PPA MANUFACTURING PROCESS
CARBON BED INLET AND OUTLET STACK
EMISSIONS TEST REPORT
TEST DATES: 30 APRIL - 01 MAY 2019

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FAYETTEVILLE, NORTH CAROLINA

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1. INTRODUCTION

1.1 FACILITY AND BACKGROUND INFORMATION

The Chemours Fayetteville Works (Chemours) is located in Bladen County, North Carolina, approximately 10 miles south of the city of Fayetteville. 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 30 April-1 May 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	3.12E-04	2.48E-03	9.82E-06	7.80E-05	96.9
R2	3.54E-04	2.81E-03	1.13E-05	8.95E-05	96.8
R3	4.71E-04	3.74E-03	8.07E-06	6.41E-05	98.3
Average	3.79E-04	3.01E-03	9.72E-06	7.72E-05	97.3

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

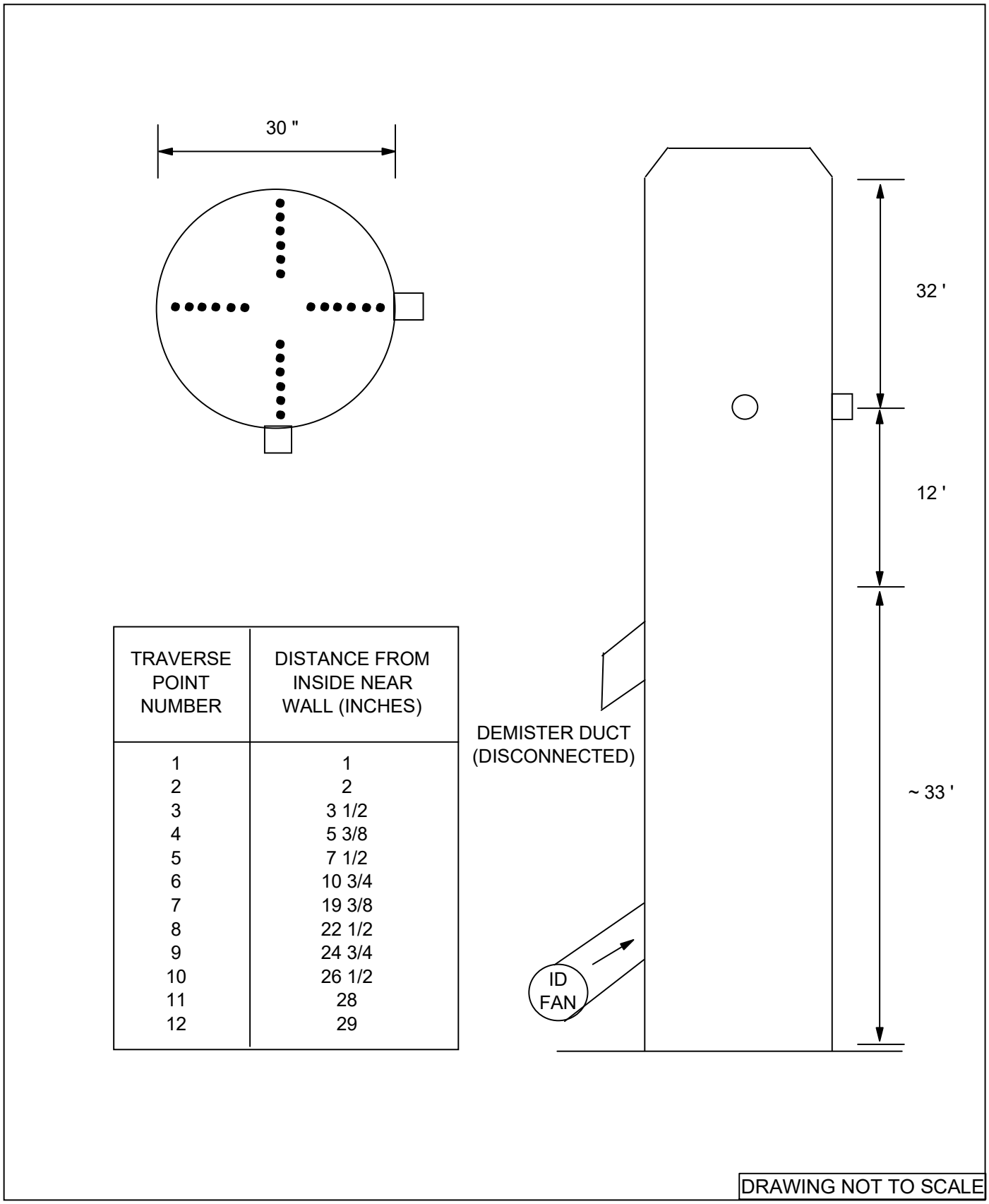
Two 4-inch ID test ports are in place on the 30-inch ID fiberglass stack. The ports are 12 feet (4.8 diameters) from the nearest downstream disturbance (carbon bed outlet) and 32 feet (12.8 diameters) from the nearest upstream disturbance (stack exit).

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

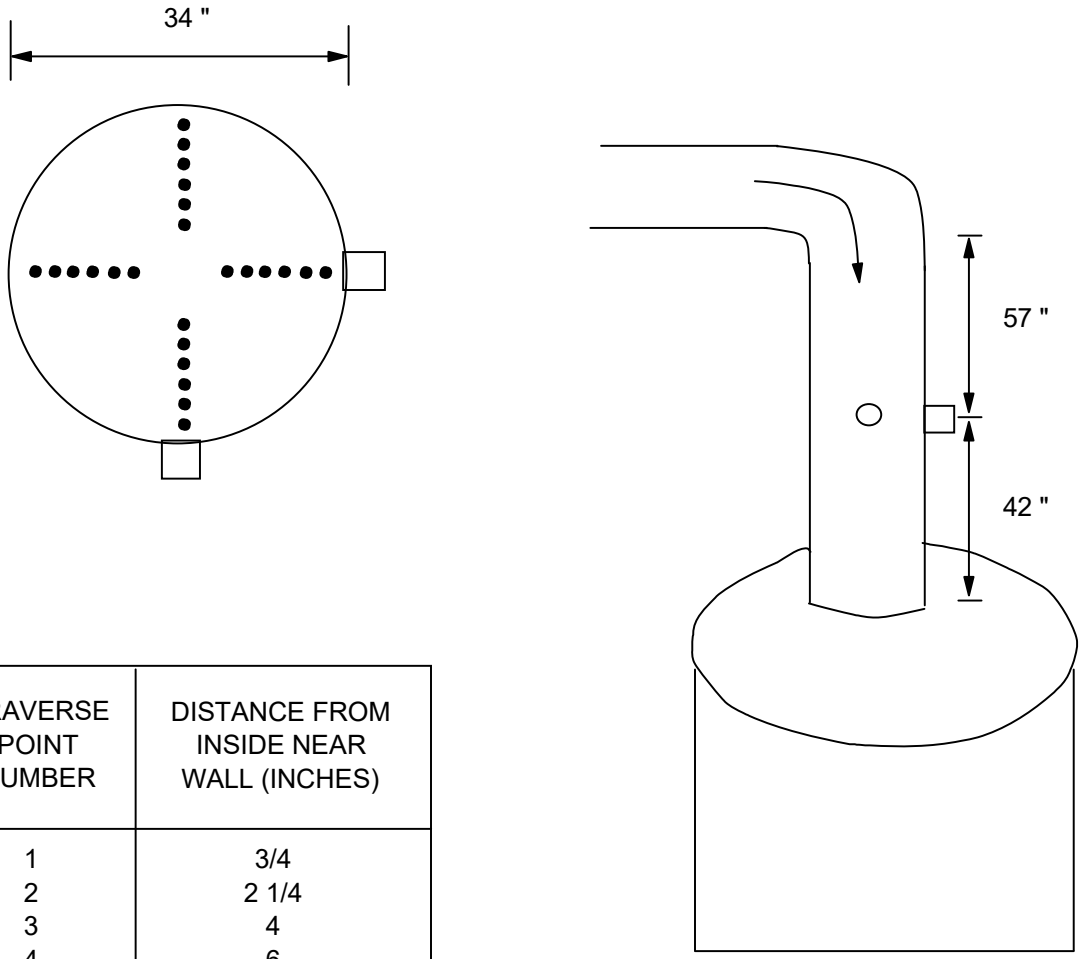
Each fiberglass reinforced plastic (FRP) duct at the inlet of the PPA carbon bed is 34-inch ID. The test ports are located a minimum of 42 inches (> 1.2 duct diameters) from the nearest downstream disturbance and at least 57 inches (> 1.7 diameters) from the nearest upstream disturbance. Based on EPA 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 PROCESS STACK TEST PORT
AND TRAVERSE POINT LOCATION

IASDATA\CHEMOURS\15418.002.012\FIGURE 4-3 PPA PROCESS 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

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.

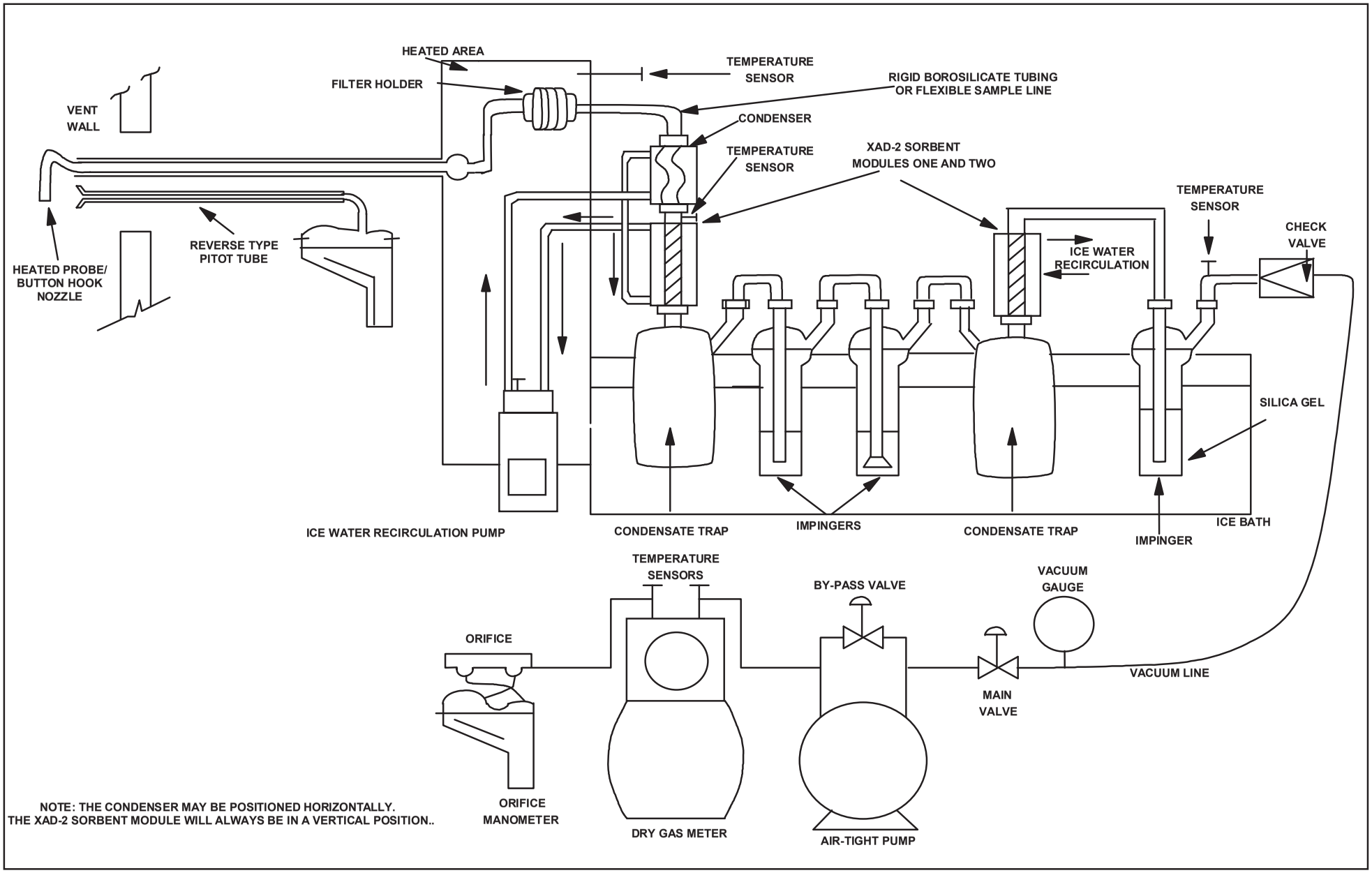


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

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

A section of borosilicate glass (or flexible polyethylene tubing) connected the filter holder exit to a Grahm (spiral) type ice water-cooled condenser 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.

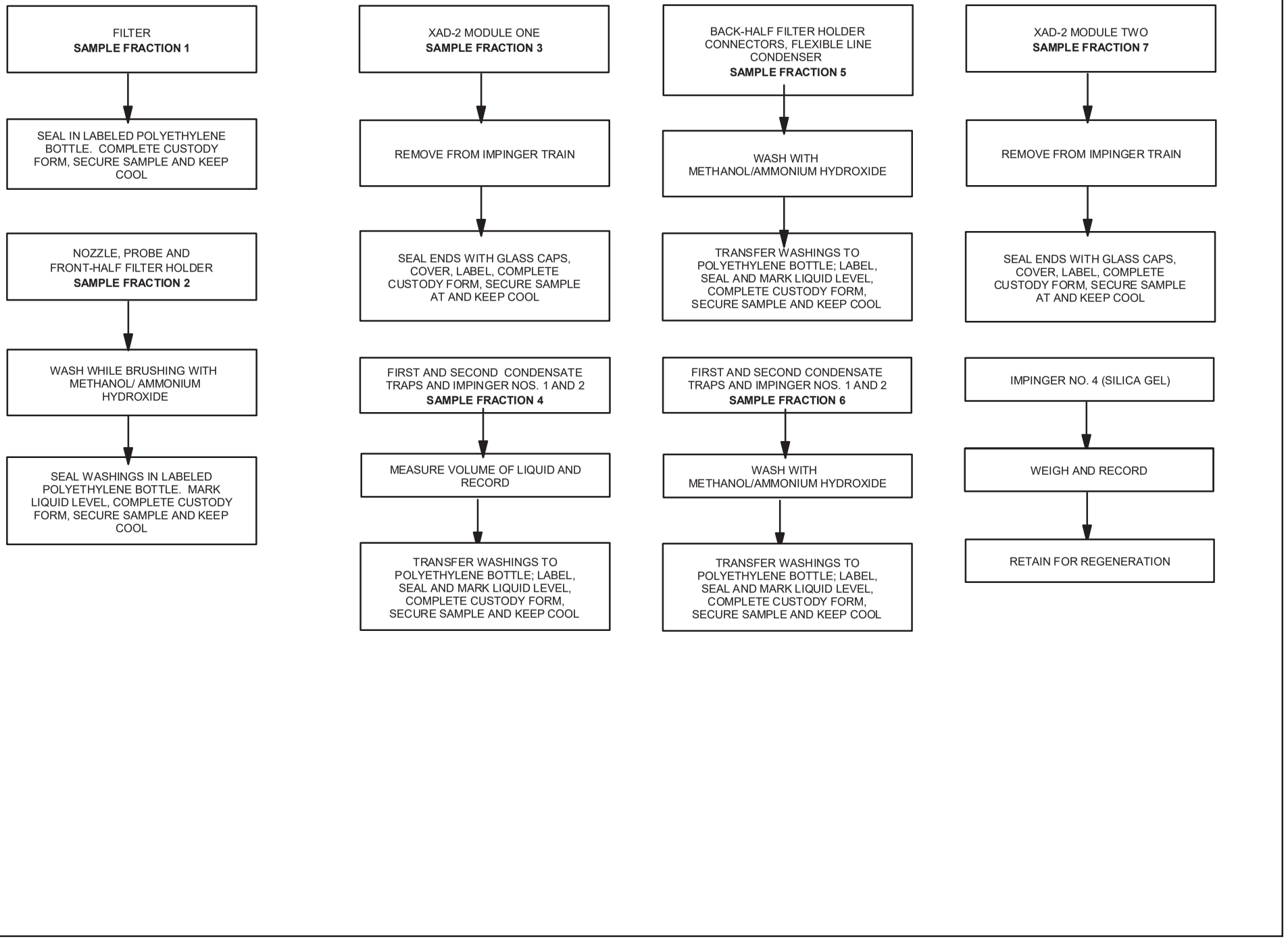


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.012\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.

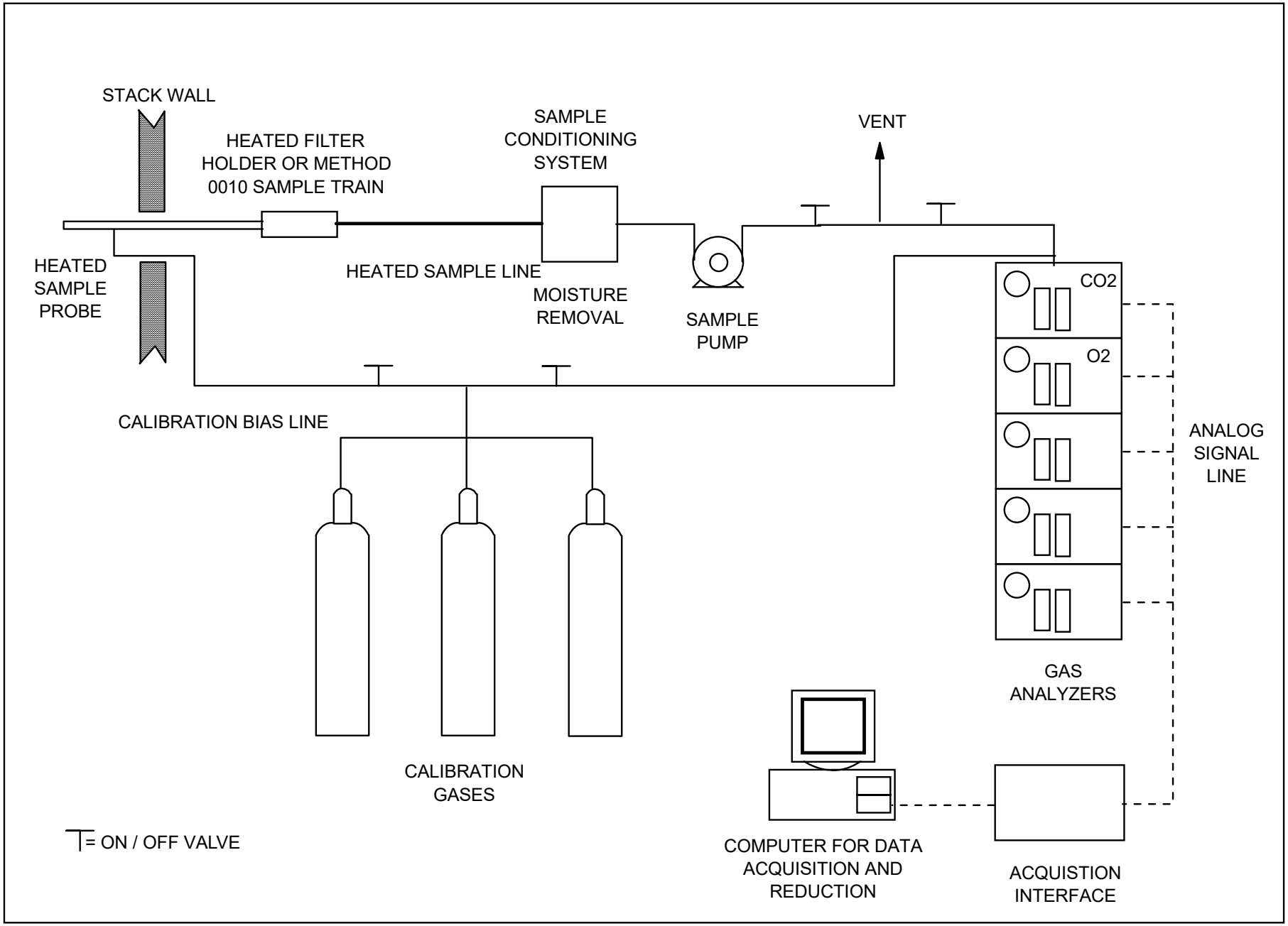


FIGURE 5-3
WESTON SAMPLING SYSTEM

IASDATA\CHEMOURS\15418.002.012\FIGURE 5-5 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 on all sources indicated that the O_2 and CO_2 concentrations were at ambient air levels (20.9% O_2, 0% CO_2), therefore, 20.9% O_2 and 0% CO_2 values were used in all calculations.

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

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	04/30/19	04/30/19	05/01/19
Time period	1010-1201	1330-1518	0830-1017
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.191	0.191	0.191
Cross sectional nozzle area, sq.ft.	0.000199	0.000199	0.000199
Barometric pressure, in. Hg	30.20	30.20	30.30
Avg. orifice press. diff., in H_2O	0.70	0.60	0.81
Avg. dry gas meter temp., deg F	81.5	102.3	79.6
Avg. abs. dry gas meter temp., deg. R	541	562	540
Total liquid collected by train, ml	11.9	24.3	19.4
Std. vol. of H_2O vapor coll., cu.ft.	0.6	1.1	0.9
Dry gas meter calibration factor	0.9944	0.9944	0.9944
Sample vol. at meter cond., dcf	43.943	41.735	47.697
Sample vol. at std. cond., dscf [(1)]	43.066	39.377	47.071
Percent of isokinetic sampling	101.9	101.9	102.2
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.013	0.028	0.019
Mole fraction of dry gas	0.987	0.972	0.981
Molecular wt. of wet gas, lb/lb mole	28.70	28.53	28.63
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	2.10	2.10	2.10
Absolute pressure, in. Hg	30.35	30.35	30.45
Avg. temperature, deg. F	87	89	83
Avg. absolute temperature, deg.R	547	549	543
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	38.2	35.6	41.4
Stack/duct cross sectional area, sq.ft.	4.90	4.90	4.90
Avg. gas stream volumetric flow, wacf/min.	11217	10454	12179
Avg. gas stream volumetric flow, dscf/min.	10842	9911	11822

[(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	04/30/19	04/30/19	05/01/19
Time period	1010-1201	1330-1518	0830-1017
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	2.3431	2.6870	1.9300
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	1.92	2.41	1.45
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	1.20E-10	1.50E-10	9.04E-11
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	7.80E-05	8.95E-05	6.41E-05
HFPO Dimer Acid (From Inlet Data)	2.48E-03	2.81E-03	3.74E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	9.82E-06	1.13E-05	8.07E-06
Carbon Bed Removal Efficiency, %	96.9	96.8	98.3

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	04/30/19	04/30/19	05/01/19
Time period	1010-1201	1330-1518	0830-1017
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	30.10	30.10	30.20
Avg. orifice press. diff., in H_2O	1.82	1.86	1.75
Avg. dry gas meter temp., deg F	83.4	89.8	76.2
Avg. abs. dry gas meter temp., deg. R	543	550	536
Total liquid collected by train, ml	34.6	32.5	27.6
Std. vol. of H_2O vapor coll., cu.ft.	1.6	1.5	1.3
Dry gas meter calibration factor	1.0005	1.0005	1.0005
Sample vol. at meter cond., dcf	63.472	65.238	62.118
Sample vol. at std. cond., dscf [(1)]	62.324	63.326	62.008
Percent of isokinetic sampling	99.9	100.6	100.7
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.	0.025	0.024	0.021
Mole fraction of dry gas	0.975	0.976	0.979
Molecular wt. of wet gas, lb/lb mole	28.56	28.58	28.61
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-2.00	-2.00	-2.00
Absolute pressure, in. Hg	29.95	29.95	30.05
Avg. temperature, deg. F	78	83	75
Avg. absolute temperature, deg.R	538	543	535
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	33.2	33.7	32.3
Stack/duct cross sectional area, sq.ft.	6.31	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	12567	12772	12230
Avg. gas stream volumetric flow, dscf/min.	12032	12144	11873

[(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	04/30/19	04/30/19	05/01/19
Time period	1010-1201	1330-1518	0830-1017
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	97.0882	110.7296	147.6090
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	55.00	61.74	84.05
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	3.43E-09	3.85E-09	5.25E-09
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	2.48E-03	2.81E-03	3.74E-03
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	3.12E-04	3.54E-04	4.71E-04

APPENDIX A
PROCESS OPERATIONS DATA

Date: 4/30/2019								
Time	800	900	1000	1100	1200	1300	1400	1500
Stack Testing			RUN 1 1010-1201			RUN 2 1330-1518		
A/F column Feed Ratev (pounds per hour)								
Charging water to Hyd - venting								X
Charging Sulfuric acid - venting								
Hydrolysis - Wash Tank pressure Transfer to Hydrolysis								
Hydrolysis - Phase Settle				11:00 TO 11:2				
Vap heels pressure transfer								
Vap cycle								
Venting after press tran from North/South Acid tank to Hyd								
DAF tran to Hyd - venting during transfer			10:15 TO 10:55					
Hydrolysis - transfer to Waste Acid Trailer								
Scrubber Recirculation Flow			36.0 GPM			37.2 GPM		
Scrubber dP			-0.45 INWC			-.5 INWC		

Date: 5/1/2019																																
Time	600				700				800		900						1000				1100				1200							
Stack Testing											Run 3 0830-1017																					
A/F column Feed Ratev (pounds per hour)																																
Charging water to Hyd - venting																																
Charging Sulfuric acid - venting																																
Hydrolysis - Wash Tank pressure Transfer to Hydrolysis																																
Hydrolysis - Phase Settle															9:30 TO 10:15																	
Vap heels pressure transfer																																
Vap cycle											8:30 TO 9:45																					
Venting after press tran from North/South Acid tank to Hyd																																
DAF tran to Hyd - venting during transfer												8:40 TO 9:30																				
Hydrolysis - transfer to Waste Acid Trailer																																
Scrubber Recirculation Flow											37.5 GPM																					
Scrubber dP											-0.4 INWC																					

APPENDIX B
RAW AND REDUCED TEST DATA

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	04/30/19	04/30/19	05/01/19
Time period	1010-1201	1330-1518	0830-1017
Operator	KA/BB/NG	KA/NG/BB	NG/KA/BB
Inputs For Calcs.			
Sq. rt. delta P	0.67054	0.62199	0.73105
Delta H	0.7004	0.6021	0.8113
Stack temp. (deg.F)	86.9	88.8	82.9
Meter temp. (deg.F)	81.5	102.3	79.6
Sample volume (act.)	43.943	41.735	47.697
Barometric press. (in.Hg)	30.20	30.20	30.30
Volume H_2O imp. (ml)	3.0	11.0	8.0
Weight change sil. gel (g)	8.9	13.3	11.4
% 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)	2.10	2.10	2.10
Nozzle dia. (in.)	0.191	0.191	0.191
Meter box cal.	0.9944	0.9944	0.9944
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
W.O.#	15418
Project ID	Chemours
Mode/Source ID	PPA
Samp. Loc. ID	STK
Run No.ID	1
Test Method ID	M0010
Date ID	15APR2019
Source/Location	PPA Stack
Sample Date	4/30/19 ✓
Baro. Press (in Hg)	30.20 ✓
Operator	KA/DP/NG ✓

Stack Conditions	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		3
Silica gel (g)		8.9
CO2, % by Vol	0.0	✓
O2, % by Vol	20.9	✓
Temperature (°F)	85	81.458
Meter Temp (°F)	85	86.875
Static Press (in H_2O)	0.23	0.30 KA
Ambient Temp (°F)	76	

Meter Box ID	24
Meter Box Y	0.9944 ✓
Meter Box Del H	1.9281
Probe ID / Length	P706
Probe Material	Boro
Pitot / Thermocouple ID	P706
Pitot Coefficient	0.84 ✓
Nozzle ID	.191
Nozzle Measurements	.191 .191 .191
Avg Nozzle Dia (in)	.191 ✓
Area of Stack (ft^2)	4.90 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

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

K Factor 1.5

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

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1010 ✓			817.902									
A 1	4		.52	.78	819.8	86	77	121	121	66	3	53		
2	8		.52	.78	821.8	87	75	119	119	60	3	51		
3	12		.52	.78	823.4	87	76	119	121	57	3	50		
4	16		.51	.77	825.5	87	77	120	120	55	3	50		
5	20		.52	.78	827.5	87	78	119	119	57	3	50		
6	24		.56	KA 1.5 .84	829.6	88	78	119	118	60	3	50		
7	28		.53	.80	831.5	87	78	119	122	61	3	52		
8	32		.49	.74	833.4	87	78	120	121	62	3	50		
9	36		.44	.66	835.2	86	80	119	120	57	2	49		
10	40		.15	.23	836.5	87	80	119	119	54	1	48		
11	44		.13	.20	837.5	86	78	119	120	55	1	49		
12	48	1058	.13	.20	838.692	85	77	120	122	55	1	50		
B 1	4	1113	.64	.96	840.8	87	84	119	121	66	3	62		~~838.602~~ 838.711
2	8		.62	.93	842.9	87	84	119	120	56	3	46		.019
3	12		.57	.86	KA 850.0 845.0	87	85	119	121	52	3	45		MPLL
4	16		.57	.86	847.0	87	84	119	119	54	3	46		
5	20		.59	.89	849.2	87	84	118	121	55	3	47		
6	24		.58	.87	851.2	87	87	119	120	54	3	45		
7	28		.58	.87	853.2	87	87	119	120	55	3	47		
8	32		.47	.71	855.1	87	88	119	121	54	3	46		
9	36		.43	.65	856.9	88	84	119	120	57	3	49		
10	40		.38	.57	858.6	87	84	120	121	57	2	48		
11	44		.36	.54	860.2	87	86	120	121	58	2	49		
12	48	1201 ✓	.36	.54	861.864	87	~~86~~ 86 KA	119	120	58	2	47		
			Avg Delta P .465 ✓	Avg Delta H .700 ✓	Total Volume 43.943 ✓	Avg Ts 86.875 ✓	Avg Tm 81.458 ✓	Min/Max 119/121	Min/Max 118/122	Max 66	Max Vac 3	Min/Max 62		
			Avg Sqrt Delta P .671 ✓	Avg Sqrt Del H .823 ✓	Comments:									

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EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions	
Client	Chemours		
W.O.#	15418		
Project ID	Chemours	% Moisture	Assumed: 2
Mode/Source ID	PPA	Impinger Vol (ml)	
Samp. Loc. ID	STK	Silica gel (g)	
Run No.ID	2	CO2, % by Vol	0.0
Test Method ID	M0010	O2, % by Vol	20.9
Date ID	15APR2019	Temperature (°F)	89 88.7 102.292
Source/Location	PPA Stack	Meter Temp (°F)	89 102.292
Sample Date	4/30/19 ✓	Static Press (in H_2O)	0.23
Baro. Press (in Hg)	30.20 ✓		2.114 ✓
Operator	KA/NG/TB ✓	Ambient Temp (°F)	85

Meter Box ID	24
Meter Box Y	0.9944 ✓
Meter Box Del H	1.9231
Probe ID / Length	P706
Probe Material	Boro
Pitot / Thermocouple ID	P706
Pitot Coefficient	0.84 ✓
Nozzle ID	KA
Nozzle Measurements	.191 / .191 / .191
Avg Nozzle Dia (in)	.191
Area of Stack (ft^2)	4.90 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

Sample Train (ft^3)	
Leak Check @ (In Hg)	
Pitot leak check good	
Pitot Inspection good	
Method 3 System good	
Temp Check	
Meter Box Temp	
Reference Temp	
Pass/Fail (+/- 2°)	
Temp Change Response ?	

K Factor 1.5

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.000	0.000	0.000
Leak Check @ (In Hg)	5"	5"	5"
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	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	1330			862.085									
P 1	4		.61	.92	864.1	88	93	119	121	66	3	60		
2	8		.61	.92	866.2	89	87	120	121	63	3	47		
3	12		.50	.75	868.2	86	86	119	119	60	3	47		
4	16		.47	.71	870.1	88	89	119	120	60	3	48		
5	20		.45	.68	872.0	87	92	119	119	61	3	46		
6	24		.38	.57	873.7	88	93	119	120	62	2	47		
7	28		.30	.45	875.3	88	92	118	119	66	2	48		
8	32		.25	.38	876.7	88	92	118	119	65	2	49		
9	36		.23	.35	878.0	88	90	119	119	64	2	49		
10	40		.20	.30	879.6	88	89	119	119	63	2	49		
11	44		.20	.30	880.8	88	92	119	120	63	2	48		
12	48	1418	.17	.26	881.982	89	91	119	119	62	1	48		
A 1	4	1430	.57	.86	884.0	89	100	119	120	66	3	60		MPLC
2	8		.57	.86	~~886.1~~ 886.1	89	99	118	120	64	3	49		882.043
3	12		.55	.83	888.3	89	104	119	120	62	3	46		.061
4	16		.52	.78	890.3	88	112	119	121	61	3	49		
5	20		.51	.77	892.2	89	119	119	120	61	3	45		
6	24		.49	.74	894.2	89	121	120	120	63	3	46		
7	28		.42	.63	896.0	89	125	119	120	62	3	48		
8	32		.36	.54	897.7	89	127	119	120	63	2	46		
9	36		.34	.51	899.4	90	126	120	120	64	2	47		
10	40		.31	.47	901.0	91	114	119	120	64	2	49		
11	44		.30	.45	902.7	91	112	120	119	65	2	50		
12	48	1518 ✓	.28	.42	903.881	91	110	119	119	65	2	50		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts ✓	Avg Tm ✓	Min/Max	Min/Max	Max	Max Vac	Min/Max		
		.399	.396	.602 ✓	41.735 ✓	88.792 ✓	102.292 ✓	118/120	119/121	66	3	60		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			.622 ✓	.763 ✓										

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EPA Method 0010 from EPA SW-846

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ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions				
Client	Chemours		Assumed	Actual	Meter Box ID	24
W.O.#	15418				Meter Box Y	0.9944 ✓
Project ID	Chemours	% Moisture	2		Meter Box Del H	1.9231
Mode/Source ID	PPA	Impinger Vol (ml)			Probe ID / Length	P706
Samp. Loc. ID	STK	Silica gel (g)			Probe Material	Boro
Run No.ID	3	CO2, % by Vol	0.1		Pitot / Thermocouple ID	P706
Test Method ID	M0010	O2, % by Vol	20.8		Pitot Coefficient	0.84 ✓
Date ID	15APR2019	Temperature (°F)	78		Nozzle ID	0.191
Source/Location	PPA Stack	Meter Temp (°F)	78	79.625	Nozzle Measurements	0.191 / 0.191 / 0.191
Sample Date	5/1/19 ✓	Static Press (in H_2O)	0.23	.23+2.7 ✓	Avg Nozzle Dia (in)	0.191 ✓
Baro. Press (in Hg)	30.30 ✓				Area of Stack (ft^2)	4.90 ✓
Operator	NG/KA/BB ✓	Ambient Temp (°F)	69		Sample Time	96 ✓
					Total Traverse Pts	24 ✓

	Sample Train (ft^3)	Leak Check @ (in Hg)	Pitot leak check good	Pitot Inspection good	Method 3 System good	Temp Check	Meter Box Temp	Reference Temp	Pass/Fail (+/- 2°)	Temp Change Response ?
Initial	0.000	15	yes / no	yes / no	~~yes / no~~					
Mid-Point	0.000	3	yes ✓ no	yes ✓ no	~~yes / no~~					
Final	0.009	5"	yes / no	yes / no	~~yes / no~~					
Pre-Test Set									Pass / Fail	yes / no
Post-Test Set									Pass / Fail	yes / no

K Factor 1.5

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	0830 ✓			904.002									
A 1	4	NG	.69	1.00	906.6	82	72	122	120	66	3	47		
2	8		.69	1.00	NG 908.4	82	73	121	122	52	3	41		
3	12		.69	1.00	910.6	83	75	122	122	50	3	42		
4	16		.70	1.05	912.8	83	77	122	121	48	3	41		
5	20		.67	1.00	915.0	83	77	122	121	50	3	41		
6	24		.65	0.96	917.2	82	78	122	122	50	3	43		
7	28		.60	0.90	919.4	82	79	121	122	50	3	42		
8	32		.57	0.86	921.3	82	NG ~~75~~ 79	121	121	50	3	42		
9	36		.54	0.81	923.3	82	80	122	123	51	3	43		
10	40		.40	.60	925.0	82	81	120	121	52	NG 2	45		
11	44		.38	.57	926.7	82	81	122	123	53	2	45		
12	48	0918	.35	.53	928.381	82	81	122	119	53	2	44		MPLC
-	-	-	-	-	-	-	-	-	-	-	-	-		928.407
B 1	4	0929	.60	.90	930.5	83	81	122	124	58	2	56		.026
2	8		.60	.90	932.6	83	82	120	121	55	2	57		
3	12		.63	.95	934.6	84	82	120	120	56	2	58		
4	16		.65	.98	937.0	84	79	120	123	57	2	59		
5	20		.67	1.00	939.2	83	81	120	124	58	2	60		
6	24		.60	.90	941.3	83	84	120	120	59	2	60		
7	28		.50	.75	943.3	83	85	120	120	58	2	58		
8	32		.42	.63	945.2	84	45	120	121	58	2	57		
9	36		.39	.59	946.8	84	78	120	120	61	2	61		
10	40		.38	.57	948.5	84	78	121	119	60	2	59		
11	44		.35	.53	950.1	84	80	121	122	61	2	60		
12	48	~~0917~~	.31	.47	951.725	83	83	122	124	60	2	59		
		1017	Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			.543 ✓	.811 ✓	47.697 ✓	82.875 ✓	79.625 ✓	120/122	119/124	66	3	41/61		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			.731 ✓	.894 ✓										

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EPA Method 0010 from EPA SW-846

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SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418
Location/Plant: Fayetteville, NC | Source & Location: PPA Stack

Run No. 1 | Sample Date 4/30 | Recovery Date 4/30/19
Sample I.D. Chemours - PPA - STK - 1 - M0010 - | Analyst PMM | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	2	99	100	2					308.9	
Initial	0	100	100	0					300	
Gain	2	-1	0	2				3	8.9	11.9

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

Run No. 2 | Sample Date 4/30 | Recovery Date 4/30/19
Sample I.D. Chemours - PPA - STK - 2 - M0010 - | Analyst PMM | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	3	98	96	14					313.3	
Initial	0	100	100	0					300	
Gain	3	-2	-4	14				11	13.3	24.3

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

Run No. 3 | Sample Date 5/1/19 | Recovery Date 5/1/19
Sample I.D. Chemours - PPA - STK - 3 - M0010 - | Analyst PMM | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	2	101	98	8					311.4	
Initial	0	100	100	0					300	
Gain	2	1	-2	8				8	11.4	19.4

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

Check COC for Sample IDs of Media Blanks

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Balance #1 WC 500.5 ⇒ 498.9 ✓

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	04/30/19	04/30/19	05/01/19
Time period	1010-1201	1330-1518	0830-1017
Operator	AS/JL	AS/JL	AS/JL
Inputs For Calcs.			
Sq. rt. delta P	0.58298	0.59008	0.57037
Delta H	1.8175	1.8579	1.7467
Stack temp. (deg.F)	77.8	82.6	74.9
Meter temp. (deg.F)	83.4	89.8	76.2
Sample volume (act.)	63.472	65.238	62.118
Barometric press. (in.Hg)	30.10	30.10	30.20
Volume H_2O imp. (ml)	10.0	14.0	11.0
Weight change sil. gel (g)	24.6	18.5	16.6
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	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.	1.0005	1.0005	1.0005
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
W.O.#	15418
Project ID	Chemours
Mode/Source ID	PPA
Samp. Loc. ID	Cbed
Run No.ID	1
Test Method ID	M0010
Date ID	APR2019
Source/Location	PPA Carbon Bed Inlet
Sample Date	4/30/19 ✓
Baro. Press (in Hg)	30.1 ✓
Operator	AS/JL ✓

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		10 ✓
Silica gel (g)		24.6 ✓
CO2, % by Vol	0	0 ✓
O2, % by Vol	20.9	20.9 ✓
Temperature (°F)	80	
Meter Temp (°F)	80	
Static Press (in H_2O)	-2.	-2 ✓
Ambient Temp (°F)	75	

Meter Box ID	2.3
Meter Box Y	1.0005 ✓
Meter Box Del H	2.2926
Probe ID / Length	D 6'
Probe Material	Bord
Pitot / Thermocouple ID	P-701
Pitot Coefficient	0.84 ✓
Nozzle ID	.290
Nozzle Measurements	.290 .290 .290
Avg Nozzle Dia (in)	.290
Area of Stack (ft^2)	0.31 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

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

K Factor 5.17

	Initial	Mid-Point	Final
	.000	.001	.000
	15"	7"	7"
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	73		79
	72.5		80.1
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	10:10 ✓			730.516									
A 1	4		.58	2.58	733.9	75	74	120	123	68	5	65		
2	8		.50	2.58	736.9	77	82	120	124	68	5	64		
3	12		.50	2.58	740.2	77	82	120	121	65	5	62		
4	16		.46	2.38	743.1	77	83	120	121	64	5	60		
5	20		.43	2.22	746.1	77	83	120	123	65	5	60		
6	24		.40	2.07	749.1	77	83	120	120	64	5	60		
7	28		.27	1.40	751.2	77	83	120	121	63	5	60		
8	32		.22	1.14	753.5	77	84	120	121	63	5	60		
9	36		.18	.93	755.4	77	83	120	120	64	2	60		
10	40		.16	.83	757.2	77	83	120	120	66	1	61		
11	44		.16	.83	759.1	77	83	120	123	67	1	60		
12	48	10:58	.13	.67	760.718	78	83	120	121	66	1	60		760.718
														760.875
B 1	52	11:13	.50	2.58	764.2	79	83	120	121	68	4	61		-.157
2	56		.46	2.39	767.4	79	84	120	121	67	4	61		
3	60		.46	2.39	770.2	79	84	120	122	67	4	61		
4	64		.46	2.38	773.3	79	84	120	122	65	4	60		
5	68		.42	2.17	776.3	79	84	120	124	66	4	60		
6	72		.42	2.17	779.1	78	85	120	122	68	4	62		
7	76		.35	1.81	781.8	79	85	120	121	67	4	61		
8	80		.30	1.55	784.3	78	85	120	121	67	4	61		
9	84		.30	1.55	787.1	78	85	120	123	67	4	62		
10	88		.30	1.55	789.3	78	85	120	122	64	4	61		ISO: 99.91
11	92		.30	1.55	791.8	79	86	120	122	63	4	60		MOIST: 2.55%
12	96	12:01 ✓	.26	1.34	794.145	79	86	120	122	62	3	61		SCFM: 12030
			Avg Delta P .352 ✓	Avg Delta H 1.8175 ✓	Total Volume 63.472 ✓	Avg Ts 77.79 ✓	Avg Tm 83.42 ✓	Min/Max 120/120	Min/Max 120/124	Max 68	Max Vac 5	Min/Max 60/65		SVOL: 62.32
			Avg Sqrt Delta P .5829 ✓	Avg Sqrt Del H 1.3253 ✓	Comments:									

EPA Method 0010 from EPA SW-846

AMM

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418
Project ID	Chemours
Mode/Source ID	PPA
Samp. Loc. ID	Cbed
Run No.ID	2
Test Method ID	M0010
Date ID	APR2019
Source/Location	PPA Carbon Bed Inlet
Sample Date	4/30/19 ✓
Baro. Press (in Hg)	30.1 ✓
Operator	AS/JL ✓

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		14 ✓
Silica gel (g)		18.5 ✓
CO2, % by Vol	0	0 ✓
O2, % by Vol	20.9	20.9 ✓
Temperature (°F)	80	
Meter Temp (°F)	80	
Static Press (in H_2O)	-2	-2 ✓
Ambient Temp (°F)	80	

Meter Box ID	23		
Meter Box Y	1.0005 ✓		
Meter Box Del H	2.2926		
Probe ID / Length	P	6'	Sample Train (ft^3)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	P701		Pitot leak check good
Pitot Coefficient	0.84 ✓		Pitot Inspection good
Nozzle ID	.250		Method 3 System good
Nozzle Measurements	.250	.250 .250	**Temp Check**
Avg Nozzle Dia (in)	.250		Meter Box Temp
Area of Stack (ft^2)	6.31 ✓		Reference Temp
Sample Time	96 ✓		Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 5.17

	Initial	Mid-Point	Final
Sample Train (ft^3)	.000	.000	.000
Leak Check @ (in Hg)	15"	6"	6"
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	86		87
Reference Temp	86.7		87.1
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	13:30 ✓			794.564									
A 1	4		.48	2.48	797.8	84	87	120	131	67	5	64		
2	8		.48	2.48	801.0	82	87	120	123	66	5	63		
3	12		.48	2.48	804.2	81	87	120	122	64	5	61		
4	16		.45	2.33	807.4	82	88	120	122	66	5	60		
5	20		.42	2.17	810.3	82	88	120	122	66	5	60		
6	24		.42	2.17	813.4	82	89	120	121	66	5	61		
7	28		.36	1.86	816.1	82	89	120	122	67	3	61		
8	32		.32	1.65	819.0	82	89	120	122	66	3	61		
9	36		.32	1.65	821.2	82	89	120	122	66	3	61		
10	40		.30	1.55	823.8	81	89	120	121	61	3	62		
11	44		.30	1.55	826.4	82	90	120	122	62	3	62		828.844
12	48	14:18	.28	1.45	828.844	82	90	120	122	59	3	60		828.886
														-.042
B 1	52	14:30	.50	2.58	832.1	83	90	120	122	68	5	61		
2	56		.50	2.58	835.1	83	90	120	122	63	5	61		
3	60		.49	2.53	838.6	83	90	120	122	58	5	60		
4	64		.48	2.48	8427	83	91	120	122	59	5	60		
5	68		.45	2.33	844.7	83	91	120	122	61	5	60		
6	72		.42	2.17	847.6	83	91	120	122	62	5	60		
7	76		.30	1.55	850.3	83	92	120	122	63	4	61		
8	80		.22	1.14	852.3	83	92	120	122	64	3	60		
9	84		.20	1.03	854.4	83	92	120	123	65	3	60		
10	88		.18	.93	856.5	83	91	120	122	65	3	61		850.100.5
11	92		.16	.83	858.2	84	91	120	122	66	3	61		MOIST: 2.36%
12	96	15:18 ✓	.12	.62	859.844	84 ✓	91	120	122	66	3	61		SCFM: 12144.96
			Avg Delta P .3596 ✓	Avg Delta H 1.8579 ✓	Total Volume ✓ 65.238	Avg Ts ✓ 82.58	Avg Tm ✓ 89.75	Min/Max 120/120	Min/Max 121/131	Max 68	Max Vac 5	Min/Max 60/64		SVOL: 63.33
			Avg Sqrt Delta P .5901 ✓	Avg Sqrt Del H 1.3413 ✓	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

AMM

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418
Project ID	Chemours
Mode/Source ID	PPA
Samp. Loc. ID	Cbed
Run No.ID	3
Test Method ID	M0010
Date ID	APR2019
Source/Location	PPA Carbon Bed Inlet
Sample Date	5/1119 ✓
Baro. Press (in Hg)	30.2 ✓
Operator	AS/JL ✓

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		11 ✓
Silica gel (g)		16.6 ✓
CO2, % by Vol	0	0 ✓
O2, % by Vol	20.9	20.9 ✓
Temperature (°F)	80	
Meter Temp (°F)	80	
Static Press (in H_2O)	-2	-2 ✓
Ambient Temp (°F)	70	

Meter Box ID	23		
Meter Box Y	1.0005 ✓		
Meter Box Del H	2.2926		
Probe ID / Length	B	6'	Sample Train (ft³)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	P70(		Pitot leak check good
Pitot Coefficient	0.84		Pitot Inspection good
Nozzle ID	.250		Method 3 System good
Nozzle Measurements	.250	.250 .250	**Temp Check**
Avg Nozzle Dia (in)	.250 ✓		Meter Box Temp
Area of Stack (ft²)	6.31 ✓		Reference Temp
Sample Time	96 ✓		Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 5.17

	Initial	Mid-Point	Final
Sample Train (ft³)	.000	.000	.000
Leak Check @ (in Hg)	15"	7"	7"
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	68		75
Reference Temp	69.1		74.1
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	8:30 ✓			860.0016									
A 1	4		.50	2.58	863.2	74	71	120	122	66	6	62		
2	8		.50	2.58	866.4	74	72	120	121	54	6	51		
3	12		.50	2.58	869.6	74	72	120	122	50	6	48		
4	16		.48	2.48	872.7	74	72	120	122	51	6	47		
5	20		.44	2.27	875.7	74	73	120	122	52	6	48		
6	24		.40	2.07	878.5	74	73	120	122	53	6	48		
7	28		.25	1.29	880.8	74	74	120	122	54	4	49		
8	32		.18	.93	882.6	74	74	120	123	55	3	50		
9	36		.16	.83	884.4	74	75	120	122	56	2	51		
10	40		.15	.78	886.2	74	75	120	122	57	2	53		
11	44		.15	.78	888.0	74	75	120	123	57	2	52		889.612
12	48	9:18	.13	.67	889.612	74	76	120	120	57	2	51		889.672
														LC: -.060
B 1	52	9:29	.48	2.27	892.7	76	76	120	122	65	4	56		
2	56		.45	2.33	895.7	75	77	120	122	58	5	52		
3	60		.45	2.33	898.8	75	77	120	121	57	5	53		
4	64		.42	2.17	902.0	75	78	120	122	58	5	51		
5	68		.41	2.12	904.8	76	79	120	122	61	5	55		
6	72		.38	1.96	907.4	76	79	120	123	64	5	57		
7	76		.33	1.71	910.0	76	79	120	121	65	5	56		
8	80		.30	1.55	912.7	75	80	120	122	63	5	57		
9	84		.28	1.45	915.0	76	80	120	122	63	5	57		
10	88		.28	1.45	917.4	76	80	120	122	63	4.5	56		ISO: 100.7
11	92		.28	1.45	920.0	76	81	120	123	62	4.5	55		MOIST: 2.05%
12	96	10:17 ✓	.25	1.29	922.184	77 ✓	81	120	122	61	4.5	56		SCFM: 11873.31
			Avg Delta P .338 ✓	Avg Delta H 1.75 ✓	Total Volume 62.118 ✓	Avg Ts ✓ 74.875	Avg Tm 76.21 ✓	Min/Max 120/120	Min/Max 120/123	Max 66	Max Vac 6	Min/Max 62		SQM: 62.01
			Avg Sqrt Delta P .5704 ✓	Avg Sqrt Del H 1.297 ✓	Comments:									

EPA Method 0010 from EPA SW-846

MMd

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418
Location/Plant	Fayetteville, NC	Source & Location	PPA Carbon Bed Inlet

Run No. 1 — Sample Date 4/30/19 — Recovery Date 4/30/19

Sample I.D. Chemours - PPA - Cbed - 1 - M0010 - — Analyst AS — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	5	99	101	5				210	324.6	534.6
Initial	0	100	100	0				200	300	500
Gain	5	-1	1	5				10 ✓	24.6 ✓	34.6

Impinger Color Clear — Labeled? ✓

Silica Gel Condition spent — Sealed? ✓

Run No. 2 — Sample Date 4/30/19 — Recovery Date 4/30/19

Sample I.D. Chemours - PPA - Cbed - 2 - M0010 - — Analyst AS — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	10	100	101	3				214	318.5	532.5
Initial	0	100	100	0				200	300	500
Gain	10	0	1	3				14 ✓	18.5 ✓	32.5

Impinger Color Clear — Labeled? ✓

Silica Gel Condition spent — Sealed? ✓

Run No. 3 — Sample Date 5-1-19 — Recovery Date 5-1-19

Sample I.D. Chemours - PPA - Cbed - 3 - M0010 - — Analyst AS — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	12	98	98	3				211	316.6	527.6
Initial	0	100	100	0				200	300	500
Gain	12	-2	-2	3				11 ✓	16.6 ✓	27.6

Impinger Color Clear — Labeled? ✓

Silica Gel Condition spent — Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

METHODS AND ANALYZERS

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

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

File: C:\DATA\Chemours\April 2019\043019 Run 1 PPA.cem
Program Version: 2.1, built 19 May 2017 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

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

Channel 2

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

CALIBRATION DATA

Number 1

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

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Start Time: 07:24

O_2

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

Calibration Standards

%	Cylinder ID
12.1	CC157024
21.0	SG9169108

Calibration Results

Zero	7 mv
Span, 21.0 %	8006 mv

Curve Coefficients

Slope	Intercept
380.9	7

CO_2

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

Calibration Standards

%	Cylinder ID
9.0	CC157024
16.6	SG9169108

Calibration Results

Zero	3 mv
Span, 16.6 %	8279 mv

Curve Coefficients

Slope	Intercept
499.2	3

CALIBRATION ERROR DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Start Time: 07:24

O_2

Method: EPA 3A
Span Conc. 21.0 %
Slope 380.9 **Intercept** 7.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.1	12.1	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2

Method: EPA 3A
Span Conc. 16.6 %
Slope 499.2 **Intercept** 3.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
9.0	8.7	-0.3	-1.8	Pass
16.6	16.6	0.0	0.0	Pass

BIAS

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Start Time: 07:29

O_2

Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	12.0	12.1	0.1	0.5	Pass

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
09:13	20.8	0.0
09:14	20.8	0.0
09:15	20.8	0.0
09:16	20.8	0.0
09:17	20.8	0.0
09:18	20.8	0.0
09:19	20.8	0.0
09:20	20.8	0.0
09:21	20.8	0.0
09:22	20.8	0.0
09:23	20.8	0.0
09:24	20.8	0.0
09:25	20.8	0.0
09:26	20.8	0.0
09:27	20.8	0.0
09:28	20.8	0.0
09:29	20.8	0.0
09:30	20.8	0.0
09:31	20.8	0.0
09:32	20.8	0.0
09:33	20.8	0.0
09:34	20.8	0.0
09:35	20.8	0.0
09:36	20.8	0.0
09:37	20.8	0.0
09:38	20.8	0.0
09:39	20.8	0.0
09:40	20.8	0.0
09:41	20.8	0.0
09:42	20.8	0.0
09:43	20.8	0.0
09:44	20.8	0.0
09:45	20.8	0.0
09:46	20.8	0.0
09:47	20.8	0.0
09:48	20.8	0.0
09:49	20.8	0.0
09:50	20.8	0.0
09:51	20.8	0.0
09:52	20.8	0.0

WESTON SOLUTIONS

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
09:53	20.8	0.0
09:54	20.8	0.0
09:55	20.8	0.0
09:56	20.8	0.0
09:57	20.8	0.0
09:58	20.8	0.0
09:59	20.8	0.0
10:00	20.8	0.0
10:01	20.8	0.0
10:02	20.8	0.0
10:03	20.8	0.0
10:04	20.8	0.0
10:05	20.8	0.0
10:06	20.8	0.0
10:07	20.8	0.0
10:08	20.8	0.0
10:09	20.8	0.0
10:10	20.8	0.0
10:11	20.8	0.0
10:12	20.8	0.0
10:13	20.8	0.0
10:14	20.8	0.0
10:15	20.8	0.0
10:16	20.8	0.0
10:17	20.8	0.0
10:18	20.8	0.0
10:19	20.8	0.0
10:20	20.8	0.0
10:21	20.8	0.0
10:22	20.8	0.0
10:23	20.8	0.0
10:24	20.8	0.0
10:25	20.8	0.0
10:26	20.8	0.0
10:27	20.8	0.0
10:28	20.8	0.0
10:29	20.8	0.0
10:30	20.8	0.0
10:31	20.8	0.0
10:32	20.8	0.0

WESTON SOLUTIONS℠

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
10:33	20.8	0.0
10:34	20.8	0.0
10:35	20.8	0.0
10:36	20.8	0.0
10:37	20.8	0.0
10:38	20.8	0.0
10:39	20.8	0.0
10:40	20.8	0.0
10:41	20.8	0.0
10:42	20.8	0.0
10:43	20.8	0.0
10:44	20.8	0.0
10:45	20.8	0.0
10:46	20.8	0.0
10:47	20.8	0.0
10:48	20.8	0.0
10:49	20.8	0.0
10:50	20.8	0.0
10:51	20.8	0.0
10:52	20.8	0.0
10:53	20.8	0.0
10:54	20.8	0.0
10:55	20.8	0.0
10:56	20.8	0.0
10:57	20.8	0.0
10:58	20.8	0.0
10:59	20.8	0.0
11:00	20.8	0.0
11:01	20.8	0.0
11:02	20.8	0.0
11:03	20.8	0.0
11:04	20.8	0.0
11:05	20.8	0.0
11:06	20.8	0.0
11:07	20.8	0.0
11:08	20.8	0.0
11:09	20.8	0.0
11:10	20.8	0.0
11:11	20.8	0.0
11:12	20.8	0.0

WESTON SOLUTIONS℠

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
11:13	20.8	0.0
11:14	20.8	0.0
11:15	20.8	0.0
11:16	20.8	0.0
11:17	20.8	0.0
11:18	20.8	0.0
11:19	20.8	0.0
11:20	20.8	0.0
11:21	20.8	0.0
11:22	20.8	0.0
11:23	20.8	0.0
11:24	20.8	0.0
11:25	20.8	0.0
11:26	20.8	0.0
11:27	20.8	0.0
11:28	20.8	0.0
11:29	20.8	0.0
11:30	20.8	0.0
11:31	20.8	0.0
11:32	20.8	0.0
11:33	20.8	0.0
11:34	20.8	0.0
11:35	20.8	0.0
11:36	20.8	0.0
11:37	20.8	0.0
11:38	20.8	0.0
11:39	20.8	0.0
11:40	20.8	0.0
11:41	20.8	0.0
11:42	20.8	0.0
11:43	20.8	0.0
11:44	20.8	0.0
11:45	20.8	0.0
11:46	20.8	0.0
11:47	20.8	0.0
11:48	20.8	0.0
11:49	20.8	0.0
11:50	20.8	0.0
11:51	20.8	0.0
11:52	20.8	0.0

WESTON SOLUTIONS

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
11:53	20.8	0.0
11:54	20.8	0.0
11:55	20.8	0.0
11:56	20.8	0.0
11:57	20.8	0.0
11:58	20.8	0.0
11:59	20.8	0.0
12:00	20.8	0.0
12:01	20.8	0.0
12:02	20.8	0.0
12:03	20.8	0.0
12:04	20.8	0.0
12:05	20.8	0.0
12:06	20.8	0.0
12:07	20.8	0.0
Avgs	**20.8**	**0.0**

RUN SUMMARY

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

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

Time: 09:12 to 12:07

Run Averages

20.8	0.0

Pre-run Bias at 07:29

Zero Bias	0.0	0.0
Span Bias	12.1	8.6
Span Gas	12.1	9.0

Post-run Bias at 12:09

Zero Bias	0.1	0.0
Span Bias	12.0	8.6
Span Gas	12.1	9.0

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

20.9	0.0

BIAS AND CALIBRATION DRIFT

Number 2

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Start Time: 12:09

O_2

Method: EPA 3A
Span Conc. 21.0 %

Bias Results

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

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.1	0.1	0.5	Pass
Span	12.1	12.0	-0.1	-0.5	Pass

*Bias No. 1

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.6	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.6	0.0	0.0	Pass

*Bias No. 1

WESTON SOLUTIONS

RUN DATA

Number 2

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
13:28	20.8	0.0
13:29	20.8	0.0
13:30	20.8	0.0
13:31	20.8	0.0
13:32	20.8	0.0
13:33	20.8	0.0
13:34	20.8	0.0
13:35	20.8	0.0
13:36	20.8	0.0
13:37	20.8	0.0
13:38	20.8	0.0
13:39	20.8	0.0
13:40	20.8	0.0
13:41	20.8	0.0
13:42	20.8	0.0
13:43	20.8	0.0
13:44	20.8	0.0
13:45	20.8	0.0
13:46	20.8	0.0
13:47	20.8	0.0
13:48	20.8	0.0
13:49	20.8	0.0
13:50	20.8	0.0
13:51	20.8	0.0
13:52	20.8	0.0
13:53	20.8	0.0
13:54	20.8	0.0
13:55	20.8	0.0
13:56	20.8	0.0
13:57	20.8	0.0
13:58	20.8	0.0
13:59	20.8	0.0
14:00	20.8	0.0
14:01	20.8	0.0
14:02	20.8	0.0
14:03	20.8	0.0
14:04	20.8	0.0
14:05	20.8	0.0
14:06	20.8	0.0
14:07	20.8	0.0

WESTON SOLUTIONS

RUN DATA

Number 2

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
14:08	20.7	0.0
14:09	20.7	0.0
14:10	20.7	0.0
14:11	20.7	0.0
14:12	20.7	0.0
14:13	20.7	0.0
14:14	20.7	0.0
14:15	20.7	0.0
14:16	20.7	0.0
14:17	20.7	0.0
14:18	20.8	0.0
14:19	20.8	0.0
14:20	20.8	0.0
14:21	20.8	0.0
14:22	20.7	0.0
14:23	20.7	0.0
14:24	20.7	0.0
14:25	20.7	0.0
14:26	20.7	0.0
14:27	20.7	0.0
14:28	20.7	0.0
14:29	20.7	0.0
14:30	20.7	0.0
14:31	20.7	0.0
14:32	20.7	0.0
14:33	20.7	0.0
14:34	20.7	0.0
14:35	20.7	0.0
14:36	20.7	0.0
14:37	20.7	0.0
14:38	20.7	0.0
14:39	20.7	0.0
14:40	20.7	0.0
14:41	20.7	0.0
14:42	20.7	0.0
14:43	20.7	0.0
14:44	20.7	0.0
14:45	20.7	0.0
14:46	20.7	0.0
14:47	20.7	0.0

WESTON SOLUTIONS

RUN DATA

Number 2

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Time	O_2 %	CO_2 %
14:48	20.7	0.0
14:49	20.7	0.0
14:50	20.7	0.0
14:51	20.7	0.0
14:52	20.7	0.0
14:53	20.7	0.0
14:54	20.7	0.0
14:55	20.8	0.0
14:56	20.8	0.0
14:57	20.8	0.0
14:58	20.8	0.0
14:59	20.8	0.0
15:00	20.8	0.0
15:01	20.8	0.0
15:02	20.8	0.0
15:03	20.8	0.0
15:04	20.8	0.0
15:05	20.8	0.0
15:06	20.8	0.0
15:07	20.8	0.0
15:08	20.8	0.0
15:09	20.8	0.0
15:10	20.8	0.0
15:11	20.8	0.0
15:12	20.8	0.0
15:13	20.8	0.0
15:14	20.8	0.0
15:15	20.8	0.0
15:16	20.8	0.0
15:17	20.8	0.0
15:18	20.8	0.0
15:19	20.8	0.0
15:20	20.8	0.0
15:21	20.8	0.0
15:22	20.7	0.0
15:23	20.7	0.0
Avgs	**20.8**	**0.0**

WESTON SOLUTIONS℠

RUN SUMMARY

Number 2

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

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

Time: 13:27 to 15:23

Run Averages

20.8	0.0

Pre-run Bias at 12:09

Zero Bias	0.1	0.0
Span Bias	12.0	8.6
Span Gas	12.1	9.0

Post-run Bias at 15:37

Zero Bias	0.0	0.0
Span Bias	12.0	8.5
Span Gas	12.1	9.0

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

20.9	0.0

BIAS AND CALIBRATION DRIFT

Number 3

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **30 Apr 2019**

Start Time: 15:37

O_2

Method: EPA 3A
Span Conc. 21.0 %

Bias Results

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

Calibration Drift

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

*Bias No. 2

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.7	8.5	-0.2	-1.2	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.0	0.0	0.0	0.0	Pass
Span	8.6	8.5	-0.1	-0.6	Pass

*Bias No. 2

METHODS AND ANALYZERS

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

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

File: C:\DATA\Chemours\April 2019\050119 Run 3 PPA.cem
Program Version: 2.1, built 19 May 2017 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

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

Channel 2

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

CALIBRATION DATA

Number 1

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

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Start Time: 07:10

O_2

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

Calibration Standards

%	Cylinder ID
12.1	CC157024
21.0	SG9169108

Calibration Results

Zero	7 mv
Span, 21.0 %	8004 mv

Curve Coefficients

Slope	Intercept
380.8	7

CO_2

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

Calibration Standards

%	Cylinder ID
9.0	CC157024
16.6	SG9169108

Calibration Results

Zero	0 mv
Span, 16.6 %	8270 mv

Curve Coefficients

Slope	Intercept
498.8	0

CALIBRATION ERROR DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Start Time: 07:10

O_2

Method: EPA 3A
Span Conc. 21.0 %
Slope 380.8 **Intercept** 7.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
12.1	12.1	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2

Method: EPA 3A
Span Conc. 16.6 %
Slope 498.8 **Intercept** 0.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
9.0	8.9	-0.1	-0.6	Pass
16.6	16.6	0.0	0.0	Pass

BIAS

Number 1

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Start Time: 07:16

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	12.1	0.0	0.0	Pass

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

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

RUN DATA

Number 3

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Time	O_2 %	CO_2 %
08:19	20.8	0.0
08:20	20.8	0.0
08:21	20.8	0.0
08:22	20.8	0.0
08:23	20.8	0.0
08:24	20.8	0.0
08:25	20.8	0.0
08:26	20.8	0.0
08:27	20.8	0.0
08:28	20.8	0.0
08:29	20.8	0.0
08:30	20.8	0.0
08:31	20.8	0.0
08:32	20.8	0.0
08:33	20.8	0.0
08:34	20.8	0.0
08:35	20.8	0.0
08:36	20.8	0.0
08:37	20.8	0.0
08:38	20.8	0.0
08:39	20.8	0.0
08:40	20.8	0.0
08:41	20.8	0.0
08:42	20.8	0.0
08:43	20.8	0.0
08:44	20.8	0.0
08:45	20.8	0.0
08:46	20.8	0.0
08:47	20.8	0.0
08:48	20.8	0.0
08:49	20.8	0.0
08:50	20.8	0.0
08:51	20.8	0.0
08:52	20.8	0.0
08:53	20.8	0.0
08:54	20.8	0.0
08:55	20.8	0.0
08:56	20.8	0.0
08:57	20.8	0.0
08:58	20.8	0.0

RUN DATA

Number 3

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Time	O_2 %	CO_2 %
08:59	20.8	0.0
09:00	20.8	0.0
09:01	20.8	0.0
09:02	20.8	0.0
09:03	20.8	0.0
09:04	20.8	0.0
09:05	20.8	0.0
09:06	20.8	0.0
09:07	20.8	0.0
09:08	20.8	0.0
09:09	20.8	0.0
09:10	20.8	0.0
09:11	20.8	0.0
09:12	20.8	0.0
09:13	20.8	0.0
09:14	20.8	0.0
09:15	20.8	0.0
09:16	20.8	0.0
09:17	20.8	0.0
09:18	20.8	0.0
09:19	20.8	0.0
09:20	20.8	0.0
09:21	20.8	0.0
09:22	20.8	0.0
09:23	20.8	0.0
09:24	20.8	0.0
09:25	20.8	0.0
09:26	20.8	0.0
09:27	20.8	0.0
09:28	20.8	0.0
09:29	20.8	0.0
09:30	20.8	0.0
09:31	20.8	0.0
09:32	20.8	0.0
09:33	20.8	0.0
09:34	20.8	0.0
09:35	20.8	0.0
09:36	20.8	0.0
09:37	20.8	0.0
09:38	20.8	0.0

WESTON SOLUTIONS℠

RUN DATA

Number 3

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Time	O_2 %	CO_2 %
09:39	20.8	0.0
09:40	20.8	0.0
09:41	20.8	0.0
09:42	20.8	0.0
09:43	20.8	0.0
09:44	20.8	0.0
09:45	20.8	0.0
09:46	20.8	0.0
09:47	20.8	0.0
09:48	20.8	0.0
09:49	20.8	0.0
09:50	20.8	0.0
09:51	20.9	0.0
09:52	20.9	0.0
09:53	20.9	0.0
09:54	20.9	0.0
09:55	20.9	0.0
09:56	20.9	0.0
09:57	20.9	0.0
09:58	20.9	0.0
09:59	20.9	0.0
10:00	20.9	0.0
10:01	20.9	0.0
10:02	20.9	0.0
10:03	20.9	0.0
10:04	20.9	0.0
10:05	20.9	0.0
10:06	20.9	0.0
10:07	20.9	0.0
10:08	20.9	0.0
10:09	20.9	0.0
10:10	20.9	0.0
10:11	20.9	0.0
10:12	20.9	0.0
10:13	20.9	0.0
10:14	20.9	0.0
10:15	20.9	0.0
10:16	21.0	0.0
10:17	21.0	0.0
10:18	21.0	0.0

WESTON SOLUTIONS

RUN DATA

Number 3

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Time	O_2 %	CO_2 %
10:19	20.9	0.0
10:20	20.9	0.0
10:21	20.9	0.0
10:22	20.9	0.0
10:23	20.9	0.0
10:24	20.8	0.0
Avgs	**20.8**	**0.0**

RUN SUMMARY

Number 3

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

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

Time: 08:18 to 10:24

Run Averages

20.8	0.0

Pre-run Bias at 07:16

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

Post-run Bias at 10:59

Zero Bias	0.0	0.0
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

20.8	0.0

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 2

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Start Time: 10:59

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	12.1	12.0	-0.1	-0.5	Pass

*Bias No. 1

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

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

Calibration Drift

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

*Bias No. 1

WESTON SOLUTIONS

RUN DATA

Number 0

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

Time	O_2 %	CO_2 %
Run 1 Bag Scrubber inlet		
11:13:47	18.5	0.2
11:14:02	18.5	0.3
11:14:17	18.5	0.3
11:14:32	18.5	0.3
11:14:47	18.5	0.3
11:15:02	18.5	0.3
11:15:17	18.5	0.3
11:15:32	18.5	0.3
Run 3 Bag Scrubber inlet		
11:18:32	19.5	0.1
11:18:47	18.7	0.1
11:19:02	18.6	0.1
11:19:17	18.6	0.2
11:19:32	18.6	0.4
11:19:47	18.6	0.5
11:20:02	18.6	0.5
11:20:17	18.7	0.5
11:20:32	18.7	0.5
11:20:47	18.7	0.5
11:21:02	18.7	0.5
11:21:17	18.7	0.5
11:21:32	18.7	0.5
11:21:47	18.7	0.5
Avgs	**18.6**	**0.4**

RUN SUMMARY

Number 0

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

Calibration **1**

Project Number: **15418.002.012**
Operator: **SR**
Date: **1 May 2019**

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

Time: 11:13:32 to 11:21:47

Run Averages

18.6	0.4

Pre-run Bias at 10:59

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

No Post-run Bias

Run averages corrected for the pre-run bias

18.7	0.4

APPENDIX C
LABORATORY ANALYTICAL REPORT

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

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ANALYTICAL REPORT

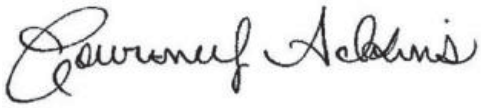
Job Number: 140-15200-1

Job Description: PPA Carbon Bed Outlet

Contract Number: LBIO-67048

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

Attention: Michael Aucoin



Approved for release.
Courtney M Adkins
Project Manager I
5/16/2019 10:54 AM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
05/16/2019

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Qualifiers

LCMS

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

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

Method Summary

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

Job ID: 140-15200-1

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

Protocol References:

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

Laboratory References:

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

Sample Summary

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

Job ID: 140-15200-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-15200-1	K-2091,2092 PPA CB OUTLET R1 M0010 FH	Air	04/30/19 00:00	05/02/19 09:00
140-15200-2	K-2093,2094,2096 PPA CB OUTLET R1 M0010 BH	Air	04/30/19 00:00	05/02/19 09:00
140-15200-3	K-2095 PPA CB OUTLET R1 M0010 IMPINGERS 1,2&3	Air	04/30/19 00:00	05/02/19 09:00
140-15200-4	K-2097 PPA CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/30/19 00:00	05/02/19 09:00
140-15200-5	K-2098,2099 PPA CB OUTLET R2 M0010 FH	Air	04/30/19 00:00	05/02/19 09:00
140-15200-6	K-2100,2101,2103 PPA CB OUTLET R2 M0010 BH	Air	04/30/19 00:00	05/02/19 09:00
140-15200-7	K-2102 PPA CB OUTLET R2 M0010 IMPINGERS 1,2&3	Air	04/30/19 00:00	05/02/19 09:00
140-15200-8	K-2104 PPA CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/30/19 00:00	05/02/19 09:00
140-15200-9	K-2105,2106 PPA CB OUTLET R3 M0010 FH	Air	05/01/19 00:00	05/02/19 09:00
140-15200-10	K-2107,2108,2110 PPA CB OUTLET R3 M0010 BH	Air	05/01/19 00:00	05/02/19 09:00
140-15200-11	K-2109 PPA CB OUTLET R3 M0010 IMPINGERS 1,2&3	Air	05/01/19 00:00	05/02/19 09:00
140-15200-12	K-2111 PPA CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	05/01/19 00:00	05/02/19 09:00

Job Narrative
140-15200-1

Sample Receipt

The samples were received on May 2, 2019 at 9:00 AM in good condition and properly preserved. The temperatures of the 4 coolers at receipt time were 0.8º C, 1.0º C, 1.0º C and 1.8º 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

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

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.

Organic Prep

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

Comments

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

LCMS

Analysis Batch: 436957

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

Prep Batch: 457273

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15200-2	K-2093,2094,2096 PPA CB OUTLET R1 M0010 I	Total/NA	Air	None	
140-15200-4	K-2097 PPA CB OUTLET R1 M0010 BREAKTHF	Total/NA	Air	None	
140-15200-6	K-2100,2101,2103 PPA CB OUTLET R2 M0010 I	Total/NA	Air	None	
140-15200-8	K-2104 PPA CB OUTLET R2 M0010 BREAKTHF	Total/NA	Air	None	
140-15200-10	K-2107,2108,2110 PPA CB OUTLET R3 M0010 I	Total/NA	Air	None	
140-15200-12	K-2111 PPA CB OUTLET R3 M0010 BREAKTHF	Total/NA	Air	None	
MB 280-457273/13-A	Method Blank	Total/NA	Air	None	
MB 280-457273/1-A	Method Blank	Total/NA	Air	None	
LCS 280-457273/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 457607

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15200-1	K-2091,2092 PPA CB OUTLET R1 M0010 FH	Total/NA	Air	None	
140-15200-5	K-2098,2099 PPA CB OUTLET R2 M0010 FH	Total/NA	Air	None	
140-15200-9	K-2105,2106 PPA CB OUTLET R3 M0010 FH	Total/NA	Air	None	
MB 280-457607/1-A	Method Blank	Total/NA	Air	None	
LCS 280-457607/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 457723

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15200-3	K-2095 PPA CB OUTLET R1 M0010 IMPINGERS	Total/NA	Air	None	
140-15200-7	K-2102 PPA CB OUTLET R2 M0010 IMPINGERS	Total/NA	Air	None	
140-15200-11	K-2109 PPA CB OUTLET R3 M0010 IMPINGERS	Total/NA	Air	None	
MB 280-457723/1-A	Method Blank	Total/NA	Air	None	
LCS 280-457723/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 458064

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15200-2	K-2093,2094,2096 PPA CB OUTLET R1 M0010 I	Total/NA	Air	8321A	457273
140-15200-4	K-2097 PPA CB OUTLET R1 M0010 BREAKTHF	Total/NA	Air	8321A	457273
140-15200-6	K-2100,2101,2103 PPA CB OUTLET R2 M0010 I	Total/NA	Air	8321A	457273
140-15200-8	K-2104 PPA CB OUTLET R2 M0010 BREAKTHF	Total/NA	Air	8321A	457273
140-15200-10	K-2107,2108,2110 PPA CB OUTLET R3 M0010 I	Total/NA	Air	8321A	457273
140-15200-12	K-2111 PPA CB OUTLET R3 M0010 BREAKTHF	Total/NA	Air	8321A	457273
MB 280-457273/13-A	Method Blank	Total/NA	Air	8321A	457273
MB 280-457273/1-A	Method Blank	Total/NA	Air	8321A	457273
LCS 280-457273/2-A	Lab Control Sample	Total/NA	Air	8321A	457273

Analysis Batch: 458065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15200-1	K-2091,2092 PPA CB OUTLET R1 M0010 FH	Total/NA	Air	8321A	457607
140-15200-5	K-2098,2099 PPA CB OUTLET R2 M0010 FH	Total/NA	Air	8321A	457607
140-15200-9	K-2105,2106 PPA CB OUTLET R3 M0010 FH	Total/NA	Air	8321A	457607
MB 280-457607/1-A	Method Blank	Total/NA	Air	8321A	457607
LCS 280-457607/2-A	Lab Control Sample	Total/NA	Air	8321A	457607

LCMS

Analysis Batch: 458066

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15200-3	K-2095 PPA CB OUTLET R1 M0010 IMPINGERS	Total/NA	Air	8321A	457723
140-15200-7	K-2102 PPA CB OUTLET R2 M0010 IMPINGERS	Total/NA	Air	8321A	457723
140-15200-11	K-2109 PPA CB OUTLET R3 M0010 IMPINGERS	Total/NA	Air	8321A	457723
MB 280-457723/1-A	Method Blank	Total/NA	Air	8321A	457723
LCS 280-457723/2-A	Lab Control Sample	Total/NA	Air	8321A	457723

Client Sample ID: K-2091,2092 PPA CB OUTLET R1 M0010 FH

Lab Sample ID: 140-15200-1

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.09		0.126	0.0136	ug/Sample		05/09/19 15:00	05/13/19 16:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*72*		*50 - 200*	*05/09/19 15:00*	*05/13/19 16:53*	*1*

Client Sample ID: K-2093,2094,2096 PPA CB OUTLET R1 M0010 BH

Lab Sample ID: 140-15200-2

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.172	J	0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*62*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:38*	*1*

Client Sample ID: K-2095 PPA CB OUTLET R1 M0010 IMPINGERS 1,2&3

Lab Sample ID: 140-15200-3

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0811	J	0.196	0.00999	ug/Sample		05/10/19 12:55	05/13/19 17:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*73*		*50 - 200*	*05/10/19 12:55*	*05/13/19 17:26*	*1*

Client Sample ID: K-2097 PPA CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15200-4

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:45	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*60*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:45*	*1*

Client Sample ID: K-2098,2099 PPA CB OUTLET R2 M0010 FH

Lab Sample ID: 140-15200-5

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.46		0.126	0.0136	ug/Sample		05/09/19 15:00	05/13/19 16:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*78*		*50 - 200*	*05/09/19 15:00*	*05/13/19 16:56*	*1*

Client Sample ID: K-2100,2101,2103 PPA CB OUTLET R2 M0010 BH

Lab Sample ID: 140-15200-6

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.108	J	0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*62*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:48*	*1*

Client Sample ID: K-2102 PPA CB OUTLET R2 M0010 IMPINGERS 1,2&3

Lab Sample ID: 140-15200-7

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.119	J	0.206	0.0105	ug/Sample		05/10/19 12:55	05/13/19 17:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*76*		*50 - 200*	*05/10/19 12:55*	*05/13/19 17:29*	*1*

Client Sample ID: K-2104 PPA CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15200-8

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*65*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:54*	*1*

Client Sample ID: K-2105,2106 PPA CB OUTLET R3 M0010 FH

Lab Sample ID: 140-15200-9

Date Collected: 05/01/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.45		0.127	0.0137	ug/Sample		05/09/19 15:00	05/13/19 17:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*		*50 - 200*	*05/09/19 15:00*	*05/13/19 17:00*	*1*

Client Sample ID: K-2107,2108,2110 PPA CB OUTLET R3 M0010 BH

Lab Sample ID: 140-15200-10

Date Collected: 05/01/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.267		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*62*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:58*	*1*

Client Sample ID: K-2109 PPA CB OUTLET R3 M0010 IMPINGERS 1,2&3

Lab Sample ID: 140-15200-11

Date Collected: 05/01/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.213		0.210	0.0107	ug/Sample		05/10/19 12:55	05/13/19 17:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*77*		*50 - 200*	*05/10/19 12:55*	*05/13/19 17:32*	*1*

Client Sample ID: K-2111 PPA CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15200-12

Date Collected: 05/01/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 16:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*61*		*50 - 200*	*05/07/19 16:05*	*05/13/19 16:01*	*1*

Default Detection Limits

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

Job ID: 140-15200-1

Method: 8321A - HFPO-DA

Prep: None

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

Method: 8321A - PFOA and PFOS

Prep: None

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

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ANALYTICAL REPORT

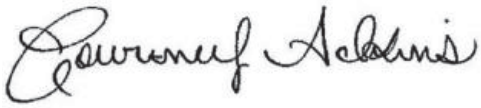
Job Number: 140-15199-1

Job Description: PPA Carbon Bed Inlet

Contract Number: LBIO-67048

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

Attention: Michael Aucoin



Approved for release.
Courtney M Adkins
Project Manager I
5/16/2019 10:53 AM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
05/16/2019

Table of Contents

Table of Contents

Qualifiers

LCMS

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

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

Job ID: 140-15199-1

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

Protocol References:

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

TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

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

Sample Summary

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

Job ID: 140-15199-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-15199-1	E-2091,2092 PPA CB INLET R1 M0010 FH	Air	04/30/19 00:00	05/02/19 09:00
140-15199-2	E-2093,2094,2096 PPA CB INLET R1 M0010 BH	Air	04/30/19 00:00	05/02/19 09:00
140-15199-3	E-2095 PPA CB INLET R1 M0010 IMPINGER 1,2&3 COND	Air	04/30/19 00:00	05/02/19 09:00
140-15199-4	E-2097 PPA CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/30/19 00:00	05/02/19 09:00
140-15199-5	E-2098,2099 PPA CB INLET R2 M0010 FH	Air	04/30/19 00:00	05/02/19 09:00
140-15199-6	E-2100,2101,2103 PPA CB INLET R2 M0010 BH	Air	04/30/19 00:00	05/02/19 09:00
140-15199-7	E-2102 PPA CB INLET R2 M0010 IMPINGER 1,2&3 COND	Air	04/30/19 00:00	05/02/19 09:00
140-15199-8	E-2104 PPA CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	04/30/19 00:00	05/02/19 09:00
140-15199-9	E-2105,2106 PPA CB INLET R3 M0010 FH	Air	05/01/19 00:00	05/02/19 09:00
140-15199-10	E-2107,2108,2110 PPA CB INLET R3 M0010 BH	Air	05/01/19 00:00	05/02/19 09:00
140-15199-11	E-2109 PPA CB INLET R3 M0010 IMPINGER 1,2&3 COND	Air	05/01/19 00:00	05/02/19 09:00
140-15199-12	E-2111 PPA CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	05/01/19 00:00	05/02/19 09:00

Job Narrative
140-15199-1

Sample Receipt

The samples were received on May 2, 2019 at 9:00 AM in good condition and properly preserved. The temperatures of the 4 coolers at receipt time were 0.8º C, 1.0º C, 1.0º C and 1.8º 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

LCMS

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

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.

Organic Prep

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

Comments

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

LCMS

Analysis Batch: 436957

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

Prep Batch: 457273

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-2	E-2093,2094,2096 PPA CB INLET R1 M0010 BH	Total/NA	Air	None	
140-15199-4	E-2097 PPA CB INLET R1 M0010 BREAKTHRO	Total/NA	Air	None	
140-15199-6	E-2100,2101,2103 PPA CB INLET R2 M0010 BH	Total/NA	Air	None	
140-15199-8	E-2104 PPA CB INLET R2 M0010 BREAKTHRO	Total/NA	Air	None	
140-15199-10	E-2107,2108,2110 PPA CB INLET R3 M0010 BH	Total/NA	Air	None	
140-15199-12	E-2111 PPA CB INLET R3 M0010 BREAKTHRO	Total/NA	Air	None	
MB 280-457273/1-A	Method Blank	Total/NA	Air	None	
LCS 280-457273/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 457607

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-1	E-2091,2092 PPA CB INLET R1 M0010 FH	Total/NA	Air	None	
140-15199-5	E-2098,2099 PPA CB INLET R2 M0010 FH	Total/NA	Air	None	
140-15199-9	E-2105,2106 PPA CB INLET R3 M0010 FH	Total/NA	Air	None	
MB 280-457607/1-A	Method Blank	Total/NA	Air	None	
LCS 280-457607/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 457723

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-3	E-2095 PPA CB INLET R1 M0010 IMPINGER 1,2	Total/NA	Air	None	
140-15199-7	E-2102 PPA CB INLET R2 M0010 IMPINGER 1,2	Total/NA	Air	None	
140-15199-11	E-2109 PPA CB INLET R3 M0010 IMPINGER 1,2	Total/NA	Air	None	
MB 280-457723/1-A	Method Blank	Total/NA	Air	None	
LCS 280-457723/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 458064

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-2	E-2093,2094,2096 PPA CB INLET R1 M0010 BH	Total/NA	Air	8321A	457273
140-15199-4	E-2097 PPA CB INLET R1 M0010 BREAKTHRO	Total/NA	Air	8321A	457273
140-15199-6	E-2100,2101,2103 PPA CB INLET R2 M0010 BH	Total/NA	Air	8321A	457273
140-15199-8	E-2104 PPA CB INLET R2 M0010 BREAKTHRO	Total/NA	Air	8321A	457273
140-15199-10	E-2107,2108,2110 PPA CB INLET R3 M0010 BH	Total/NA	Air	8321A	457273
140-15199-12	E-2111 PPA CB INLET R3 M0010 BREAKTHRO	Total/NA	Air	8321A	457273
MB 280-457273/1-A	Method Blank	Total/NA	Air	8321A	457273
LCS 280-457273/2-A	Lab Control Sample	Total/NA	Air	8321A	457273

Analysis Batch: 458065

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-1	E-2091,2092 PPA CB INLET R1 M0010 FH	Total/NA	Air	8321A	457607
140-15199-5	E-2098,2099 PPA CB INLET R2 M0010 FH	Total/NA	Air	8321A	457607
140-15199-9	E-2105,2106 PPA CB INLET R3 M0010 FH	Total/NA	Air	8321A	457607
MB 280-457607/1-A	Method Blank	Total/NA	Air	8321A	457607
LCS 280-457607/2-A	Lab Control Sample	Total/NA	Air	8321A	457607

Analysis Batch: 458066

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-3	E-2095 PPA CB INLET R1 M0010 IMPINGER 1,2	Total/NA	Air	8321A	457723

LCMS (Continued)

Analysis Batch: 458066 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-15199-7	E-2102 PPA CB INLET R2 M0010 IMPINGER 1,2	Total/NA	Air	8321A	457723
140-15199-11	E-2109 PPA CB INLET R3 M0010 IMPINGER 1,2	Total/NA	Air	8321A	457723
MB 280-457723/1-A	Method Blank	Total/NA	Air	8321A	457723
LCS 280-457723/2-A	Lab Control Sample	Total/NA	Air	8321A	457723

Client Sample ID: E-2091,2092 PPA CB INLET R1 M0010 FH

Lab Sample ID: 140-15199-1

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	95.7		1.01	0.109	ug/Sample		05/09/19 15:00	05/13/19 16:43	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*90*	*D*	*50 - 200*	*05/09/19 15:00*	*05/13/19 16:43*	*10*

Client Sample ID: E-2093,2094,2096 PPA CB INLET R1 M0010 BH

Lab Sample ID: 140-15199-2

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.33		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*61*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:18*	*1*

Client Sample ID: E-2095 PPA CB INLET R1 M0010 IMPINGER 1,2&3 COND

Lab Sample ID: 140-15199-3

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0582	J	0.196	0.00999	ug/Sample		05/10/19 12:55	05/13/19 17:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*94*		*50 - 200*	*05/10/19 12:55*	*05/13/19 17:16*	*1*

Client Sample ID: E-2097 PPA CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15199-4

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:22	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*62*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:22*	*1*

Client Sample ID: E-2098,2099 PPA CB INLET R2 M0010 FH

Lab Sample ID: 140-15199-5

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	108		1.01	0.109	ug/Sample		05/09/19 15:00	05/13/19 16:47	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*84*	*D*	*50 - 200*	*05/09/19 15:00*	*05/13/19 16:47*	*10*

Client Sample ID: E-2100,2101,2103 PPA CB INLET R2 M0010 BH

Lab Sample ID: 140-15199-6

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.63		0.225	0.0450	ug/Sample		05/07/19 16:05	05/13/19 15:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*64*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:25*	*1*

Client Sample ID: E-2102 PPA CB INLET R2 M0010 IMPINGER 1,2&3 COND

Lab Sample ID: 140-15199-7

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0996	J	0.208	0.0106	ug/Sample		05/10/19 12:55	05/13/19 17:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*95*		*50 - 200*	*05/10/19 12:55*	*05/13/19 17:19*	*1*

Client Sample ID: E-2104 PPA CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15199-8

Date Collected: 04/30/19 00:00
Matrix: Air
Date Received: 05/02/19 09:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*75*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:28*	*1*

Client Sample ID: E-2105,2106 PPA CB INLET R3 M0010 FH

Lab Sample ID: 140-15199-9

Date Collected: 05/01/19 00:00
Date Received: 05/02/19 09:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	146		1.01	0.109	ug/Sample		05/09/19 15:00	05/13/19 16:50	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*87*	*D*	*50 - 200*	*05/09/19 15:00*	*05/13/19 16:50*	*10*

Client Sample ID: E-2107,2108,2110 PPA CB INLET R3 M0010 BH

Lab Sample ID: 140-15199-10

Date Collected: 05/01/19 00:00
Date Received: 05/02/19 09:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.31		0.225	0.0450	ug/Sample		05/07/19 16:05	05/13/19 15:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*64*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:32*	*1*

Client Sample ID: E-2109 PPA CB INLET R3 M0010 IMPINGER 1,2&3 COND

Lab Sample ID: 140-15199-11

Date Collected: 05/01/19 00:00
Date Received: 05/02/19 09:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.299		0.210	0.0107	ug/Sample		05/10/19 12:55	05/13/19 17:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*83*		*50 - 200*	*05/10/19 12:55*	*05/13/19 17:23*	*1*

Client Sample ID: E-2111 PPA CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-15199-12

Date Collected: 05/01/19 00:00
Date Received: 05/02/19 09:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		05/07/19 16:05	05/13/19 15:35	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*59*		*50 - 200*	*05/07/19 16:05*	*05/13/19 15:35*	*1*

Default Detection Limits

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

Job ID: 140-15199-1

Method: 8321A - HFPO-DA

Prep: None

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

Method: 8321A - PFOA and PFOS

Prep: None

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

APPENDIX D
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 3 | **Test Date: 05/01/19**
Test Location: PPA Stack | **Test Period: 0830-1017**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{1.9 \times 2.2046 \times 10\text{-}9}{47.071}$$

Conc1 = 9.04E-11

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 = 1.9 / (47.071 x 0.02832)

Conc2 = 1.45E+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

$MR1_{(Outlet)}$ = 9.04E-11 x 11822 x 60

$MR1_{(Outlet)}$ = 6.41E-05

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

$MR2_{(Outlet)}$ = 6.41E-05 x 453.59 /3600

$MR2_{(Outlet)}$ = 8.07E-06

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, %

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

$$RE = \frac{(3.74E\text{-}03) - (6.41E\text{-}05)}{3.74E\text{-}03}$$

RE = 98.28

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

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 3	Test Date: 5/01/19
Test Location: PPA Stack	Test Period: 0830-1017

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

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

$$Vm(std) = \frac{17.64 \times 0.9944 \times 47.697 \times \left(30.30 + \frac{0.811}{13.6} \right)}{79.63 + 460} = 47.071$$

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.

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

$$Vw(std) = (0.04707 \times 8.0) + (0.04715 \times 11.4) = 0.91$$

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

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

$$bws = \frac{0.91}{0.91 + 47.071} = 0.019$$

Where:

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

4. Mole fraction of dry gas.

Md = 1 - bws

Md = 1 - 0.019 = 0.981

Where:

Md = Mole fraction of dry gas, dimensionless.

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

MWd = (0.440 x % CO_2) + (0.320 x % O_2) + (0.280 x (% N_2 + % CO))

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

MWd = 28.84

Where:

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

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

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

MWs = (28.84 x 0.981) +(18 (1 - 0.981)) = 28.63

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.

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

$$Vs = 85.49 \times 0.84 \times 0.73105 \times \left(\frac{543}{30.45 \times 28.63} \right)^{\wedge}1/2 = 41.4$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

Cp = Pitot tube coefficient, dimensionless.

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

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

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

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

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

$$Qs(act) = 60 \times 41.4 \times 4.90 = 12179$$

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.

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

$$Qs(std) = 17.64 \times 0.981 \times \frac{30.45}{542.9} \times 12179$$

$$Qs(std) = 11822$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 543 \times 47.071}{41.4 \times 96 \times 30.45 \times 0.981 \times (0.191)^{\wedge}2} = 102.2$$

Where:

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

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 3 | **Test Date: 05/01/19**
Test Location: PPA CB Inlet | **Test Period: 0830-1017**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{147.6 \times 2.2046 \times 10\text{-}9}{62.008}$$

Conc1 = 5.25E-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 = 147.6 / (62.008 x 0.02832)

Conc2 = 8.40E+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.

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

$MR1_{(Outlet)}$ = 5.25E-09 x 11873 x 60

$MR1_{(Outlet)}$ = 3.74E-03

Where:

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

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

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

$MR2_{(Outlet)}$ = 3.74E-03 x 453.59 /3600

$MR2_{(Outlet)}$ = 4.71E-04

Where:

$MR2_{(Outlet)}$ = 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.

EXAMPLE CALCULATIONS FOR VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

PPA CARBON BED INLET

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 3	Test Date: 5/01/19
Test Location: PPA Stack	Test Period: 0830-1017

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

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

$$Vm(std) = \frac{17.64 \times 1.0005 \times 62.118 \times \left(30.20 + \frac{1.747}{13.6} \right)}{76.21 + 460} = 62.008$$

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.

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

$$Vw(std) = (0.04707 \times 11.0) + (0.04715 \times 16.6) = 1.30$$

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

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

$$bws = \frac{1.30}{1.30 + 62.008} = 0.021$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.021 = 0.979$$

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.

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

$$MWs = (28.84 \times 0.979) +(18 (1 - 0.979)) = 28.61$$

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.

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

$$Vs = 85.49 \times 0.84 \times 0.57037 \times \left(\frac{535}{30.05 \times 28.61} \right)^{\wedge}1/2 = 32.3$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

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.

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

$$Qs(act) = 60 \times 32.3 \times 6.31 = 12230$$

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.

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

$$Qs(std) = 17.64 \times 0.979 \times \frac{30.05}{534.9} \times 12230$$

$$Qs(std) = 11873$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 535 \times 62.008}{32.3 \times 96 \times 30.05 \times 0.979 \times (0.250)\text{^}2} = 100.7$$

Where:

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

APPENDIX E
EQUIPMENT CALIBRATION RECORDS

INTERFERENCE CHECK

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

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

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

Chad Walker

INTERFERENCE CHECK

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

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

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

Chad Walker

Airgas Specialty Gases
Airgas USA, LLC
6141 Easton Road
Bldg 1
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	160-401424145-1
Cylinder Number:	CC157024	Cylinder Volume:	150.5 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12019	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Feb 26, 2019

Expiration Date: Feb 26, 2027

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 %	9.018 %	G1	+/- 0.6% NIST Traceable	02/26/2019
OXYGEN	12.00 %	12.06 %	G1	+/- 0.3% NIST Traceable	02/26/2019
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	061507	K014984	13.94 % CARBON DIOXIDE/NITROGEN	0.57%	Jan 30, 2024
NTRM	16060507	CC401541	23.204 % OXYGEN/NITROGEN	0.2%	Dec 24, 2021

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
HORIBA VA5011 T5V6VU9P NDIR CO2	NDIR	Feb 12, 2019
SIEMENS OXYMAT 61 S01062 O2	PARAMAGNETIC	Feb 18, 2019

Triad Data Available Upon Request

Signature on file

Approved for Release

Airgas
an Air Liquide company

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

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

Expiration Date: Nov 18, 2025

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

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

ANALYTICAL RESULTS

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

CALIBRATION STANDARDS

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

ANALYTICAL EQUIPMENT

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

Triad Data Available Upon Request

Signature on file

Approved for Release

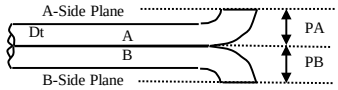
Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection KS

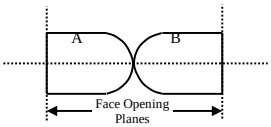
If all Criteria PASS
Cp is equal to 0.84

		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	

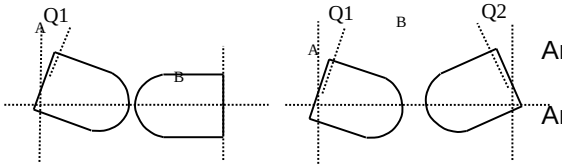


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

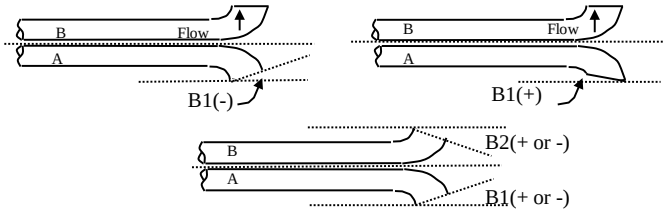


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



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 $\leq 10^o$

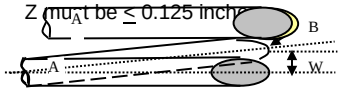


Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

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

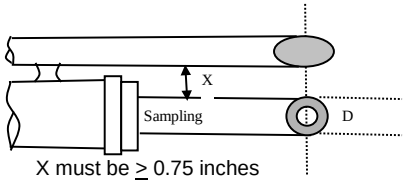
Horizontal offset between A and B Tubes (Z) - inches	0.006	PASS

Z must be $\leq$ 0.125 inches



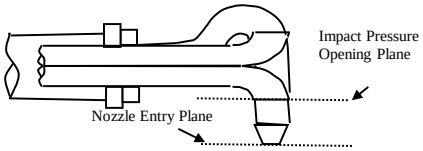
Vertical offset between A and B Tubes (W) - inches	0.012	PASS

W must be $\leq$ 0.03125 inches

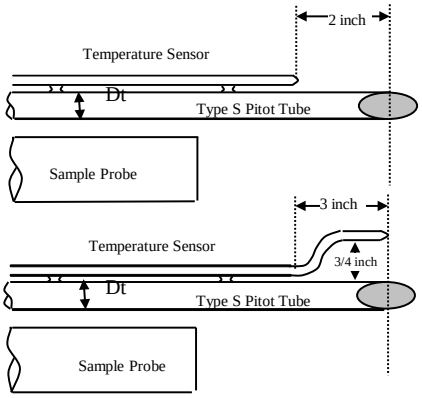


Distance between Sample Nozzle and Pitot (X) - inches	0.79	PASS

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

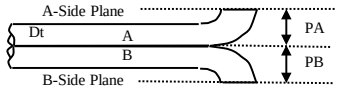
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-701**

Inspection Date 5/30/18 Individual Conducting Inspection SR

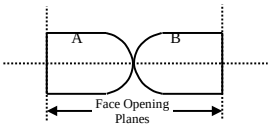
If all Criteria PASS
Cp is equal to 0.84

		PASS/FAIL
Distance to A Plane (PA) - inches	0.466	PASS
Distance to B Plane (PB) - inches	0.466	PASS
Pitot OD (D_t) - inches	0.375	

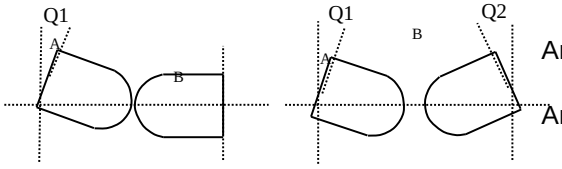


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



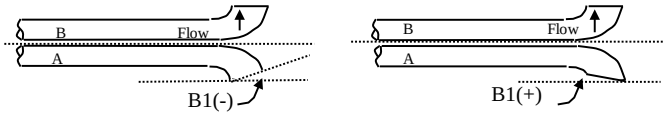
Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



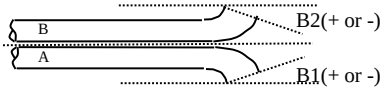
Angle of Q1 from vertical A Tube- degrees (absolute): 0 — PASS

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

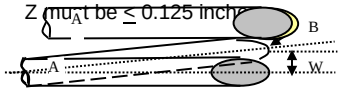


Angle of B1 from vertical B Tube- degrees (absolute): 0 — PASS

B1 or B2 must be ≤ 5°

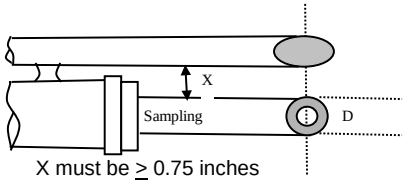
Horizontal offset between A and B Tubes (Z) - inches: 0.008 — PASS

Z must be ≤ 0.125 inches



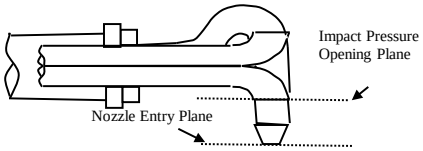
Vertical offset between A and B Tubes (W) - inches: 0.02 — PASS

W must be ≤ 0.03125 inches

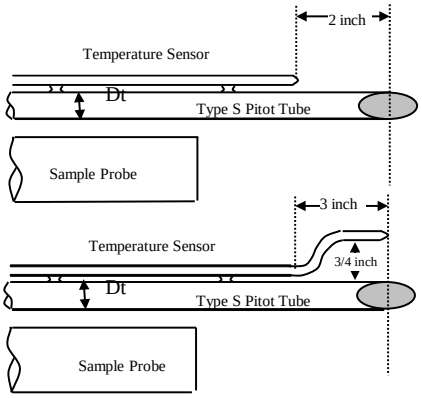


Distance between Sample Nozzle and Pitot (X) - inches: 0.89 — PASS

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

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

Calibrator MDW | **Meter Box Number** 24 | **Ambient Temp** 72

Date 17-Aug-18 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 17087363

Baro Press, in Hg (Pb)	29.68

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	5.00	165.901	72.0	76.00	76.00	76.5	12.8	0.9917	1.8463
		170.979		77.00	77.00				
		5.078		76.50	76.50				
1.0	5.0	173.050	72.0	77.00	77.00	77.5	9.1	1.0024	1.8629
		178.077		78.00	78.00				
		5.027		77.50	77.50				
1.5	10.0	179.100	72.0	78.00	78.00	78.5	15.1	0.9948	1.9199
		189.237		79.00	79.00				
		10.137		78.50	78.50				
2.0	10.0	190.250	72.0	79.00	79.00	79.0	13.2	0.9928	1.9544
		200.405		79.00	79.00				
		10.155		79.00	79.00				
3.0	10.0	201.439	72.0	80.00	80.00	80.0	11.0	0.9901	2.0320
		211.615		80.00	80.00				
		10.176		80.00	80.00				
							Average	**0.9944**	**1.9231**

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

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

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

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

Reference Temperature	Temperature Reading from Individual Thermocouple Input [1]						Average Temperature Reading	Temp Difference [2] (%)
Select Temperature ○ °C ◉ °F	Channel Number							
	1	2	3	4	5	6		
32	32	32	32	32	32		32.0	0.0%
212	212	212	212	212	212		212.0	0.0%
932	931	930	928	930	928		929.4	0.2%
1832	1828	1831	1832	1828	1830		1829.8	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. 24

04/30/2019 + 05/01/2019

	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.	81.5	102.3	79.6

$$Tma = Ts + 460$$

$$Tma = 81.46 + 460$$

Tma =	541.46	562.29	539.63

Ps = Absolute meter pressure, inches Hg.			
13.60 = Specific gravity of mercury.			
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	0.70	0.60	0.81
Pb = Barometric Pressure, in Hg.	30.20	30.20	30.30

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

$$Pm = 30.2 + (0.700416666666667 / 13.6)$$

Pm =	30.25	30.24	30.36

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.	43.943	41.735	47.697
Y = Dry gas meter calibration factor (based on full calibration)	0.9944	0.9944	0.9944
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.9231	1.9231	1.9231
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.8229	0.7635	0.8940
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 43.94) * SQRT (0.0319 * 541.46 * 29) / (1.92 * 30.25 * 28.84) * 0.82$$

$$Yqa = 2.185 * SQRT 500.903 / 1,677.499 * 0.82$$

Yqa =	0.9823	0.9782	0.9798

Diff = Absolute difference between Yqa and Y	1.22	1.63	1.47

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

$$Diff = ((0.9944 - 0.982) / 0.9944) * 100$$

Average Diff = 1.44

Allowable = 5.0

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

Calibrator MDW | **Meter Box Number** 23 | **Ambient Temp** 72

Date 11-Feb-19 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 17087349

Baro Press, in Hg (Pb)	30.7

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	531.257	72.0	73.00	73.00	73.0	14.0	1.0363	2.1493
		536.085		73.00	73.00				
		4.828		73.00	73.00				
1.0	5.0	537.085	72.0	73.00	73.00	73.5	10.2	1.0034	2.2797
		542.070		74.00	74.00				
		4.985		73.50	73.50				
1.5	10.0	543.080	72.0	76.00	76.00	76.0	16.8	0.9905	2.3083
		553.215		76.00	76.00				
		10.135		76.00	76.00				
2.0	10.0	554.221	72.0	77.00	77.00	77.0	14.8	0.9850	2.3841
		564.420		77.00	77.00				
		10.199		77.00	77.00				
3.0	10.0	565.462	72.0	77.00	77.00	77.0	12.0	0.9871	2.3416
		575.635		77.00	77.00				
		10.173		77.00	77.00				
							Average	**1.0005**	**2.2926**

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

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

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

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

Reference Temperature	Temperature Reading from Individual Thermocouple Input [1]						Average Temperature Reading	Temp Difference [2] (%)
Select Temperature ○ °C ◉ °F	Channel Number							
	1	2	3	4	5	6		
32	32	32	32	32	33		32.2	0.0%
212	212	213	213	212	213		212.6	-0.1%
932	931	932	931	932	933		931.8	0.0%
1832	1831	1833	1833	1832	1833		1832.4	0.0%

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. 23

04/30/2019 + 05/01/2019

	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.	83.4	89.8	76.2

$$Tma = Ts + 460$$

$$Tma = 83.42 + 460$$

Tma =	543.42	549.75	536.21

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	1.82	1.86	1.75
Pb = Barometric Pressure, in Hg.	30.10	30.10	30.20

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

$$Pm = 30.1 + (1.8175 / 13.6)$$

Pm =	30.23	30.24	30.33

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.	63.472	65.238	62.118
Y = Dry gas meter calibration factor (based on full calibration)	1.0005	1.0005	1.0005
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	2.2926	2.2926	2.2926
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.3254	1.3413	1.2969
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 63.47) * SQRT (0.0319 * 543.42 * 29) / (2.29 * 30.23 * 28.84) * 1.33$$

$$Yqa = 1.512 * SQRT\ 502.715 / 1,998.488 * 1.33$$

Yqa =	1.0054	0.9955	0.9969

Diff = Absolute difference between Yqa and Y	0.49	0.50	0.36

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

$$Diff = ((1.0005 - 1.005) / 1.0005) * 100$$

Average Diff = 0.45

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
Nicholas Guarino	Team Member
Austin Squires	Team Member
Kris Ansley	Team Member
Brandon Berger	Team Member