:14	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	61		50 - 200	06/24/19 15:10	07/03/19 10:14	1

Client Sample ID: D-2715,2716 PPA INLET R3 M0010 FH

Lab Sample ID: 140-15588-9

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	64.0		0.540	0.0583	ug/Sample		06/24/19 13:15	07/03/19 11:32	20

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	115	D	50 - 200	06/24/19 13:15	07/03/19 11:32	20

Client Sample ID: D-2717,2718,2720 PPA INLET R3 M0010 BH

Lab Sample ID: 140-15588-10

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.75		0.226	0.0452	ug/Sample		06/24/19 15:10	07/03/19 10:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*74*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:18*	*1*

Client Sample ID: D-2719 PPA INLET R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-15588-11

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0523	J H	0.0980	0.00500	ug/Sample		06/25/19 12:37	06/28/19 09:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*51*		*50 - 200*	*06/25/19 12:37*	*06/28/19 09:47*	*1*

Client Sample ID: D-2721 PPA INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15588-12

Date Collected: 06/11/19 00:00
Matrix: Air
Date Received: 06/11/19 18:45
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		06/24/19 15:10	07/03/19 10:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*67*		*50 - 200*	*06/24/19 15:10*	*07/03/19 10:21*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Job ID: 140-15588-1
Project/Site: PPA Carbon Bed Inlet - M0010

Method: 8321A - HFPO-DA

Prep: None

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

Method: 8321A - PFOA and PFOS

Prep: None

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

APPENDIX D
SAMPLE CALCULATIONS

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 3	Test Date: 06/11/19
Test Location: PPA Stack	Test Period: 1208-1353

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

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

$$Vm(std) = \frac{17.64 \times 1.0107 \times 47.320 \times \left(30.00 + \frac{0.886}{13.6} \right)}{83.42 + 460} = 46.676$$

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.

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

$$Vw(std) = (0.04707 \times 18.0) + (0.04715 \times 7.1) = 1.18$$

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

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

$$bws = \frac{1.18}{1.18 + 46.676} = 0.025$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.025 = 0.975$$

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.

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

$$MWs = (28.84 \times 0.975) +(18 (1 - 0.975)) = 28.57$$

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.

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

$$Vs = 85.49 \times 0.84 \times 0.75328 \times \left(\frac{540}{29.82 \times 28.57} \right)^{\wedge}1/2 = 43.1$$

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.

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

$$Qs(act) = 60 \times 43.1 \times 4.90 = 12661$$

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.

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

$$Qs(std) = 17.64 \times 0.975 \times \frac{29.82}{539.9} \times 12661$$

$$Qs(std) = 12030$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 540 \times 46.676}{43.1 \times 96 \times 29.82 \times 0.975 \times (0.190)^2} = 100.6$$

Where:

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

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 3 | **Test Date: 06/11/19**
Test Location: PPA Stack | **Test Period: 1208-1353**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{4.0 \times 2.2046 \times 10\text{-}9}{46.676}$$

Conc1 = 1.90E-10

Where:

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

Conc1 = PPA 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 = 4.0 / (46.676 x 0.02832)

Conc2 = 3.04E+00

Where:

Conc2 = PPA 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

$MR1_{(Outlet)}$ = 1.90E-10 x 12030 x 60

$MR1_{(Outlet)}$ = 1.37E-04

Where:

$MR1_{(Outlet)}$ = PPA 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

$MR2_{(Outlet)}$ = 1.37E-04 x 453.59 /3600

$MR2_{(Outlet)}$ = 1.73E-05

Where:

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

453.6 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

5. HFPO Dimer Acid Removal Efficiency, %

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

$$RE = \frac{(1.71E\text{-}03) - (1.37E\text{-}04)}{1.71E\text{-}03}$$

RE = 91.97

Where:

RE = Carbon Bed Removal Efficiency.

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

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

EXAMPLE CALCULATIONS FOR VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

PPA CARBON BED INLET

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 3 Test	Test Date: 06/11/19
Location: PPA CB Inlet	Test Period: 1208-1353

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

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

$$Vm(std) = \frac{17.64 \times 0.9834 \times 60.273 \times \left(30.03 + \frac{1.180}{13.6} \right)}{80.83 + 460} = 58.223$$

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.

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

$$Vw(std) = (0.04707 \times 8.0) + (0.04715 \times 10.9) = 0.89$$

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

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

$$bws = \frac{0.89}{0.89 + 58.223} = 0.015$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.015 = 0.985$$

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.

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

$$MWs = (28.84 \times 0.985) +(18 (1 - 0.985)) = 28.67$$

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.

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

$$Vs = 85.49 \times 0.84 \times 0.54315 \times \left(\frac{542}{29.88 \times 28.67} \right)^{\wedge}1/2 = 31.0$$

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.

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

$$Qs(act) = 60 \times 31.0 \times 6.31 = 11750$$

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.

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

$$Qs(std) = 17.64 \times 0.985 \times \frac{29.88}{542.5} \times 11750$$

$$Qs(std) = 11246$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 542 \times 58.223}{31.0 \times 96 \times 29.88 \times 0.985 \times (0.250)^2} = 99.9$$

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 3 | **Test Date: 06/11/19**
Test Location: PPA CB Inlet | **Test Period: 1208-1353**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{66.8 \times 2.2046 \times 10\text{-}9}{58.223}$$

Conc1 = 2.53E-09

Where:

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

Conc1 = PPA Carbon Bed Inlet 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 = 66.8 / (58.223 x 0.02832)

Conc2 = 4.05E+01

Where:

Conc2 = PPA Carbon Bed Inlet 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

$MR1_{(Inlet)}$ = 2.53E-09 x 11246 x 60

$MR1_{(Inlet)}$ = 1.71E-03

Where:

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

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

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

$MR2_{(Inlet)}$ = 1.71E-03 x 453.59 /3600

$MR2_{(Inlet)}$ = 2.15E-04

Where:

$MR2_{(Inlet)}$ = PPA Carbon Bed Inlet 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 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 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

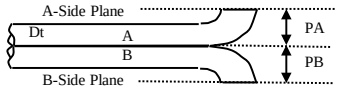
Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection ks

If all Criteria PASS
Cp is equal to 0.84

PASS/FAIL



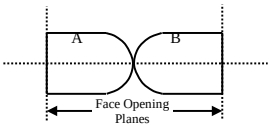
Distance to A Plane (PA) - inches 0.459 PASS

Distance to B Plane (PB) - inches 0.459 PASS

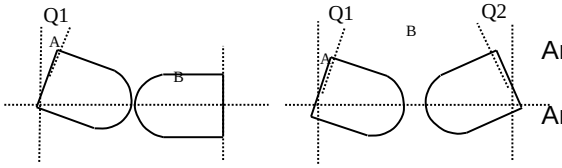
Pitot OD (D_t) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



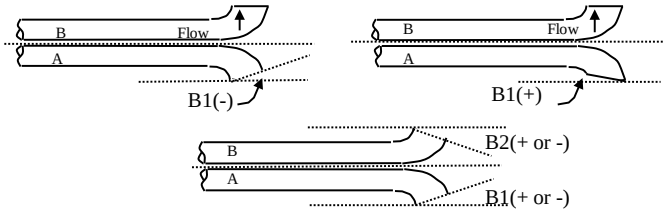
Are Open Faces Aligned Perpendicular to the Tube Axis (●) YES ( ) NO PASS



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 ≤ 10°



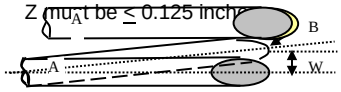
Angle of B1 from vertical A Tube- degrees (absolute) 0 PASS

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

B1 or B2 must be ≤ 5°

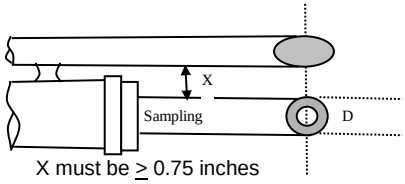
Horizontal offset between A and B Tubes (Z) - inches 0.003 PASS

Z must be ≤ 0.125 inches



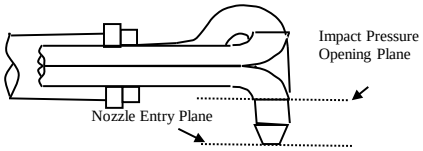
Vertical offset between A and B Tubes (W) - inches 0.012 PASS

W must be ≤ 0.03125 inches

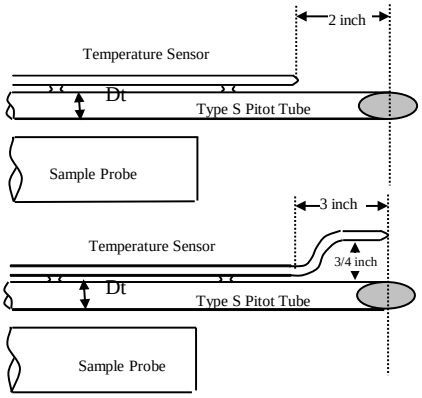


Distance between Sample Nozzle and Pitot (X) - inches 0.93 PASS

X must be ≥ 0.75 inches



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



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

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

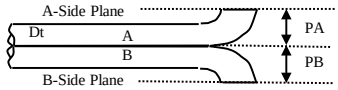
Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection KS

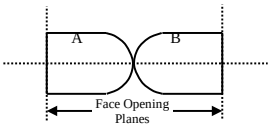
If all Criteria PASS
Cp is equal to 0.84

		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	

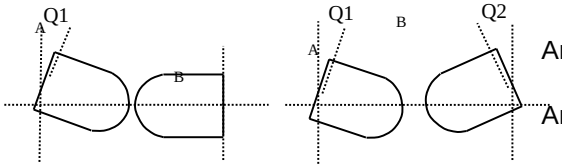


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

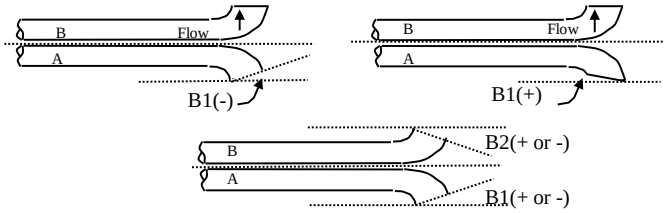


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



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 $\leq 10^o$

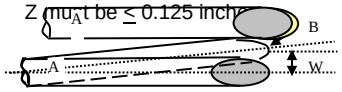


Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

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

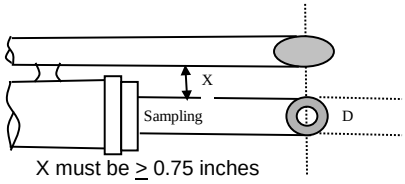
Horizontal offset between A and B Tubes (Z) - inches	0.006	PASS

Z must be $\leq$ 0.125 inches



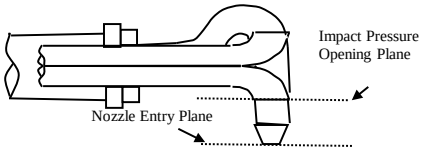
Vertical offset between A and B Tubes (W) - inches	0.012	PASS

W must be $\leq$ 0.03125 inches

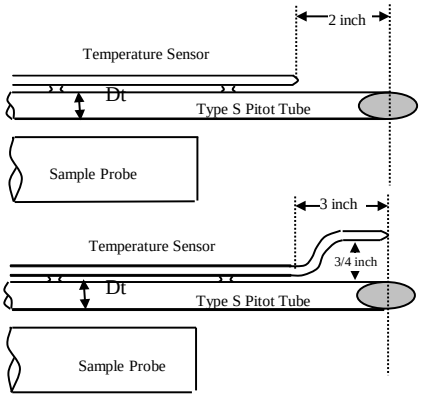


Distance between Sample Nozzle and Pitot (X) - inches	0.79	PASS

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

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

PPA STACK

METER BOX NO. 26

06/10/2019 + 06/11/2019

	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.	90.7	78.0	83.4

$$Tma = Ts + 460$$

$$Tma = 90.67 + 460$$

Tma =	550.67	537.96	543.42

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	1.00	0.89	0.89
Pb = Barometric Pressure, in Hg.	29.98	30.01	30.00

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

$$Pm = 29.98 + (0.99875 / 13.6)$$

Pm =	30.05	30.08	30.07

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.	49.655	47.486	47.320
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	0.9929	0.9394	0.9362
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 49.66) * SQRT (0.0319 * 550.67 * 29) / (2.09 * 30.05 * 28.84) * 0.99$$

$$Yqa = 1.933 * SQRT\ 509.422 / 1,808.258 * 0.99$$

Yqa =	1.0189	0.9958	1.0011

Diff = Absolute difference between Yqa and Y	0.81	1.47	0.95

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

$$Diff = ((1.0107 - 1.019) / 1.0107) * 100$$

Average Diff = 1.08

Allowable = 5.0

Environmental Supply Company, Inc.
Quality Source Sampling Systems & Accessories

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:

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

708 E. Club Blvd., Durham, North Carolina 27704 www.environsupply.com 919-956-9688 FAX: 919-682-0333

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN

PPA STACK

METER BOX NO. 32

06/10/2019 + 06/11/2019

	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.	79.7	74.4	80.8

$$Tma = Ts + 460$$

$$Tma = 79.67 + 460$$

Tma =	539.67	534.42	540.83

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	1.14	1.19	1.18
Pb = Barometric Pressure, in Hg.	29.95	29.97	30.03

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

$$Pm = 29.95 + (1.14458333333333 / 13.6)$$

Pm =	30.03	30.06	30.12

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.	58.936	59.865	60.273
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	1.0534	1.0713	1.0708
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 58.94) * SQRT (0.0319 * 539.67 * 29) / (1.72 * 30.03 * 28.84) * 1.05$$

$$Yqa = 1.629 * SQRT\ 499.246 / 1,487.261 * 1.05$$

Yqa =	0.9942	0.9900	0.9877

Diff = Absolute difference between Yqa and Y	1.10	0.67	0.44

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

$$Diff = ((0.9834 - 0.994) / 0.9834) * 100$$

Average Diff = 0.74

Allowable = 5.0

APPENDIX F
LIST OF PROJECT PARTICIPANTS

The following Weston employees participated in this project:

Paul Meeter	Senior Project Manager
Jacob Little	Team Member
Matt Winkeler	Team Member
Kris Ansley	Team Member
Kyle Schweitzer	Team Member