FLUOROMONOMERS AND PPA MANUFACTURING PROCESSES CARBON ADSORPTION BEDS EMISSIONS TEST REPORT TEST DATES: 12 AND 15 JUNE 2018

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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 ten miles south of the city of Fayetteville. Chemours operating areas on the site include the Fluoromonomers, IXM and Polymers Processing Aid (PPA) manufacturing areas, Wastewater Treatment, and Powerhouse.

Chemours contracted Weston Solutions, Inc. (WESTON) to perform HFPO Dimer Acid Fluoride, captured as HFPO Dimer Acid emission testing on two sources at the facility (VE North and PPA Carbon Beds). Testing was performed on 12 and 15 June 2018 and generally followed the "Emission Test Protocol" reviewed and approved by the North Carolina Department of Environmental Quality (NCDEQ). This report provides the results from the emission test program.

1.2 TEST OBJECTIVES

The specific objectives for this test program were as follows:

- Measure the emissions concentrations and mass emissions rates of HFPO Dimer Acid Fluoride from the VE North and PPA Carbon Bed inlets and outlets which are located in the Fluoromonomers and PPA processes.
- Calculate the carbon bed removal efficiency for HFPO Dimer Acid.
- Monitor and record process and emissions control data in conjunction with the test program.
- Provide representative emissions data.

1.3 TEST PROGRAM OVERVIEW

During the emissions test program, the concentrations and mass emissions rates of HFPO Dimer Acid Fluoride were measured on four sources.

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

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

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

Table 1-1
Sampling Plan for VE North Carbon Bed Periodic Testing

Sampling Point & Location	**VE North Carbon Bed**				
Number of Tests:	4 (2 inlet and 2 outlet)				
Parameters To Be Tested:	HFPO Dimer Acid (HFPO-DA)	Volumetric Flow Rate and Gas Velocity	Carbon Dioxide	Oxygen	Water Content
Sampling or Monitoring Method	EPA M-0010	EPA M1, M2, M3A, and M4 in conjunction with M-0010 tests	EPA M3/3A		EPA M4 in conjunction with M-0010 tests
Sample Extraction/ Analysis Method(s):	LC/MS/MS	NA[6]	NA		NA
Sample Size	$\geq 1.5m^3$	NA	NA	NA	NA
Total Number of Samples Collected[1]	4	4	4	4	4
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	8[5]	4	4	4	4

Key:

[1] Sample collected in field.

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

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

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

[5] Actual number of samples collected in field.

[6] Not applicable.

Table 1-2
Sampling Plan for PPA Carbon Bed Periodic Testing

Sampling Point & Location	**PPA Carbon Bed**				
Number of Tests:	4 (2 inlet and 2 outlet)				
Parameters To Be Tested:	HFPO Dimer Acid (HFPO-DA)	Volumetric Flow Rate and Gas Velocity	Carbon Dioxide	Oxygen	Water Content
Sampling or Monitoring Method	EPA M-0010	EPA M1, M2, M3A, and M4 in conjunction with M-0010 tests	EPA M3/3A		EPA M4 in conjunction with M-0010 tests
Sample Extraction/ Analysis Method(s):	LC/MS/MS	NA[6]	NA		NA
Sample Size	$\geq 1.5m^3$	NA	NA	NA	NA
Total Number of Samples Collected[1]	4	4	4	4	4
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	8[5]	4	4	4	4

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 two test runs were performed on the VE North carbon bed inlet and outlet. Two test runs (during Hydrolysis) were performed on the PPA carbon bed inlet and outlet (stack). Table 2-1 provides a summary of the HFPO Dimer Acid carbon bed emissions test results and removal efficiency. 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 Carbon Bed Test Results

	Inlet		Outlet		Removal Efficiency
	g/sec	lb/hr	g/sec	lb/hr	%
PPA Carbon Bed					
R1	2.60E-2	2.07E-1	3.99E-5	3.17E-4	99.8
R2	4.33E-2	3.44E-1	1.09E-4	8.67E-4	99.7
Average	3.47E-2	2.76E-1	7.45E-5	5.92E-4	99.8
VE North Carbon Bed					
R1	1.50E-3	1.19E-2	3.85E-5	3.06E-4	97.4
R2	2.55E-3	2.02E-2	1.39E-5	1.10E-4	99.5
Average	2.03E-3	1.61E-2	2.62E-5	2.08E-4	98.7

3. PROCESS DESCRIPTIONS

The Fluoromonomers and PPA areas are included in the scope of this test program.

3.1 FLUOROMONOMERS

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

The VEN building air systems are vented to the carbon bed and connected to the Tower Exhaust Blower. Process emissions are not vented to the VEN carbon bed.

3.2 POLYMER PROCESSING AID (PPA) AREA

The PPA facility produces surfactants used to produce Chemours Teflon® as well as sales to outside producers of fluoropolymers.

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

3.3 PROCESS OPERATIONS AND PARAMETERS

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

Source	Operation/Product	Batch or Continuous
VE North	PSEPVE	Semi-continuous – Condensation is a continuous Agitated Bed Reactor, Refining (ether column) is batch
PPA	Hydrolysis, AF Column Reboiler/Virgin Pressure Transfers/Virgin or Purified	Continuous once it starts taking off to feed tank 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.

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

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

4. DESCRIPTION OF TEST LOCATIONS

4.1 CARBON BEDS

The two carbon beds have been installed for control of HFPO Dimer Acid Fluoride emissions and located in the VE North and PPA process areas.

4.2 VINYL ETHERS NORTH CARBON BED

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

Location	Distance from Flow Disturbance	
	Downstream (B)	Upstream (A)
Inlet	67 inches > 1.9 duct diameters	61 inches > 1.8 duct diameters
Outlet	58 inches > 1.7 duct diameters	57 inches > 1.5 duct diameters

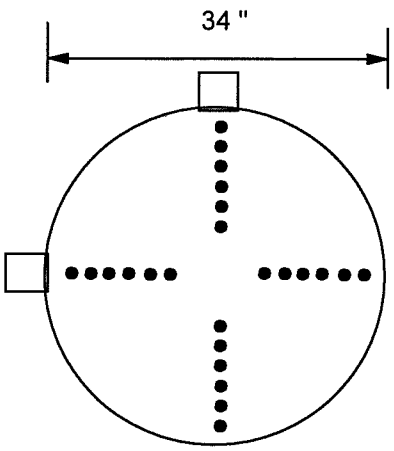
4.3 PPA CARBON BED

Each FRP duct at the inlet of the PPA carbon bed is 34" ID. The test ports are located a minimum of 42" (> 1.2 duct diameters) from the nearest downstream disturbance and at least 57" (> 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.

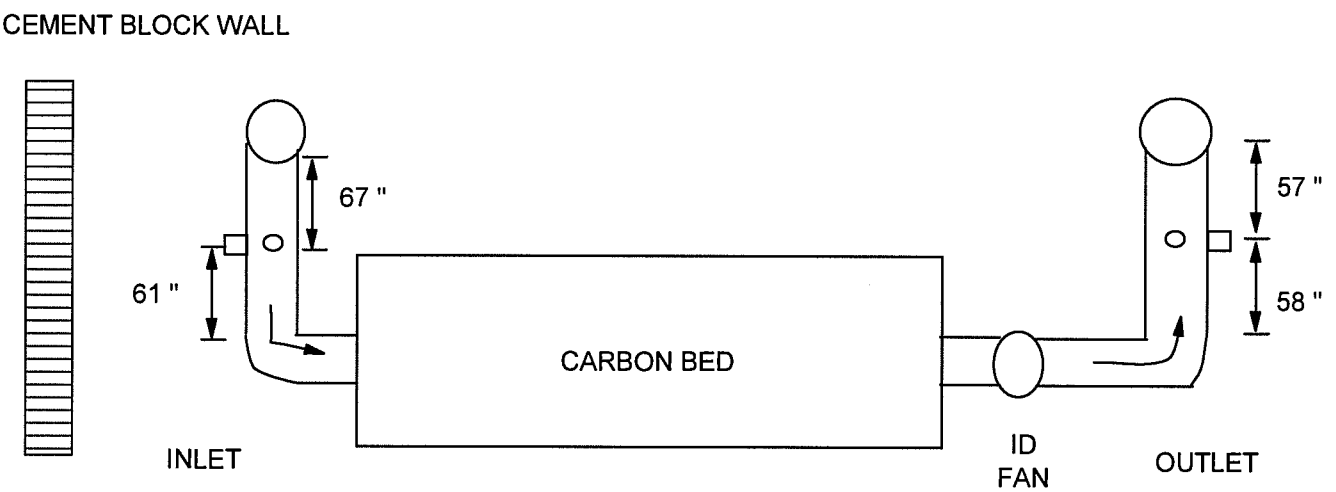
The PPA carbon bed outlet is the PPA stack. See Figure 4-3.

Two 4" ID test ports are in place on the 30" ID fiberglass stack. The ports are 12' (4.8 diameters) from the nearest downstream disturbance (a disconnected demister duct) and 32' (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 M0010 isokinetic sampling.

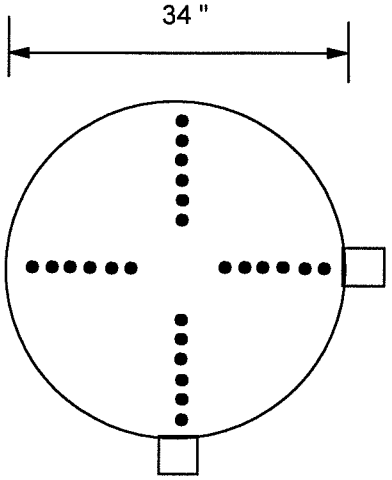


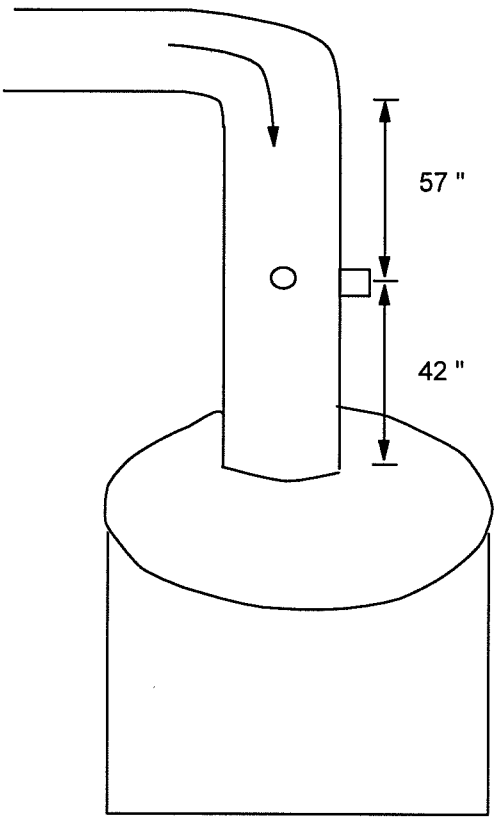
TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	3/4
2	2 1/4
3	4
4	6
5	8 1/2
6	12 1/8
7	21 5/8
8	25 1/2
9	28
10	30
11	31 3/4
12	33 1/4



DRAWING NOT TO SCALE

FIGURE 4-1
VE NORTH PROCESS CARBON BED INLET AND OUTLET SCHEMATIC



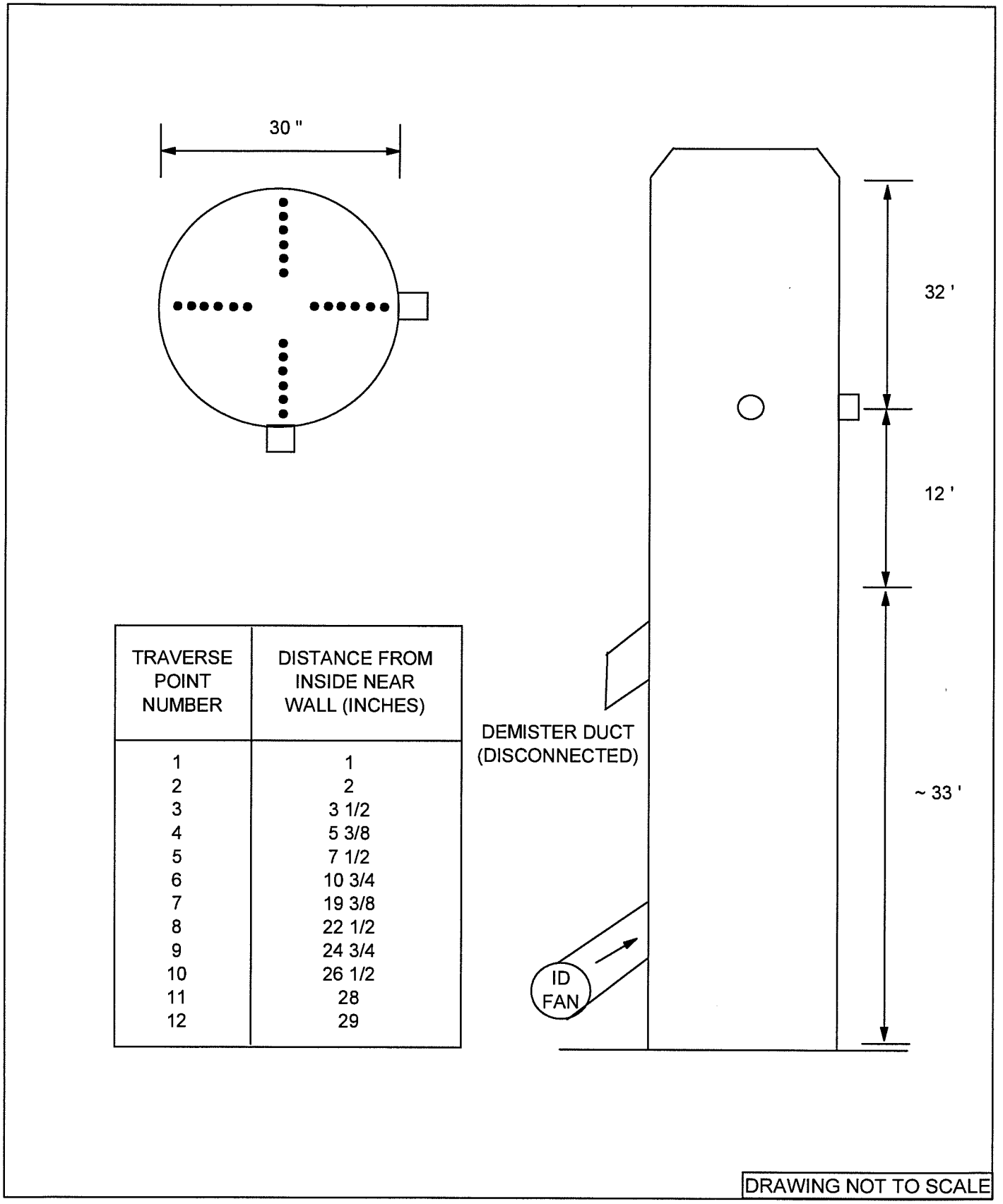


CARBON BED

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 SCHEMATIC



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 4-3
PPA EXHAUST STACK 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 trains and to provide details of the stack sampling and analytical procedures utilized during the emissions test program.

5.1.1 Pre-Test Determinations

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

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

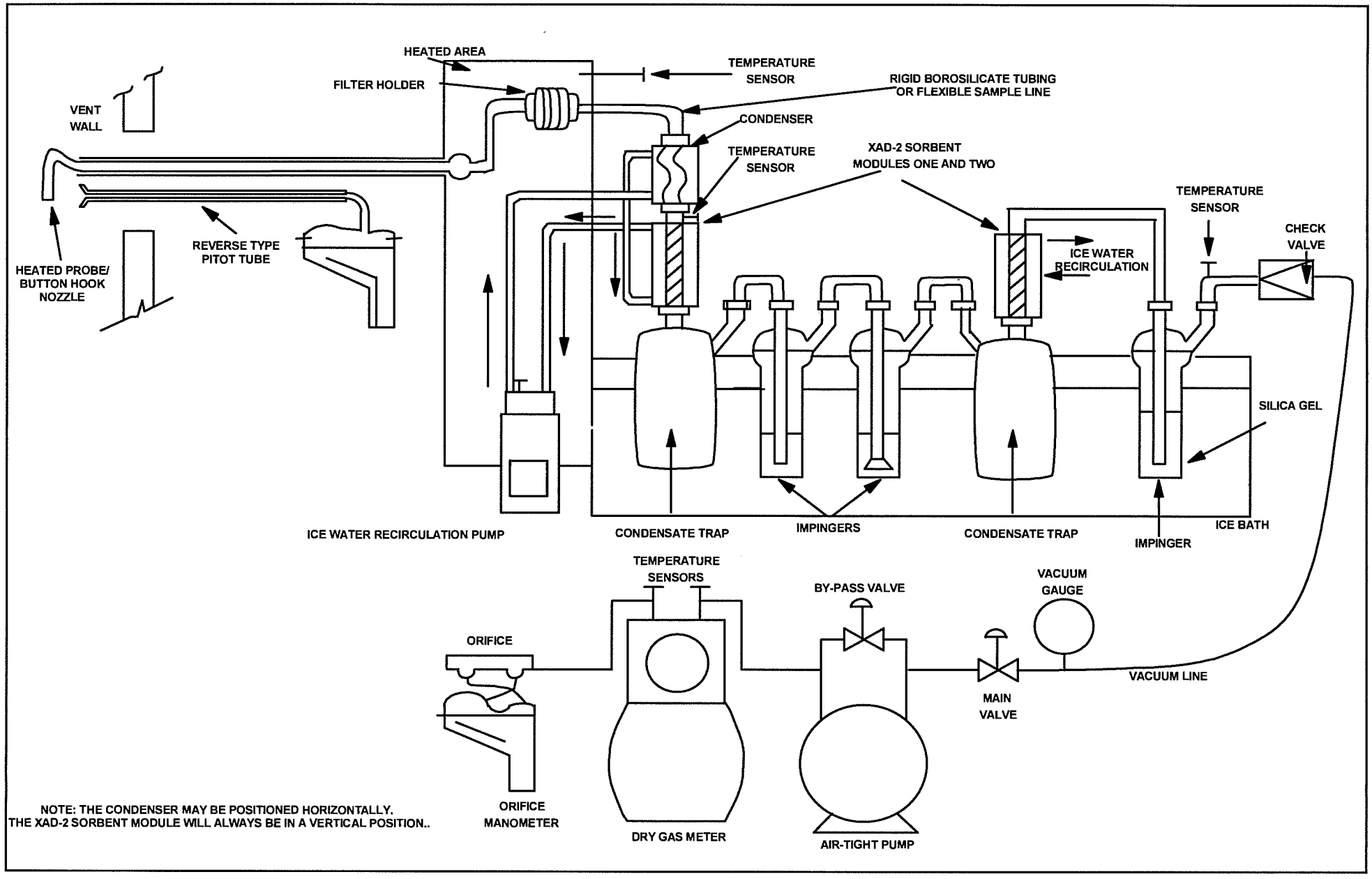


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

A section of borosilicate glass [or flexible polyethylene tubing (VE North carbon bed inlet and outlet only)] connected the filter holder exit to a Grahm (spiral) type ice water-cooled condenser, an icewater-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 both XAD-2 modules 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 ± 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 remains. 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 the impingers one, two, and second condensate trap were measured, the values recorded, and sample was placed in the same container as step 4 above and 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, a Method 0010 blank train was setup near the test location, leak checked and recovered along with the respective sample train. Following sample recovery, all samples were transported to the TestAmerica Inc. for sample extraction and analysis.

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

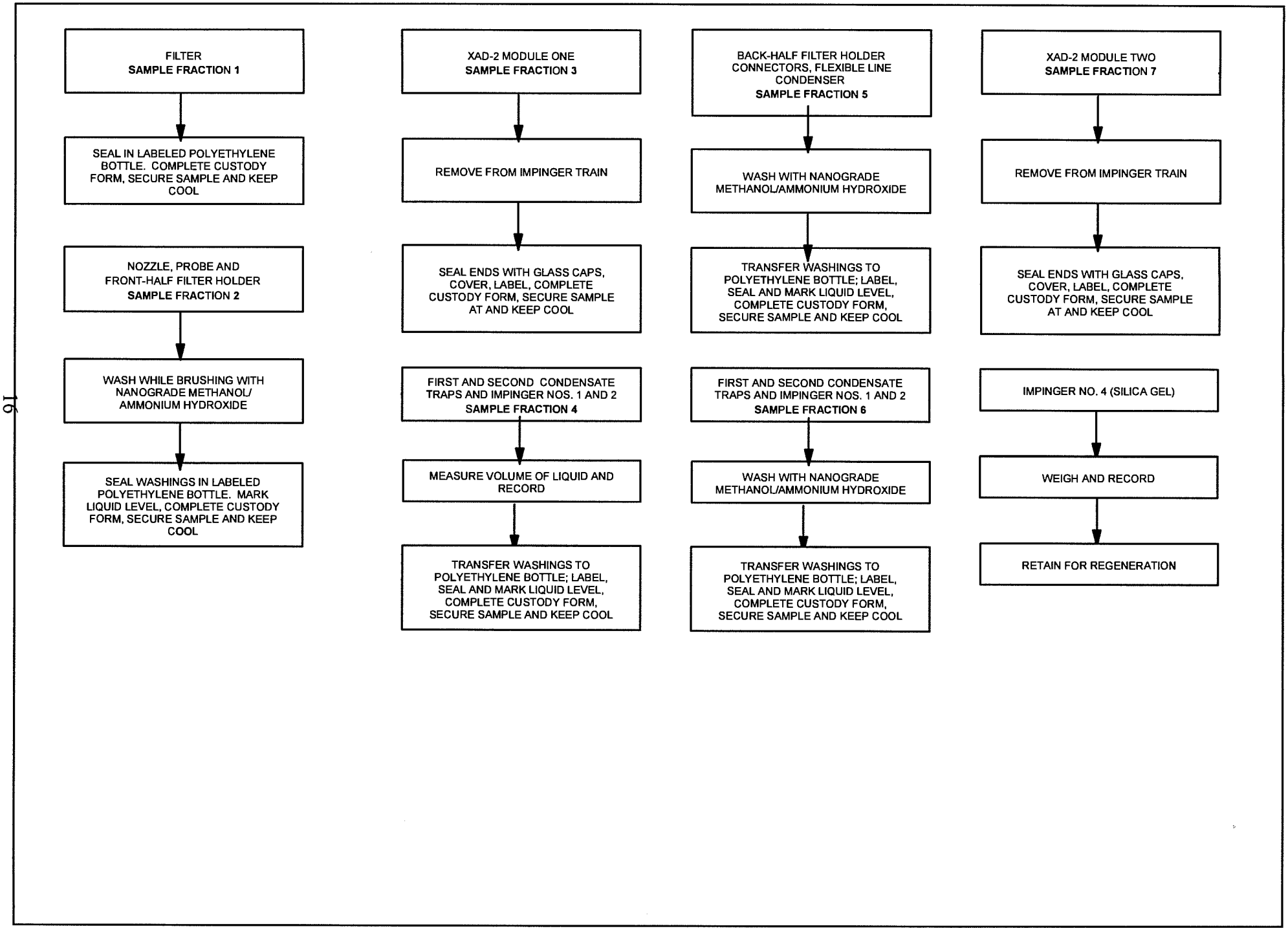


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.005\FIGURE 5-2 EPA 0010

5.2.3 EPA Method 0010 – Sample Analysis

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

- Front-Half Composite—comprised of the Particulate Filter, and the probe, nozzle, and front-half of the filter holder solvent rinses,
- Back-half Composite—comprised of the first XAD-2 resin material and the back-half of the filter holder with connecting glassware solvent rinses,
- Condensate Composite—comprised of the aqueous condensates and the contents of Impingers #1 and 2 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 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.

Test America developed detailed procedures for the sample extraction and analysis for HFPO Dimer Acid. These procedures were incorporated into the test protocol and are summarized in Appendix C.

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 insure sample line integrity and to calculate a bias correction factor after each run using the ratio of the measured concentration of the bias gas certified by the calibration gas supplier.

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

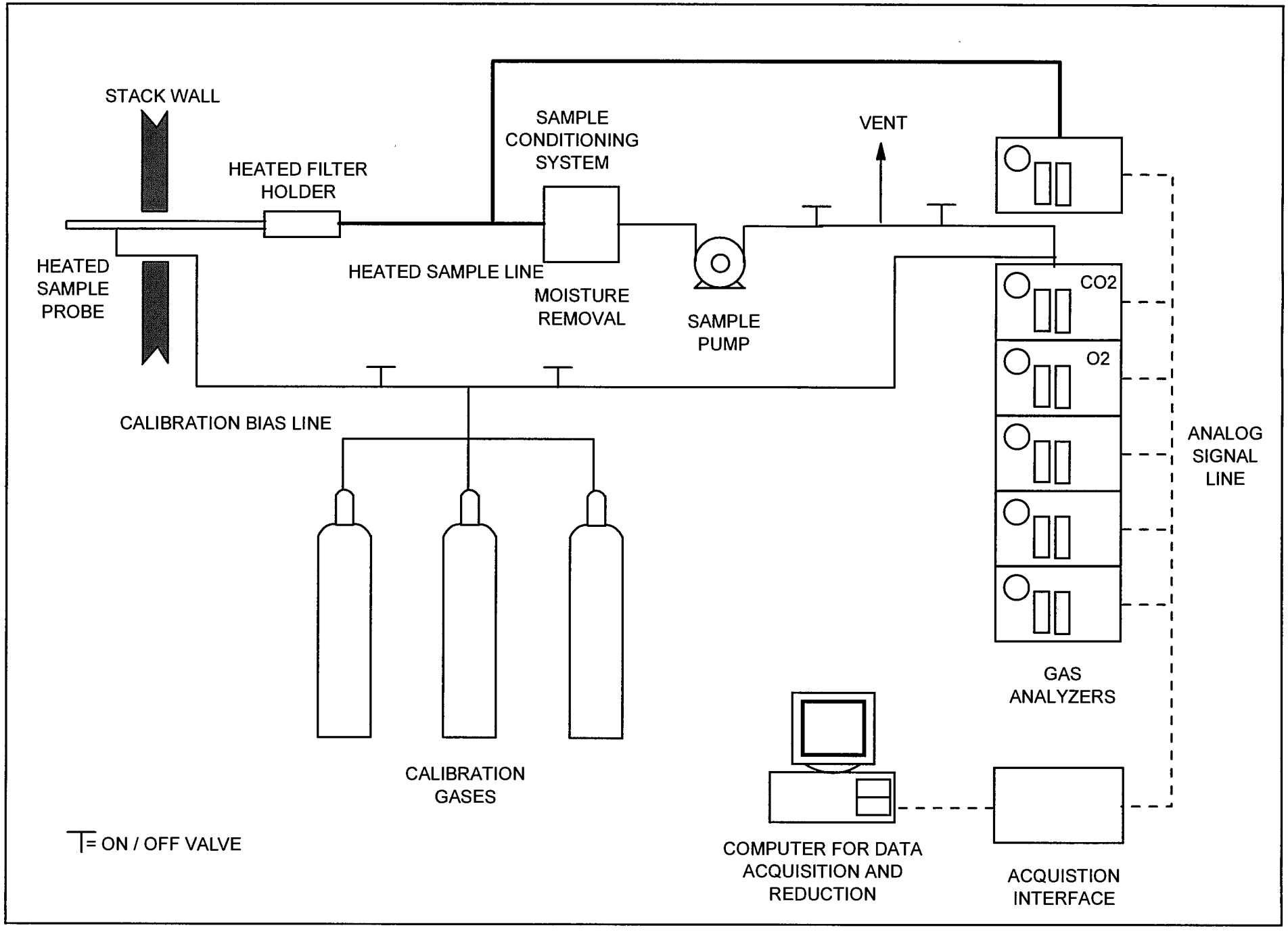


FIGURE 5-3
WESTON SAMPLING SYSTEM

IASDATA\CHEMOURS\15418.002.005\FIGURE 5-3 WESTON SAMPLING SYSTEM

6. DETAILED TEST RESULTS AND DISCUSSION

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

Each test was a minimum of 90 minutes in duration. A total of two test runs were performed on the VE North carbon bed and two test runs were performed on the PPA carbon bed.

Tables 6-1 through 6-4 provide detailed test data and test results for the PPA and VE North carbon beds, 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.

The VE North Carbon Bed inlet location has an obstruction (cement block wall) located in front of the horizontal sample port. The standard 6 ft probe needed to access all of the traverse points could not be used and a standard 5 ft probe was used instead. As a result to last two traverse points all the way into the ductwork could not be sampled. The last traverse point available was sampled at an extended time to account for this discrepancy. WESTON has since designed a sample probe that can reach all of the sample points and still access the sample port. This probe will be used at this location going forward. Also note that the final sample train leak check at this location for run number 1 was slightly above the 0.02 cfm limit. The glassware was checked and the leak check was repeated and was acceptable. Both of these discrepancies were discussed with NC DEQ while on site.

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

Test Data		
Run number	1	2
Location	PPA Carbon Bed - IN	PPA Carbon Bed - IN
Date	6/12/2018	6/12/2018
Time period	0837-1033	1832-2019
SAMPLING DATA:		
Sampling duration, min.	96.0	96.0
Nozzle diameter, in.	0.235	0.235
Cross sectional nozzle area, sq.ft.	0.000301	0.000301
Barometric pressure, in. Hg	30.09	30.08
Avg. orifice press. diff., in H_2O	0.84	0.93
Avg. dry gas meter temp., deg F	70.3	74.8
Avg. abs. dry gas meter temp., deg. R	530	535
Total liquid collected by train, ml	32.7	37.1
Std. vol. of H_2O vapor coll., cu.ft.	1.5	1.7
Dry gas meter calibration factor	0.9960	0.9960
Sample vol. at meter cond., dcf	48.990	51.520
Sample vol. at std. cond., dscf [(1)]	48.940	51.032
Percent of isokinetic sampling	105.7	102.6
GAS STREAM COMPOSITION DATA:		
CO_2, % by volume, dry basis	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.031	0.033
Mole fraction of dry gas	0.969	0.967
Molecular wt. of wet gas, lb/lb mole	28.51	28.48
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:		
Static pressure, in. H_2O	-2.00	-2.00
Absolute pressure, in. Hg	29.94	29.93
Avg. temperature, deg. F	74	76
Avg. absolute temperature, deg.R	534	536
Pitot tube coefficient	0.84	0.84
Total number of traverse points	24	24
Avg. gas stream velocity, ft./sec.	27.8	30.1
Stack/duct cross sectional area, sq.ft.	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	10526	11385
Avg. gas stream volumetric flow, dscf/min.	10093	10845

[(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

TEST DATA		
Run number	1	2
Location	PPA Carbon Bed - IN	PPA Carbon Bed - IN
Date	6/12/2018	6/12/2018
Time period	0837-1033	1832-2019
LABORATORY REPORT DATA, ug.		
HFPO Dimer Acid	7581.3	12227.0
EMISSION RESULTS, ug/dscm.		
HFPO Dimer Acid	5469.4	8459.4
EMISSION RESULTS, lb/dscf.		
HFPO Dimer Acid	3.42E-07	5.28E-07
EMISSION RESULTS, lb/hr.		
HFPO Dimer Acid	2.07E-01	3.44E-01
EMISSION RESULTS, g/sec.		
HFPO Dimer Acid	2.60E-02	4.33E-02

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

Test Data		
Run number	1	2
Location	PPA-STK	PPA-STK
Date	6/12/2018	6/12/2018
Time period	0837-1033	1832-2019
SAMPLING DATA:		
Sampling duration, min.	96.0	96.0
Nozzle diameter, in.	0.191	0.185
Cross sectional nozzle area, sq.ft.	0.000199	0.000187
Barometric pressure, in. Hg	29.99	29.98
Avg. orifice press. diff., in H_2O	0.77	0.62
Avg. dry gas meter temp., deg F	70.1	75.2
Avg. abs. dry gas meter temp., deg. R	530	535
Total liquid collected by train, ml	33.8	18.8
Std. vol. of H_2O vapor coll., cu.ft.	1.6	0.9
Dry gas meter calibration factor	0.9916	0.9916
Sample vol. at meter cond., dcf	43.540	39.820
Sample vol. at std. cond., dscf [(1)]	43.169	39.079
Percent of isokinetic sampling	100.3	99.4
GAS STREAM COMPOSITION DATA:		
CO_2, % by volume, dry basis	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.036	0.022
Mole fraction of dry gas	0.964	0.978
Molecular wt. of wet gas, lb/lb mole	28.45	28.60
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:		
Static pressure, in. H_2O	0.23	0.21
Absolute pressure, in. Hg	30.01	30.00
Avg. temperature, deg. F	81	83
Avg. absolute temperature, deg.R	541	543
Pitot tube coefficient	0.84	0.84
Total number of traverse points	24	24
Avg. gas stream velocity, ft./sec.	39.8	38.3
Stack/duct cross sectional area, sq.ft.	4.91	4.91
Avg. gas stream volumetric flow, wacf/min.	11711	11292
Avg. gas stream volumetric flow, dscf/min.	11059	10769

[(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

TEST DATA		
Run number	1	2
Location	PPA-STK	PPA-STK
Date	6/12/2018	6/12/2018
Time period	0837-1033	1832-2019
LABORATORY REPORT DATA, ug.		
HFPO Dimer Acid	9.4	23.8
EMISSION RESULTS, ug/dscm.		
HFPO Dimer Acid	7.7	21.5
EMISSION RESULTS, lb/dscf.		
HFPO Dimer Acid	4.78E-10	1.34E-09
EMISSION RESULTS, lb/hr.		
HFPO Dimer Acid	3.17E-04	8.67E-04
HFPO Dimer Acid (From Inlet Data)	2.07E-01	3.44E-01
EMISSION RESULTS, g/sec.		
HFPO Dimer Acid	3.99E-05	1.09E-04
Carbon Bed Removal Efficiency, %	99.8	99.7

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

Test Data		
Run number	1	2
Location	VE N. Carbon Bed IN	VE N. Carbon Bed IN
Date	6/15/2018	6/15/2018
Time period	0920-1148	1440-1638
SAMPLING DATA:		
Sampling duration, min.	96.0	96.0
Nozzle diameter, in.	0.218	0.218
Cross sectional nozzle area, sq.ft.	0.000259	0.000259
Barometric pressure, in. Hg	29.95	29.92
Avg. orifice press. diff., in H_2O	1.09	1.31
Avg. dry gas meter temp., deg F	105.3	105.3
Avg. abs. dry gas meter temp., deg. R	565	565
Total liquid collected by train, ml	51.0	50.8
Std. vol. of H_2O vapor coll., cu.ft.	2.4	2.4
Dry gas meter calibration factor	0.9916	0.9916
Sample vol. at meter cond., dcf	54.050	59.659
Sample vol. at std. cond., dscf [(1)]	50.228	55.415
Percent of isokinetic sampling	100.3	101.7
GAS STREAM COMPOSITION DATA:		
CO_2, % by volume, dry basis	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.046	0.041
Mole fraction of dry gas	0.954	0.959
Molecular wt. of wet gas, lb/lb mole	28.34	28.39
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:		
Static pressure, in. H_2O	-4.20	-4.20
Absolute pressure, in. Hg	29.64	29.61
Avg. temperature, deg. F	93	100
Avg. absolute temperature, deg.R	553	560
Pitot tube coefficient	0.84	0.84
Total number of traverse points	24	24
Avg. gas stream velocity, ft./sec.	37.2	40.8
Stack/duct cross sectional area, sq.ft.	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	14064	15446
Avg. gas stream volumetric flow, dscf/min.	12698	13807

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

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

TEST DATA		
Run number	1	2
Location	VE N. Carbon Bed IN	VE N. Carbon Bed IN
Date	6/15/2018	6/15/2018
Time period	0920-1148	1440-1638
LABORATORY REPORT DATA, ug.		
HFPO Dimer Acid	355.6	613.6
EMISSION RESULTS, ug/dscm.		
HFPO Dimer Acid	250.0	390.9
EMISSION RESULTS, lb/dscf.		
HFPO Dimer Acid	1.56E-08	2.44E-08
EMISSION RESULTS, lb/hr.		
HFPO Dimer Acid	1.19E-02	2.02E-02
EMISSION RESULTS, g/sec.		
HFPO Dimer Acid	1.50E-03	2.55E-03

TABLE 6-4
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS

Test Data		
Run number	1	2
Location	VE N. Carbon Bed Outlet	VE N. Carbon Bed Outlet
Date	6/15/2018	6/15/2018
Time period	0920-1148	1440-1638
SAMPLING DATA:		
Sampling duration, min.	96.0	96.0
Nozzle diameter, in.	0.215	0.215
Cross sectional nozzle area, sq.ft.	0.000252	0.000252
Barometric pressure, in. Hg	29.95	29.92
Avg. orifice press. diff., in H_2O	1.20	1.28
Avg. dry gas meter temp., deg F	97.4	104.5
Avg. abs. dry gas meter temp., deg. R	557	565
Total liquid collected by train, ml	51.3	53.9
Std. vol. of H_2O vapor coll., cu.ft.	2.4	2.5
Dry gas meter calibration factor	0.9960	0.9960
Sample vol. at meter cond., dcf	57.139	57.171
Sample vol. at std. cond., dscf [1]	54.098	53.407
Percent of isokinetic sampling	103.1	98.7
GAS STREAM COMPOSITION DATA:		
CO_2, % by volume, dry basis	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.043	0.045
Mole fraction of dry gas	0.957	0.955
Molecular wt. of wet gas, lb/lb mole	28.37	28.34
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:		
Static pressure, in. H_2O	4.30	4.30
Absolute pressure, in. Hg	30.27	30.24
Avg. temperature, deg. F	99	103
Avg. absolute temperature, deg.R	559	563
Pitot tube coefficient	0.84	0.84
Total number of traverse points	24	24
Avg. gas stream velocity, ft./sec.	39.5	41.2
Stack/duct cross sectional area, sq.ft.	6.31	6.31
Avg. gas stream volumetric flow, wacf/min.	14961	15593
Avg. gas stream volumetric flow, dscf/min.	13670	14097

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

TABLE 6-4(cont.)
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS

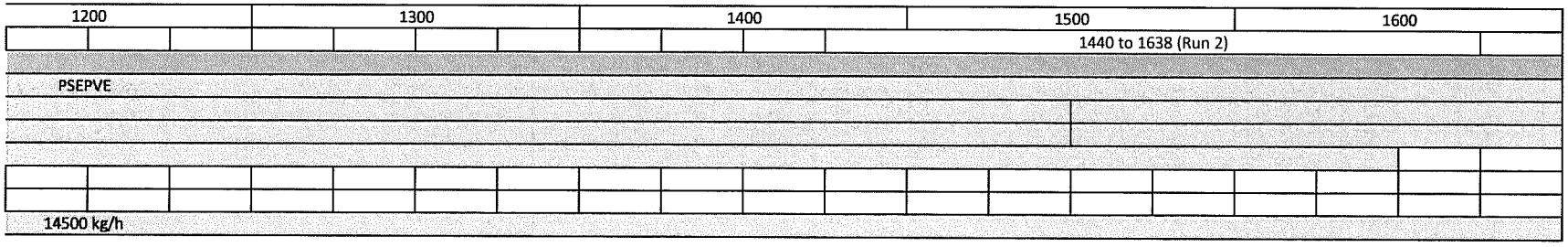
TEST DATA		
Run number	1	2
Location	VE N. Carbon Bed Outlet	VE N. Carbon Bed Outlet
Date	6/15/2018	6/15/2018
Time period	0920-1148	1440-1638
LABORATORY REPORT DATA, ug.		
HFPO Dimer Acid	9.16	3.16
EMISSION RESULTS, ug/dscm.		
HFPO Dimer Acid	6.0	2.1
EMISSION RESULTS, lb/dscf.		
HFPO Dimer Acid	3.73E-10	1.30E-10
EMISSION RESULTS, lb/hr.		
HFPO Dimer Acid	3.06E-04	1.10E-04
HFPO Dimer Acid (From Inlet Data)	1.19E-02	2.02E-02
EMISSION RESULTS, g/sec.		
HFPO Dimer Acid	3.85E-05	1.39E-05
Carbon Bed Removal Efficiency, %	97.4	99.5

APPENDIX A
PROCESS OPERATIONS DATA

Date	6/12/2018															
Time	700				800				900				1000			
Stack Testing							0837 to 1033 (Run 1 - Hydrolysis)									
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												X	X			
Vap heels pressure transfer																
Vap cycle																
Venting after press tran from North/South Acid tank to Hyd																
DAF tran to Hyd - venting during transfer							X	X	X	X	X					
Hydrolysis - transfer to Waste Acid Trailer																
Scrubber Recirculation Flow	38 GPM															
Scrubber dP	0 TO .25 INWC															

					[redacted]	6/12/2018											
	1100					1800				1900				2000			
								1832 to 2019 (Run 2 - Hydrolysis)									
													X	X			
								X	X	X	X	X	X	X			
								X	X	X	X	X					
								38 GPM									
								0 TO 0.25 INWC									

Date	6/15/2018																
Time	800				900				1000				1100				
Carbon Bed Testing						920-1140 (Run 1)											
HFPO																	
VEN Product																	
VEN Precursor																	
VEN Condensation (HFPO)																	
VEN ABR																	
VEN Refining																	
Stripper Column Vent																	
Division WGS Recirculation Flow																	


1200
1300
1400
1500
1600
1440 to 1638 (Run 2)
PSEPVE
14500 kg/h

APPENDIX B
RAW AND REDUCED TEST DATA

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS

Test Data		
Run number	1	2
Location	PPA Carbon Bed - IN	PPA Carbon Bed - IN
Date	6/12/2018	6/12/2018
Time period	0837-1033	1832-2019
Operator	AS/JL	AS/JL
Inputs For Calcs.		
Sq. rt. delta P	0.48984	0.52850
Delta H	0.8383	0.9263
Stack temp. (deg.F)	74.0	76.0
Meter temp. (deg.F)	70.3	74.8
Sample volume (act.)	48.990	51.520
Barometric press. (in.Hg)	30.09	30.08
Volume H_2O imp. (ml)	12.0	19.0
Weight change sil. gel (g)	20.7	18.1
% CO_2	0.0	0.0
% O_2	20.9	20.9
% N_2	79.1	79.1
Area of stack (sq.ft.)	6.305	6.305
Sample time (min.)	96.0	96.0
Static pressure (in.H_2O)	-2.00	-2.00
Nozzle dia. (in.)	0.235	0.235
Meter box cal.	0.9960	0.9960
Cp of pitot tube	0.84	0.84
Traverse points	24	24

Sample and Velocity Traverse Point Data Sheet - Method 1

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

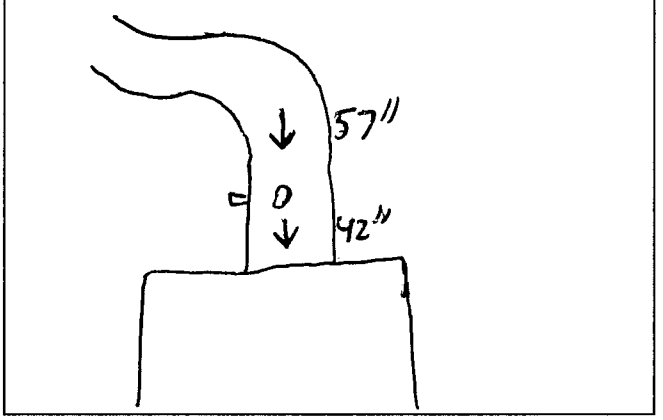
Operator KS
Date 6/11/18
W.O. Number

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

Distance from far wall to outside of port (in.) = C	51
Port Depth (in.) = D	~~14~~ 17
Depth of Duct, diameter (in.) = C-D	34
Area of Duct (ft^2)	6.305
Total Traverse Points	24
Total Traverse Points per Port	12
Port Diameter (in.) —(Flange-Threaded-Hole)	
Monorail Length	
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	
Equivalent Diameter = (2*L*W)/(L+W)	

Flow Disturbances	
Upstream - A (ft)	3.50
Downstream - B (ft)	4.75
Upstream - A (duct diameters)	1.24
Downstream - B (duct diameters)	1.70

Diagram of Stack



Traverse Point Locations

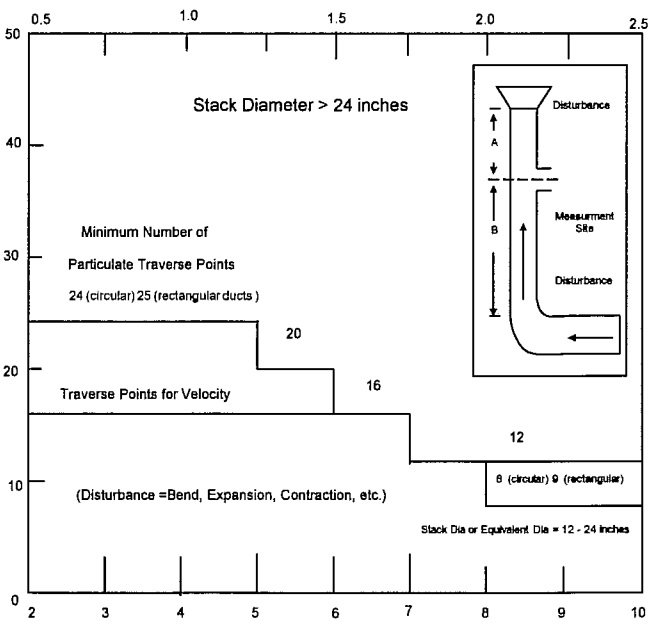
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	2.1	0.714	17.41	18
2	6.7	2.28	19.28	19 1/3
3	11.8	4.01	21.01	21
4	17.7	6.02	23.02	23
5	25	8.50	25.5	25 1/2
6	35.6	12.10	29.10	29
7	64.4	21.90	38.9	39
8	75	25.5	42.5	42 1/2
9	82.3	27.98	44.98	45
10	88.2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

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations

1	0.167		
2	0.50		
3	0.833		

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

Duct Diameters Upstream from Flow Disturbance (Distance A)



Duct Diameters Downstream from Flow Disturbance (Distanca B)

Traverse Point Location Percent of Stack -Circular

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

Traverse Point Location Percent of Stack -Rectangular

Traverse Point \ Number of Traverse Points	1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2												
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4												
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6												
7							92.9	81.3	72.2	65.0	59.1	54.2
8												
9									94.4	85.0	77.3	70.8
10												
11											95.5	87.5
12												

WESTON MANAGERS DESIGNERS/CONSULTANTS

PPA

Determination of Stack Gas Velocity - Method 2

Client: Chemours | Operator: AS/TL | Pitot Coeff (Cp): .84
Location/Plant: Fayetteville | Date: 06/11/18 | Stack Area, ft² (As): 6.30
Source: ~~Scrubber~~ Inlet (EW) | W.O. Number: 15916027.0225 | Pitot Tube/Thermo ID: P697
Carbon Bed

Run Number			
Time	14:15 – 14:45		
Barometric Press, in Hg (Pb)	29.93		
Static Press, in H_2O (Pstatic)	-2		
Source Moisture, % (BWS)	~3		
O_2, %	20.9		
CO_2, %	0		

Cyclonic Flow Determination		Traverse Location		Leak Check good? (Y) / N		Leak Check good? Y / N		Leak Check good? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0		A	1	.35	88				
0			2	.34	88				
0			3	.32	88				
0	2°		4	.32	88				
0			5	.32	88				
0			6	.28	88				
0			7	.20	88				
0	5°		8	.16	88				
0			9	.14	88				
0	10°		10	.12	88				
0	5°		11	.10	89				
0			12	.14	90				
0		B	1	.22	92				
0			2	.25	91				
0	10°		3	.25	91				
0	5°		4	.26	90				
0			5	.27	90				
0			6	.28	90				
0			7	.30	89				
0	10		8	.32	89				
100	10		9	.32	89				
0			10	.28	89				
0			11	.25	90				
0			12	.30	91				
Avg Angle		Avg Delta P & Temp		.2537	89.17°				
		avg √DeltaP		.5040.4976					
Average gas stream velocity, ft/sec.				28.867					
Vol. flow rate @ actual conditions, wacf/min				10911.627					
Vol. flow rate at standard conditions, dscf/min				10198.792					

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

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments _____

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.005
Project ID	Chemours
Mode/Source ID	PPA Carbon Bed
Samp. Loc. ID	IN
Run No.ID	1
Test Method ID	M0010
Date ID	11JUN2018
Source/Location	PPA Carbon Bed Inlet
Sample Date	6/12/18
Baro. Press (in Hg)	30.09
Operator	AS/JL

Stack Conditions		
	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		12
Silica gel (g)		20.7
CO2, % by Vol	0	0
O2, % by Vol	20.9	20.0
Temperature (°F)	80	
Meter Temp (°F)	80	
Static Press (in H_2O)	-2	-2
Ambient Temp (°F)	72	

Meter Box ID	25	
Meter Box Y	.9960	
Meter Box Del H	1.9921	
Probe ID / Length	P701	6'
Probe Material	Boro	
Pitot / Thermocouple ID	P701	
Pitot Coefficient	0.84	
Nozzle ID	.235	
Nozzle Measurements	.235 / .235 / .235	
Avg Nozzle Dia (in)	.235	
Area of Stack (ft^2)	6.31	
Sample Time	96	
Total Traverse Pts	24	

Sample Train (ft^3)			
Leak Check @ (in Hg)	.010		.006
Pitot leak check good	15"		9"
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
Meter Box Temp	73		74
Reference Temp	72.1		73.6
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

K Factor 3.4833

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	0837			234.021 / 235.401									
A 1	4		.16	.56	235.7	73	68	130	130	64	4	62		
2	8		.20	.70	237.5	74	68	130	130	62	4.5	60		
3	12		.20	.70	239.4	74	68	110	110	61	4.5	57		
4	16		.21	.73	241.5	74	68	110	110	61	4.5	58		
5	20		.23	.80	243.4	74	69	110	110	61	4.5	58		
6	24		.23	.80	245.6	74	69	110	110	62	4.5	58		
7	28		.24	.84	247.3	74	69	110	110	62	4.5	59		
8	32		.25	.87	249.5	74	69	110	110	63	5	60		
9	36		.25	.87	251.6	74	70	110	110	64	5	60		
10	40		.25	.87	253.7	74	70	110	110	65	5	62		
11	44		.25	.87	255.7	74	70	110	110	66	5	61		23.788
12	48	0925	.25	.87	257.809	74	70	110	110	64	5	42		
B 1	52	0945	.21	.73	259.7	74	71	110	110	63	4.5	46		
2	56		.23	.80	261.7	74	71	110	110	61	5	46		
3	60		.24	.84	263.8	74	71	110	110	60	5	45		
4	64		.25	.87	265.8	74	71	110	110	59	5	41		
5	68		.25	.87	267.9	74	71	110	110	58	5	38		
6	72		.25	.87	270.0	74	71	110	110	57	5	39		
7	76		.26	.90	272.1	75	72	110	110	58	5	46		ΔSO: 105.5
8	80		.26	.90	274.3	74	72	110	110	58	5	40		Moist: 2.99
9	84		.27	.94	276.5	74	72	110	110	57	5.5	37		SCFM: 1016.24
10	88		.27	.94	278.6	74	72	110	111	56	5.5	41		SVOL: 48.94
11	92		.28	.97	280.9	74	72	110	110	56	5.5	44		
12	96	1033	.29	1.01	283.011	74	73	110	110	56	5.5	43		25,202
			Avg Delta P .24083	Avg Delta H .8383	Total Volume 48.990	Avg Ts 74	Avg Tm 70.29	Min/Max 110/130	Min/Max 110/130	Max 66	Max Vac 5.5	Min/Max 37/62		
			Avg Sqrt Delta P .490	Avg Sqrt Del H .914	Comments:									

0.24981

EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

			Stack Conditions	
Client	Chemours		Assumed	Actual
W.O.#	15418.002.005	% Moisture	2	
Project ID	Chemours	Impinger Vol (ml)		19
Mode/Source ID	PPA Carbon Bed	Silica gel (g)		18.1
Samp. Loc. ID	IN	CO2, % by Vol	0	0
Run No.ID	#2	O2, % by Vol	20.9	20.6
Test Method ID	M0010	Temperature (°F)	74	
Date ID	11JUN2018	Meter Temp (°F)	75	
Source/Location	PPA Carbon Bed Inlet	Static Press (in H_2O)	-2	-2
Sample Date	6/12/18			
Baro. Press (in Hg)	30.05			
Operator	ASIJL	Ambient Temp (°F)	74	

Meter Box ID	25		
Meter Box Y	.9960		
Meter Box Del H	1.9921		
Probe ID / Length	P701	6'	Sample Train (ft³)
Probe Material	Boro		Leak Check @ (in Hg)
Pitot / Thermocouple ID	P709		Pitot leak check good
Pitot Coefficient	0.84		Pitot Inspection good
Nozzle ID	.235		Method 3 System good
Nozzle Measurements	.235 / .235 / .235		**Temp Check**
Avg Nozzle Dia (in)	.235		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 3.48 3.31

	Initial	Mid-Point	Final
	.205		.001
	15"		9"
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	75		72
	73.9		73.0
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	14:32			283.401									
B 1	4		.31	1.03	285.7	74	74	110	110	68	5	62		
2	8		.31	1.03	287.9	75	74	110	110	67	5	45		
3	12		.29	.96	290.0	76	74	110	110	61	5	45		
4	16		.29	.96	292.1	76	74	110	110	58	5	47		
5	20		.29	.96	294.4	76	74	110	110	57	5	47		
6	24		.29	.96	296.5	76	74	110	110	57	5	47		
7	28		.29	.96	298.7	76	75	110	110	57	5	47		
8	32		.29	.96	300.9	76	75	110	111	58	5	45		
9	36		.29	.96	303.1	76	75	110	110	58	5	47		
10	40		.29	.96	305.2	76	75	110	110	59	5	49		
11	44		.29	.96	307.4	76	75	110	110	60	5	51		
12	48	19:20	.29	.96	309.617	76	75	110	110	61	5	56		
A 1	52	19:31	.25	.83	311.8	76	75	110	110	66	5	59		
2	56		.27	.89	313.8	76	75	110	110	63	5	56		
3	60		.28	.93	315.9	77	75	110	110	63	5	40		
4	64		.28	.93	318.2	77	75	110	110	61	5	36		
5	68		.28	.93	320.2	76	75	110	110	58	5	35		
6	72		.28	.93	322.3	76	75	110	110	57	5.5	35		
7	76		.27	.89	324.4	76	75	110	110	55	5.5	36		
8	80		.27	.89	326.6	76	75	110	110	54	5.5	36		
9	84		.26	.86	328.6	76	75	110	110	55	5	36		
10	88		.25	.83	330.7	76	75	110	110	55	5	39		
11	92		.25	.83	332.7	76	75	110	110	54	5	41		
12	96	20:19	.25	.83	334.921	76	75	110	110	53	5	42		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			.28	.92625	87.850	75.96	74.75	110/110	110/111	68	5.5	35/62		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			.529	.962										

WESTON SOLUTIONS

0.27958

0.52850

EPA Method 0010 from EPA SW-846

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.005

Location/Plant: Fayetteville, NC | Source & Location: PPA Carbon Bed Inlet

Run No. 1 | Sample Date 6/11/18 | Recovery Date 6/12/18

Sample I.D. Chemours - PPA Carbon Bed - IN - 1 - M0010 - | Analyst [illegible] | Filter Number [illegible]

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	7	99	103	3					320.7	
Initial	0	100	100	0					300	
Gain	7	-1	3	3				12	20.7	32.7

Impinger Color: clear | Labeled? ✓

Silica Gel Condition: Good | Sealed? ✓

Run No. 2 | Sample Date 6/12/18 | Recovery Date 6/12/18

Sample I.D. Chemours - PPA Carbon Bed - IN - 2 - M0010 - | Analyst [illegible] | Filter Number [illegible]

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	20	100	97	2					318.6	
Initial	0	100	100	0					300	
Gain	20	—	-3	2				19	18.6	37.1

Impinger Color: clear | Labeled? ✓

Silica Gel Condition: Good | Sealed? ✓

Run No. 3 | Sample Date _____ | Recovery Date _____

Sample I.D. Chemours - PPA Carbon Bed - IN - 3 - M0010 - | Analyst _____ | Filter Number _____

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

Impinger Color _____ | Labeled? _____

Silica Gel Condition _____ | Sealed? _____

Check COC for Sample IDs of Media Blanks

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Source Gas Analysis Data Sheet - Modified Method 3/3A

Client Chemours
Location/Plant Fayetteville, NC
Source PPA Inlet
W.O. Number 15418.002.005.0001

Analyst Austin Squires
Date 6/12/18
Analyzer Make & Model Servomex 1440

Calibration

Analysis Number	Span	Calibration Gas Value O_2 (%)	Calibration Gas Value CO_2 (%)	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1	Zero	0	0	0	0
2	Mid	11.93	~~21~~ 8.913	11.9	8.9
3	High	21	16.58	21	16.6
	Average				

Run Number	Analysis Time	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1	11:21	20.0	0.0
2			
3			
	Average		

Run Number	Analysis Time	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1			
2			
3			
	Average		

Span	Cylinder ID
Mid	CC429490
High	SG9169108

**Report all values to the nearest 0.1 percent

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS

Test Data		
Run number	1	2
Location	PPA-STK	PPA-STK
Date	6/12/2018	6/12/2018
Time period	0837-1033	1832-2019
Operator	MW	MW
Inputs For Calcs.		
Sq. rt. delta P	0.69578	0.67127
Delta H	0.7713	0.6192
Stack temp. (deg.F)	80.6	82.5
Meter temp. (deg.F)	70.1	75.2
Sample volume (act.)	43.540	39.820
Barometric press. (in.Hg)	29.99	29.98
Volume H_2O imp. (ml)	21.0	9.0
Weight change sil. gel (g)	12.8	9.8
% CO_2	0.0	0.0
% O_2	20.9	20.9
% N_2	79.1	79.1
Area of stack (sq.ft.)	4.909	4.909
Sample time (min.)	96.0	96.0
Static pressure (in.H_2O)	0.23	0.21
Nozzle dia. (in.)	0.191	0.185
Meter box cal.	0.9916	0.9916
Cp of pitot tube	0.84	0.84
Traverse points	24	24

Sample and Velocity Traverse Point Data Sheet - Method 1

Client: chemours
Location/Plant: Fayetteville NC
Source: P&A Stack

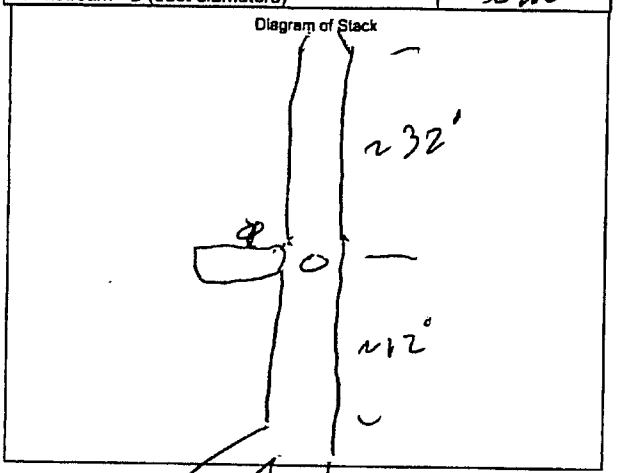
Operator: Paul
Date: 11/8/18
W.O. Number: 15418.002.007

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

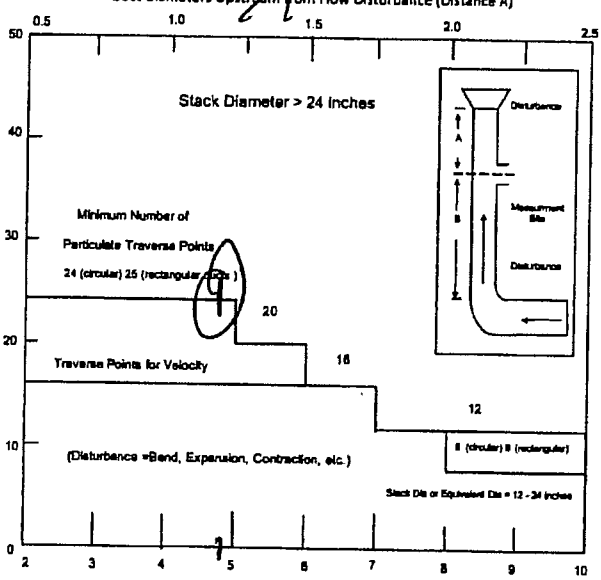
Distance from far wall to outside of port (in.) = C	45
Port Depth (in.) = D	15
Depth of Duct, diameter (in.) = C-D	30
Area of Duct (ft²)	4.909
Total Traverse Points	24
Total Traverse Points per Port	12
Port Diameter (in.) —(Flange-Threaded-Hole)	4"
Monorail Length	—
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	N/A
Total Ports (rectangular duct only)	
Equivalent Diameter = (2*L*W)/(L+W)	

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

Diagram of Stack



Duct Diameters Upstream from Flow Disturbance (Distance A)



Duct Diameters Downstream from Flow Disturbance (Distance B)

Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	2.1	6.3	16
2	6.7	20.	17
3	10.9	3.5	18 1/2
4	17.7	5.3	20 3/8
5	25	7.5	22 1/2
6	35.6	10.7	7.5 3/4
7	64.4	19.3	34 3/8
8	75	22.5	37 1/2
9	82.3	24.7	39 3/4
10	88.2	26.5	41 1/2
11	93.3	28.0	43
12	97.9	29.4	44

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations

1	0.167		
2	0.50		
3	0.833		

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

Traverse Point Location Percent of Stack -Circular

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

Traverse Point Location Percent of Stack -Rectangular

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

WESTON

Determination of Stack Gas Velocity - Method 2

Client: Chanor's | Operator: KS/MW | Pitot Coeff (Cp): ~~0.84~~ .8
Location/Plant: Fayetteville | Date: 1/08/2018 | Stack Area, ft² (As): 4.909
Source: PPA | W.O. Number: 184[illegible] | Pitot Tube/Thermo ID: P696

Run Number	Run 1		
Time	1727 - 1740		
Barometric Press, in Hg (Pb)			
Static Press, in H_20 (Pstatic)	+0.2		
Source Moisture, % (BWS)	~3		
O_2, %	20.9		
CO_2, %	0.0		

Cyclonic Flow Determination		Traverse Location		Leak Check good ? (Y) N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0.07	5	A	1	0.14	65				
0.07	5		2	0.14	65				
0.08	5		3	0.44	67				
0.08	5		4	0.49	68				
0.07	5		5	0.54	69				
0.08	5		6	0.70	70				
0.08	5		7	0.73	70				
0.10	5		8	0.76	70				
0.08	5		9	0.76	71				
0.09	5		10	0.76	71				
0.08	5		11	0.77	71				
0.08	5		12	0.72	71				
-	-	-	-	-	-				
0	0	B	1	0.17	67				
0	0		2	0.17	67				
0	0		3	0.17	67				
0	0		4	0.38	68				
0	0		5	0.51	68				
0	0		6	0.59	69				
0	0		7	0.73	69				
0	0		8	0.79	68				
0	0		9	0.78	70				
0.08	5		10	0.77	70				
0.07	5		11	0.77	70				
0.07	5		12	0.74	70				
Avg Angle		Avg Delta P & Temp		0.5633	69				
		avg $\sqrt{DeltaP}$		0.7273					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

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

$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$

$Qs(act) = 60 * Vs * As$

$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual, wacf/min
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____
method2.xls

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions	
Client	Chemours		
W.O.#	15418.002.005		
Project ID	Chemours	% Moisture	~2 /
Mode/Source ID	PPA	Impinger Vol (ml)	/ 152
Samp. Loc. ID	STK	Silica gel (g)	/ 12.8
Run No.ID	1	CO2, % by Vol	0.1 / 0.0
Test Method ID	M0010	O2, % by Vol	20.8 / 20.9
Date ID	11JUN2018	Temperature (°F)	~64 /
Source/Location	PPA Stack	Meter Temp (°F)	63 /
Sample Date	6/12/18	Static Press (in H_2O)	0.23 / 0.23
Baro. Press (in Hg)	29.99 / 30.09 MW	Ambient Temp (°F)	~66 64
Operator	MD		

Meter Box ID	3	K Factor	1.62
Meter Box Y	0.9916		
Meter Box Del H	2.0587		
Probe ID / Length	P697	Sample Train (ft^3)	
Probe Material	Boro	Leak Check @ (in Hg)	0.005 / 0.005 / 0.005
Pitot / Thermocouple ID	P697	Pitot leak check good	yes / no
Pitot Coefficient	0.84	Pitot Inspection good	yes / no
Nozzle ID	0.191	Method 3 System good	yes / no
Nozzle Measurements	0.191 / 0.191 / 0.191	**Temp Check**	Pre-Test Set / Post-Test Set
Avg Nozzle Dia (in)	0.191	Meter Box Temp	68 / 70
Area of Stack (ft^2)	4.909	Reference Temp	68 / 70
Sample Time	96	Pass/Fail (+/- 2°)	Pass / Fail / Pass / Fail
Total Traverse Pts	24	Temp Change Response ?	yes / no / yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	0837			67.025									
B 1	4		0.66	1.06	68.99	98	67	100	101	66	3	59		
2	8		0.66	1.06	71.20	85	67	100	101	65	3	57		
3	12		0.67	1.03	73.20	81	67	100	101	65	3	57		
4	16		0.55	0.89	74.89	81	68	100	101	50	3	53		# K-Factor 1.56
5	20		0.55	0.86	77.23	81	68	100	100	45	3	53	<=	
6	24		0.53	0.83	79.00	81	68	100	101	45	3	53		
7	28		0.67	1.04	81.11	80	68	100	101	45	3	53		
8	32		0.48	0.74	82.95	80	68	100	100	45	3	53		
9	36		0.40	0.62	84.51	79	69	100	102	46	2	53		
10	40		0.38	0.59	86.18	79	69	100	102	46	2	54		
11	44		0.38	0.59	87.47	78	70	99	99	45	2	54		
12	48	0925	0.29	0.45	89.175	78	70	99	98	45	2	54		
		0945			89.250									
A 1	4		0.35	0.54	90.98	81	71	99	102	46	2	61		
2	8		0.35	0.54	92.50	81	71	100	100	46	2	59		
3	12		0.65	1.01	94.50	80	72	100	100	45	2	57		
4	16		0.65	1.01	96.60	80	72	100	100	45	2	57		
5	20		0.55	0.85	98.54	81	72	100	100	45	2	57		
6	24		0.55	0.85	100.77	81	72	100	100	45	2	55		
7	2232		0.66	1.02	102.00	81	72	100	100	46	2	56		
8	32		0.48	0.74	104.65	81	73	99	99	46	2	56		
9	36		0.40	0.62	106.53	80	72	100	100	47	2	57		
10	40		0.35	0.54	107.71	79	72	100	100	47	2	57		
11	44		0.35	0.54	109.27	79	72	100	99	48	2	57		
12	48	1033	0.28	0.44	110.700	79	72	100	99	48	2	57		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.49333	0.77125	43.54	80.5	70.08	99/100	98/102	66	3	61		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.69578	0.86953										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

1 2

21.45
22.09

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

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		Stack Conditions	Assumed	Actual
Client	Chemours			
W.O.#	15418.002.005	% Moisture	2.5	
Project ID	Chemours	Impinger Vol (ml)		94
Mode/Source ID	PPA	Silica gel (g)		98
Samp. Loc. ID	STK	CO2, % by Vol	0.0	0
Run No.ID	2	O2, % by Vol	20.9	20.9
Test Method ID	M0010	Temperature (°F)	≈ 80	
Date ID	11JUN2018	Meter Temp (°F) MW	70	
Source/Location	PPA Stack	Static Press (in H_2O)	~~0.28~~	0.2
Sample Date	6/12/18		0.2	
Baro. Press (in Hg)	29.98	Ambient Temp (°F)	≈ 70	
Operator	MW MATT WINKELER			

Meter Box ID	31
Meter Box Y	0.996
Meter Box Del H	2.0587
Probe ID / Length	P704 5'
Probe Material	Boro
Pitot / Thermocouple ID	P704
Pitot Coefficient	0.84
Nozzle ID	G185
Nozzle Measurements	0.184 / 0.185 / 0.185
Avg Nozzle Dia (in)	0.185
Area of Stack (ft^2)	4.909
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°)	Pass / Fail
Temp Change Response ?	yes / no

K Factor 1.37

	Initial	Mid-Point	Final
	0.001	0.005	0.005
	c15	c6	c5
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
Pre-Test Set	74		Post-Test Set
	74		68
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1832			111.065									
A 1	4		0.56	0.76	112.81	83	74	100	100	66	3	66	45	
2	8		0.56	0.76	114.70	83	73	100	100	57	3	45		
3	12		0.54	0.73	116.45	83	73	101	100	56	2	44		
4	16		0.54	0.73	118.46	83	73	99	99	55	2	44		20.175
5	20		0.52	0.71	120.30	83	73	99	99	55	2	44		
6	24		0.51	0.70	121.82	83	74	100	100	54	2	45		
7	28		0.50	0.68	123.54	83	74	100	99	53	2	47		
8	32		0.48	0.66	125.29	83	74	100	99	53	2	47		
9	36		0.45	0.62	126.98	82	74	100	99	53	2	47		
10	40		0.35	0.48	128.43	82	74	99	98	55	1	46		
11	44		0.30	0.41	129.89	81	74	99	99	55	1	46		
12	48	1920	0.28	0.38	131.240	81	74	99	99	55	1	46		19.645
		1931			131.300									
B 1	4		0.35	0.48	132.67	83	75	100	100	62	1	47		
2	8		0.35	0.48	134.01	83	76	100	100	59	1	46		
3	12		0.40	0.55	135.70	83	76	99	99	58	1	46		
4	16		0.54	0.73	136.62	83	76	100	101	56	2	47		
5	20		0.52	0.71	139.31	83	76	100	100	56	2	47		
6	24		0.52	0.71	141.08	83	77	100	100	55	2	47		
7	28		0.50	0.68	142.90	83	77	100	100	55	2	47		
8	32		0.45	0.61	144.57	82	77	99	99	56	2	48		
9	36		0.45	0.61	146.19	82	77	100	100	56	2	48		
10	40		0.44	0.60	147.80	82	77	100	100	56	2	46		
11	44		0.40	0.54	149.36	82	78	100	99	57	2	46		
12	48	2019	0.40	0.54	150.945	82	78	100	99	57	2	46		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.45458	0.61917	39.82	82.5	75.2	99/101	99/100	66	3	46		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.67127	0.78348										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.005

Location/Plant: Fayetteville, NC | Source & Location: PPA Stack

Run No. 1 | Sample Date: 6/12/18 | Recovery Date: 6/12/18

Sample I.D.: Chemours - PPA - STK - 1 - M0010 - | Analyst: Pam | Filter Number: NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	8	103	98	12					312.8	
Initial	0	100	100	0					300	
Gain	8	3	-2	12				21	12.8	33.8

Impinger Color: Clear | Labeled? ✓

Silica Gel Condition: Good | Sealed? ✓

Run No. 2 | Sample Date: 6/12/18 | Recovery Date: 6/12/18

Sample I.D.: Chemours - PPA - STK - 2 - M0010 - | Analyst: Pam | Filter Number: NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	9	106	92	2					309.8	
Initial	0	100	100	0					300	
Gain	9	6	-8	2				9	9.8	18.8

Impinger Color: Clear | Labeled? ✓

Silica Gel Condition: Good | Sealed? ✓

Run No. 3 | Sample Date: | Recovery Date:

Sample I.D.: Chemours - PPA - STK - 3 - M0010 - | Analyst: | Filter Number:

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

Impinger Color: | Labeled?

Silica Gel Condition: | Sealed?

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

METHODS AND ANALYZERS

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

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

File: C:\Users\Administrator.WINDOWS-2GHELJO\Desktop\Chemours PPA June 2018.cem
Program Version: 2.0, built 21 Feb 2015 **File Version:** 2.02
Computer: WINDOWS-2GHELJO **Trailer:** 26
Analog Input Device: MCC USB-1608G

Channel 1

Analyte	**O_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 1440 S/N 0144001**
Full-Scale Output, mv	**1000**
Analyzer Range, %	**25.0**
Span Concentration, %	**21.0**

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 1440 S/N 0144001**
Full-Scale Output, mv	**1000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.6**

WESTON SOLUTIONS

CALIBRATION DATA

Number 1

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

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Start Time: 13:36

O_2

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

Calibration Standards

%	Cylinder ID
11.9	CC429490
21.0	SG9169108

Calibration Results

Zero	11 mv
Span, 21.0 %	874 mv

Curve Coefficients

Slope	Intercept
41.10	11

CO_2

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

Calibration Standards

%	Cylinder ID
8.9	CC429490
16.6	SG9169108

Calibration Results

Zero	6 mv
Span, 16.6 %	835 mv

Curve Coefficients

Slope	Intercept
50.00	6

CALIBRATION ERROR DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Start Time: 13:36

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 41.10 **Intercept** 11.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
11.9	11.9	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.6 %
Slope 50.00 **Intercept** 6.0

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

BIAS

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Start Time: 13:43

O_2
Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.2	0.2	1.0	Pass
Span	11.9	11.6	-0.3	-1.4	Pass

CO_2
Method: EPA 3A
Span Conc. 16.6 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	9.0	8.9	-0.1	-0.6	Pass

RUN DATA

Number 0

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Time	O_2 %	CO_2 %
Response Time		
In Eastern Time		
1 Min Response		
13:56:14	0.2	0.1
13:56:24	0.2	0.1
13:56:34	0.2	0.1
13:56:44	0.2	0.1
13:56:54	0.2	0.1
14:57:10 Begin O2/CO2 up		
13:57:04	0.1	0.1
13:57:14	0.1	0.1
13:57:24	0.2	0.1
13:57:34	0.2	0.1
13:57:44	6.3	4.0
13:57:54	11.1	8.7
14:58:10 End O2/CO2 up		
13:58:04	11.5	8.9
13:58:14	11.5	8.9
14:58:30 Begin O2/CO2 down		
13:58:24	11.6	8.9
13:58:34	11.6	8.9
13:58:44	11.6	8.9
13:58:54	11.6	8.9
13:59:04	6.7	5.6
13:59:14	0.5	0.3
14:59:30 End O2/CO2 Down		
13:59:24	0.2	0.1
13:59:34	0.2	0.1
13:59:44	0.2	0.1
13:59:54	0.2	0.1
14:00:04	0.1	0.1
Avgs	**4.0**	**3.1**

WESTON

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Time	O_2 %	CO_2 %
18:33	20.4	0.1
18:34	20.4	0.1
18:35	20.4	0.1
18:36	20.4	0.0
18:37	20.4	0.0
18:38	20.4	0.0
18:39	20.4	0.0
18:40	20.4	0.0
18:41	20.4	0.0
18:42	20.4	0.1
18:43	20.4	0.1
18:44	20.4	0.1
18:45	20.4	0.1
18:46	20.4	0.1
18:47	20.4	0.1
18:48	20.4	0.0
18:49	20.4	0.0
18:50	20.4	0.0
18:51	20.4	0.0
18:52	20.4	0.0
18:53	20.4	0.0
18:54	20.4	0.1
18:55	20.4	0.1
18:56	20.4	0.1
18:57	20.3	0.1
18:58	20.3	0.1
18:59	20.3	0.1
19:00	20.3	0.1
19:01	20.3	0.0
19:02	20.3	0.0
19:03	20.4	0.0
19:04	20.4	0.0
19:05	20.4	0.0
19:06	20.4	0.0
19:07	20.4	0.1
19:08	20.4	0.1
19:09	20.3	0.1
19:10	20.3	0.1
19:11	20.3	0.1
19:12	20.3	0.1
19:13	20.3	0.0
19:14	20.4	0.0

WESTON SOLUTIONS

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Time	O_2 %	CO_2 %
19:15	20.4	0.0
19:16	20.4	0.0
19:17	20.4	0.0
19:18	20.4	0.1
19:19	20.4	0.1
19:20	20.4	0.1
PORT CHANGE		
RESTART		
19:30	20.3	0.0
19:31	20.3	0.0
19:32	20.3	0.1
19:33	20.3	0.1
19:34	20.3	0.1
19:35	20.3	0.1
19:36	20.3	0.1
19:37	20.3	0.1
19:38	20.3	0.0
19:39	20.2	0.0
19:40	20.3	0.0
19:41	20.3	0.0
19:42	20.3	0.0
19:43	20.3	0.0
19:44	20.4	0.1
19:45	20.4	0.1
19:46	20.3	0.1
19:47	20.4	0.1
19:48	20.4	0.1
19:49	20.4	0.1
19:50	20.4	0.0
19:51	20.4	0.0
19:52	20.4	0.0
19:53	20.4	0.0
19:54	20.4	0.0
19:55	20.5	0.0
19:56	20.5	0.0
19:57	20.5	0.1
19:58	20.5	0.1
19:59	20.5	0.1
20:00	20.5	0.1
20:01	20.5	0.1
20:02	20.5	0.1
20:03	20.5	0.1

WESTON

RUN DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Time	O_2 %	CO_2 %
20:04	20.5	0.0
20:05	20.5	0.0
20:06	20.6	0.0
20:07	20.6	0.0
20:08	20.6	0.0
20:09	20.6	0.0
20:10	20.6	0.0
20:11	20.6	0.1
20:12	20.6	0.1
20:13	20.6	0.1
20:14	20.6	0.1
20:15	20.6	0.1
20:16	20.6	0.1
20:17	20.6	0.1
20:18	20.6	0.0
20:19	20.6	0.0
Avgs	**20.4**	**0.1**

WESTON SOLUTIONS

RUN SUMMARY

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

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

Time: 17:30 to 19:20

Run Averages

	20.4	0.1

Pre-run Bias at 13:43

Zero Bias	0.2	0.1
Span Bias	11.6	8.9
Span Gas	11.9	8.9

Post-run Bias at 19:21

Zero Bias	0.1	0.0
Span Bias	12.2	8.9
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	20.6	0.0

WESTON SOLUTIONS℠

BIAS AND CALIBRATION DRIFT

Number 2

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **AJS**
Date: **12 Jun 2018**

Start Time: 19:21

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	11.9	12.2	0.3	1.4	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.2	0.1	-0.1	-0.5	Pass
Span	11.6	12.2	0.6	2.9	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	9.0	8.9	-0.1	-0.6	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.6	Pass
Span	8.9	8.9	0.0	0.0	Pass

*Bias No. 1

WESTON SOLUTIONS

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS

Test Data		
Run number	1	2
Location	VE N. Carbon Bed IN	VE N. Carbon Bed IN
Date	6/15/2018	6/15/2018
Time period	0920-1148	1440-1638
Operator	KA	KA
Inputs For Calcs.		
Sq. rt. delta P	0.63825	0.69650
Delta H	1.0863	1.3092
Stack temp. (deg.F)	92.7	100.2
Meter temp. (deg.F)	105.3	105.3
Sample volume (act.)	54.050	59.659
Barometric press. (in.Hg)	29.95	29.92
Volume H_2O imp. (ml)	29.2	30.3
Weight change sil. gel (g)	21.8	20.5
% CO_2	0.0	0.0
% O_2	20.9	20.9
% N_2	79.1	79.1
Area of stack (sq.ft.)	6.305	6.305
Sample time (min.)	96.0	96.0
Static pressure (in.H_2O)	-4.20	-4.20
Nozzle dia. (in.)	0.218	0.218
Meter box cal.	0.9916	0.9916
Cp of pitot tube	0.84	0.84
Traverse points	24	24

INLET

Sample and Velocity Traverse Point Data Sheet - Method 1

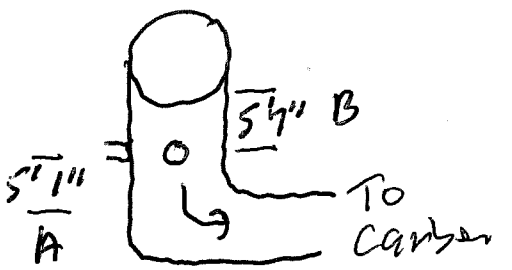
Client Chemours
Loaction/Plant Fayetteville NC
Source VE North Carbon Inlet
Operator AS
Date 6-13-13
W.O. Number

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

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

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

Diagram of Stack



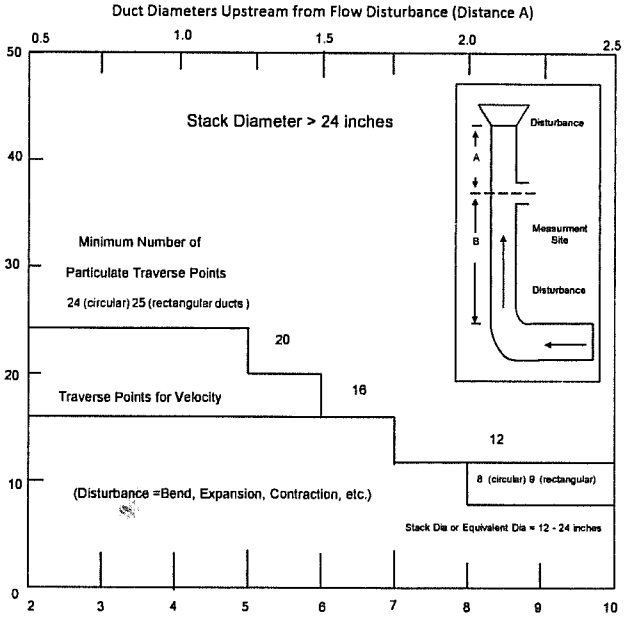
Traverse Point Locations

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

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations

1	0.167		
2	0.50		
3	0.833		

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



Traverse Point Location Percent of Stack -Circular

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

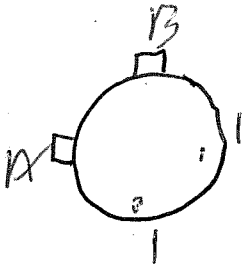
Traverse Point Location Percent of Stack -Rectangular

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

WESTON MANAGERS DESIGNERS/CONSULTANTS

INLET

Determination of Stack Gas Velocity - Method 2



Client: Clemson | Operator: KA | Pitot Coeff (Cp): .842
Location/Plant: Fayetteville NC | Date: 6/13/18 | Stack Area, ft² (As): 6.305
Source: VE Wood Carbon Inlet | W.O. Number: | Pitot Tube/Thermo ID: P703

Run Number	2		
Time	1500		
Barometric Press, in Hg (Pb)	30.01		
Static Press, in H_2O (Pstatic)	-4.2		
Source Moisture, % (BWS)	~2.0		
O_2, %	20.9		
CO_2, %	0.0		

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y/ N		Leak Check good ? Y/ N		Leak Check good ? Y/ N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0	0	A	1	.44	94				
0	0		2	.41	94				
0	0		3	.44	94				
0	0		4	.46	94				
0	0		5	.43	94				
0	0		6	.45	94				
0	0		7	.60	94				
0	0		8	.62	94				
0	0		9	.64	94				
0	0		10	.66	94				
.02	.02		11	.63	94				
0	0		12	.60	94				
0	0	B	1	.55	94				
0	0		2	.57	95				
0	0		3	.55	95				
0	0		4	.55	95				
0	0		5	.53	95				
.01	1		6	.53	95				
0	0		7	.53	95				
0	0		8	.49	95				
.02	2		9	.52	95				
ITA000	0		10	.51	95				
0	0		11	.52	95				
.01	0		12	.50	95				
Avg Angle		Avg Delta P & Temp		.553	94.5				
		avg √DeltaP		.72643					
Average gas stream velocity, ft/sec.					42.1				
Vol. flow rate @ actual conditions, wacf/min				15940					
Vol. flow rate at standard conditions, dscf/min				14760					

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

$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$

$Qs(act) = 60 * Vs * As$

$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$

K = .238
.215 = 1.26

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

		Stack Conditions	Assumed	Actual
Client	Chemours			
W.O.#	15418.002.005			
Project ID	Chemours	% Moisture	2	
Mode/Source ID	VE North Carbon Bed	Impinger Vol (ml)		29.2
Samp. Loc. ID	IN	Silica gel (g)		21.8
Run No.ID	1	CO2, % by Vol	0	0
Test Method ID	M0010	O2, % by Vol	20.9	20.9
Date ID	11JUN2018	Temperature (°F)	95	92.708
Source/Location	VE North Carbon Bed Inlet	Meter Temp (°F)	KA 90.98	105.25
Sample Date	6/15/18	Static Press (in H_2O)	-4.2	-4.2
Baro. Press (in Hg)	29.95			
Operator	KA	Ambient Temp (°F)	73	

Meter Box ID	31
Meter Box Y	.9916
Meter Box Del H	2.0587
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P 103
Pitot Coefficient	0.84
Nozzle ID	.218
Nozzle Measurements	.218 .218 .218
Avg Nozzle Dia (in)	.218
Area of Stack (ft^2)	6.305
Sample Time	96 mins
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 2.65

	Initial	Mid-Point	Final *
	.02 .08	.006 / .006	.018
	15"	6" / 6"	6
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	0920			154.911									
B 12	4	KA	.35	.88	157.0	90	97	127	128	66	3.0	66		
11	8		.33	.88	159.0	91	101	127	128	64	3.0	56		
10	12		.34	.90	161.1	91	101	129	129	61	3.0	54		
9	16		.35	.93	163.1	90	101	129	131	58	3.5	50		
8	20		.34	.90	165.2	90	101	129	130	56	3.5	52		
7	24		.35	.93	167.3	90	101	130	129	57	3.5	53		
6	28		.36	.95	169.4	90	101	129	130	57	4.0	57		
5	32		.42	1.1	KA 171.9	90	101	128	130	56	4.0	51		26.103 cf
4	36		.43	1.1	174.0	90	101	129	129	55	4.5	46		
3	40		.43	1.1	176.2	90	102	129	131	56	4.5	46		
2	44		.45	1.2	178.6	90	102	129	129	55	5.0	47		
1	48	KA 1007.008	.46	1.2	181.014	90	103	130	129	55	5.0	49		
A 1	52	1100	.40	1.1	KA 183.173	95	108	129	130	66	5.0	65		181.173 - leak check
2	56		KA .40	1.1	185.3	95	109	129	129	64	5.0	55		
3	60		.41	1.1	KA 187.6	95	109	129	130	60	5.0	52		
4	64		.42 .39	1.0	189.8	95	110	129	129	60	4.0	50		
5	68		.42	1.1	192.0	95	110	128	128	59	5.0	51		27.947
6	72		.40	1.1	194.6	95	109	128	130	60	4.5	51		
7	76		.45	KA 1.2	196.8	95	110	129	130	61	4.5	54		
8	80		.48	1.3	199.2	95	110	129	130	62	4.5	54		
9	84		.47	1.3	201.8	95	110	129	127	62	5.0	54		
10	88		.48	1.3	204.2	96	110	129	129	64	5.0	55		
11	92		.45	1.2	206.8	96	109	129	129	64	5.0	55		
12	96	1148	.45	1.2	209.120	96	110	129	129	66	5.0	58		
		1148												
			Avg Delta P .408 .470	Avg Delta H 1.086	Total Volume 54.050	Avg Ts 92.708	Avg Tm 105.25	Min/Max 127/130	Min/Max 127/131	Max 66	Max Vac 5.0	Min/Max 46/66		
			Avg Sqrt Delta P .6382 .6858	Avg Sqrt Del H 1.040	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

0.6382

* Final leak check at 6" was slightly above 0.02. The filter holder had turned in the box and was reoriented to original position. The leak test was repeated and was 0.018" 50.228

100.3 I 4.16% m 12692 scfm

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

		Stack Conditions					
Client	Chemours		Assumed	Actual	Meter Box ID	31	
W.O.#	15418.002.005	% Moisture	2		Meter Box Y	.9916	
Project ID	Chemours	Impinger Vol (ml)		30.3	Meter Box Del H	2.0587	
Mode/Source ID	VE North Carbon Bed	Silica gel (g)		20.5	Probe ID / Length		
Samp. Loc. ID	IN	CO2, % by Vol	0	0	Probe Material	Boro	
Run No.ID	2	O2, % by Vol	20.9	20.9	Pitot / Thermocouple ID	P705	
Test Method ID	M0010	Temperature (°F)	100	100.167	Pitot Coefficient	0.84	
Date ID	11JUN2018	Meter Temp (°F)	107	106.25	Nozzle ID	.218	
Source/Location	VE North Carbon Bed Inlet	Static Press (in H_2O)	-4.2	-4.2	Nozzle Measurements	.218 .218 .218	
Sample Date	6/15/18				Avg Nozzle Dia (in)	.218	
Baro. Press (in Hg)	29.92				Area of Stack (ft^2)	6.305	
Operator	KA	Ambient Temp (°F)	88		Sample Time	96 min	
					Total Traverse Pts	24	

K Factor 2.65

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.009	.007	.005
Leak Check @ (in Hg)	15"	6	8"
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp			
Reference Temp			
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1440			209.742									
B 12	4		.37	.98	211.9	101	98	129	130	66	4.0	60		
11	8		.43	1.1	214.1	100	98	128	127	62	4.0	55		
10	12		.41	1.1	216.4	100	99	128	127	60	4.0	52		
9	16		.43	1.2	218.7	100	101	127	127	61	4.5	50		26.516 #
8	20		.44	1.2	221.0	100	102	129	128	58	4.5	52		
7	24		.42	1.1	223.4	100	103	129	129	56	4.5	48		
6	28		.44	1.2	225.7	100	103	129	130	58	5.0	50		
5	32		.43	1.1	228.1	100	104	130	130	59	4.5	54		
4	36		.39	1.0	230.5	100	105	128	129	61	4.5	53		
3	40		.28	.74	232.2	100	106	128	130	62	4.5	53		236.354
2	44		.30	.80	234.2	100	105	129	130	63	4.5	52		
1	48	1528	.34	.40	236.258	100	105	129	129	65	4.5	52		
A 1	52	1550	KA .43.51	KA 1.4	239.0	101	107	128	129	66	5.0	54		
2	56		.50	1.3	241.3	101	108	129	128	63	5.0	50		
3	60		.55	1.5	244.2	100	108	128	127	57	5.0	50		
4	64		.42	1.1	246.5	100	108	128	129	59	5.0	52		
5	68		.52	1.4	249.2	100	108	129	130	60	5.0	54		33.143 #
6	72		.58	1.5	251.8	100	108	129	129	62	5.0	53		
7	76		.67	1.8	254.7	100	108	130	130	59	5.5	51		
8	80		.70	1.9	257.8	100	108	129	129	60	6.0	54		
9	84		.65	1.7	260.6	100	108	130	129	55	6.0	52		
10	88		.70	1.9	263.5	100	109	130	130	57	6.0	51		
11	92		.68	1.8	266.4	100	109	129	128	59	6.0	53		
12	96	1638	.68	1.8	269.497	101	109	130	129	61	6.0	55		
			12	11										
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			.49333	1.309	59.659	100.167	105.25	127/130	127/130	66	6.0	48/60		
			Avg Sqrt Delta P	Avg Sqrt Delta H	Comments:									
			.69650	1.134										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

101.8 Tds 4.14 % m

13797 scfm 55.4 Vm

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.005

Location/Plant: Fayetteville, NC | Source & Location: VE North Carbon Bed Inlet

Run No. 1 | Sample Date 6/15/18 | Recovery Date 6/15/18

Sample I.D. Chemours - VE North Carbon Bed - IN - 1 - M0010 - | Analyst JMO | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20		XAD-1	XAD-2			Silica Gel	
Final	18	100	100	0	323.2	310.9			321.8	
Initial	0	100	100	0	312.0	310.9			300	
Gain	18	0	0	0	11.2	0		29.2	21.8	51

Impinger Color: all clear | Labeled? ✓

Silica Gel Condition: ~~blue~~ 30% | Sealed? ✓

Run No. 2 | Sample Date 6/15/18 | Recovery Date 6/15/18

Sample I.D. Chemours - VE North Carbon Bed - IN - 2 - M0010 - | Analyst JMO | Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20		XAD-1	XAD-2			Silica Gel	
Final	22	100	100	0	297.6	311.8			320.5	
Initial	0	100	100	0	289.3	311.8			300	
Gain	22	0	0	0	8.3	0		30.3	20.5	50.8

Impinger Color: all clear | Labeled? ✓

Silica Gel Condition: ~~blue~~ 30% | Sealed? ✓

Run No. 3 | Sample Date _____ | Recovery Date _____

Sample I.D. Chemours - VE North Carbon Bed - IN - 3 - M0010 - | Analyst _____ | Filter Number _____

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

Impinger Color _____ | Labeled? _____

Silica Gel Condition _____ | Sealed? _____

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS

Test Data		
Run number	1	2
Location	VE N. Carbon Bed Outlet	VE N. Carbon Bed Outlet
Date	6/15/2018	6/15/2018
Time period	0920-1148	1440-1638
Operator	KD	KD
Inputs For Calcs.		
Sq. rt. delta P	0.68236	0.70806
Delta H	1.2000	1.2800
Stack temp. (deg.F)	99.3	103.2
Meter temp. (deg.F)	97.4	104.5
Sample volume (act.)	57.139	57.171
Barometric press. (in.Hg)	29.95	29.92
Volume H_2O imp. (ml)	28.3	25.8
Weight change sil. gel (g)	23.0	28.1
% CO_2	0.0	0.0
% O_2	20.9	20.9
% N_2	79.1	79.1
Area of stack (sq.ft.)	6.305	6.305
Sample time (min.)	96.0	96.0
Static pressure (in.H_2O)	4.30	4.30
Nozzle dia. (in.)	0.215	0.215
Meter box cal.	0.9960	0.9960
Cp of pitot tube	0.84	0.84
Traverse points	24	24

OUTLET

Sample and Velocity Traverse Point Data Sheet - Method 1

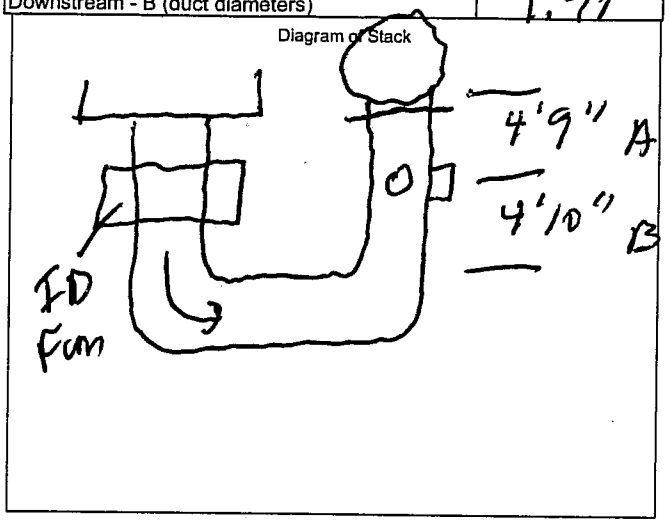
Client Chemours — Operator KG
Loaction/Plant Fayetteville NC — Date 6/13/18
Source VE North Carbon Outlet — W.O. Number

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

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

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

Diagram of Stack



Traverse Point Locations

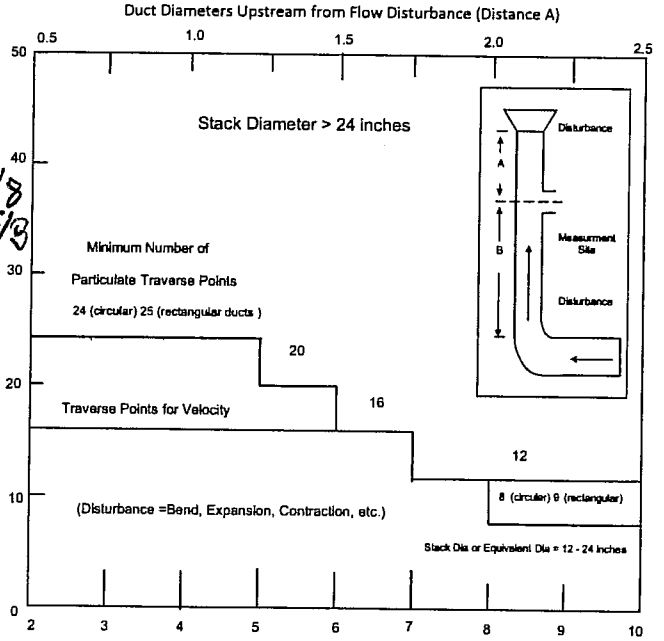
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.021	3/4	21 3/8
2	.067	2 1/4	22 7/8
3	.118	4	24 5/8
4	.177	6	26 5/8
5	.250	8 1/2	29 1/8
6	.356	12 1/8	32 3/4
7	.644	21 5/8	42 1/2
8	.75	25 1/2	46 1/8
9	.823	28	48 5/8
10	.882	30	50 5/8
11	.933	31 3/4	52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

CEM 3 Point(Long Measurment Line) Stratificaton Point Locations

1	0.167		
2	0.50		
3	0.833		

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

Duct Diameters Upstream from Flow Disturbance (Distance A)



Duct Diameters Downstream from Flow Disturbance (Distance B)

Traverse Point Location Percent of Stack -Circular

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

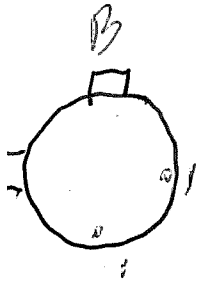
Traverse Point Location Percent of Stack -Rectangular

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

WESTON

OUTLET

Determination of Stack Gas Velocity - Method 2



Client Chemours | Operator AS | Pitot Coeff (Cp) .842

Location/Plant Fayetteville NC | Date 6/13/13 | Stack Area, ft² (As) 6.305

Source VE North Carbon Outlet | W.O. Number | Pitot Tube/Thermo ID P704

Run Number	1		
Time	1530		
Barometric Press, in Hg (Pb)	30.01		
Static Press, in H_2O (Pstatic)	4.3		
Source Moisture, % (BWS)	≈ 2.0		
O_2, %	20.9		
CO_2, %	0.0		

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	.41	98				
.02	3		2	.42	98				
.01	2		3	.44	98				
.01	2		4	.46	98				
.02	3		5	.48	98				
.02	3		6	.53	98				
-.01	2		7	.77	98				
-.02	3		8	.85	98				
-.03	5		9	.89	98				
-.04	6		10	.95	98				
-.02	3		11	1.0	98				
-.05	9		12	.97	98				
-.02	4	B	1	.51	99				
-.03	5		2	.54	~~98~~ 98				
0	0		3	.57	98				
-.04	6		4	.56	98				
-.05	7		5	.58	98				
-.07	9		6	.59	98				
.05	7		7	.60	98				
.05	7		8	.61	98				
.03	5		9	.62	98				
.03	5		10	.64	98				
.03	5		11	.65	98				
.02	4		12	.65	98				
Avg Angle	<20	Avg Delta P & Temp		.636	98				
		avg √DeltaP		.79043					
Average gas stream velocity, ft/sec.				45.5					
Vol. flow rate @ actual conditions, wacf/min				17213					
Vol. flow rate at standard conditions, dscf/min				16176					

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

$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$ 2.4 K

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$

$Qs(act) = 60 * Vs * As$

$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

WESTON MANAGERS DESIGNERS/CONSULTANTS

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours
W.O.#	15418.002.005
Project ID	Chemours
Mode/Source ID	VE North Carbon Bed
Samp. Loc. ID	OUT
Run No.ID	1
Test Method ID	M0010
Date ID	11JUN2018
Source/Location	VE North Carbon Bed Outlet
Sample Date	6/15/18
Baro. Press (in Hg)	29.95
Operator	KD

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		28.3
Silica gel (g)		23
CO2, % by Vol	0	0
O2, % by Vol	20.9	20.9
Temperature (°F)	95	
Meter Temp (°F)	98	
Static Press (in H_2O)		4.3
Ambient Temp (°F)	73	

Meter Box ID	25		
Meter Box Y	.9960		
Meter Box Del H	1.492		
Probe ID / Length	KD-704		
Probe Material	Boro		
Pitot / Thermocouple ID	P704		
Pitot Coefficient	0.84		
Nozzle ID	.215		
Nozzle Measurements	.215	.215	.215
Avg Nozzle Dia (in)	.215		
Area of Stack (ft^2)	6.305		
Sample Time	96 min		
Total Traverse Pts	24		

Page ____ of ____

K Factor 2.5

	Initial	Mid-Point	Final
Sample Train (ft^3)	.609	1960 .017	.017
Leak Check @ (in Hg)	15	8 15	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			
Reference Temp			
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	9:20			338.066									
B 12	4	9:24	.39	.98	340.22	97	89	128	128	62	4	60		
11	8	9:28	.39	.98	342.39	97	92	128	128	60	4	45		
10	12	9:32	.40	1.0	344.65	97	92	126	128	60	4	45		
9	16	9:36	.40	1.0	346.89	98	92	128	129	60	4	46		
8	20	9:40	.41	1.0	349.12	98	93	129	129	60	4	46		
7	24	9:44	.44	1.1	351.43	97	97	128	128	60	4	49		
6	28	9:48	.45	1.1	353.83	99	97	128	128	60	4	50		28.744
5	32	9:52	.55	1.4	356.35	98	94	129	130	61	5	53		
4	36	9:56	.54	1.4	359.00	98	94	129	129	62	5	49		
3	40	10:00	.55	1.4	361.60	99	94	129	129	60	5	48		
2	44	10:04	.55	1.4	364.20	98	95	125	130	60	5	49		
1	48	10:08	.54	1.4	366.810	99	95	128	128	60	5	50		restart 368.881
A 1	52	10:00	.31	.78	370.27	101	101	125	130	60	4	59		
2	56	11:04	.33	.83	372.29	101	101	128	129	60	4	58		
3	60	11:08	.33	.83	374.30	101	101	125	130	60	4	59		
4	64	11:12	.32	.80	376.27	101	101	125	130	60	4	48		378.88
5	68	11:16	.34	.85	378.27	101	101	125	127	60	4	45		
6	72	11:20	.36	.90	380.31	101	101	127	128	59	4	45		
7	76	11:24	.38	.95	382.47	101	102	125	130	61	5	46		
8	80	11:28	.66	1.7	385.24	101	102	125	129	60	6	46		
9	84	11:32	.70	1.8	388.14	101	103	127	128	59	7	44		
10	88	11:36	.70	1.8	391.07	101	103	126	127	60	7	46		
11	92	11:40	.68	1.7	393.96	101	103	126	127	61	7	47		
12	96	11:44	.66	1.7	396.776	101	103	126	128	64	6	50		
		11:46												
			Avg Delta P .47417	Avg Delta H 1.200	Total Volume 58.71	Avg Ts 99.333	Avg Tm 97.417	Min/Max 125/129	Min/Max 127/130	Max 64	Max Vac 7	Min/Max 44/60		
			Avg Sqrt Delta P .68236	Avg Sqrt Del H 1.095	Comments:									

EPA Method 001 from EPA SW-846

105.9 I 4.17 % m 13675 sctm 55.57 Vm

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

Client	Chemours
W.O.#	15418.002.005
Project ID	Chemours
Mode/Source ID	VE North Carbon Bed
Samp. Loc. ID	OUT
Run No.ID	2
Test Method ID	M0010
Date ID	11JUN2018
Source/Location	VE North Carbon Bed Outlet
Sample Date	6/15/18
Baro. Press (in Hg)	29.95
Operator	KD

Stack Conditions

	Assumed	Actual
% Moisture	2	
Impinger Vol (ml)		25.8
Silica gel (g)		25.1
CO2, % by Vol	0	0
O2, % by Vol	20.9	20.9
Temperature (°F)	100	
Meter Temp (°F)	100	
Static Press (in H_2O)		4.3
Ambient Temp (°F)	88	

Meter Box ID	KD ~~1020~~ 2.5
Meter Box Y	KD ~~1.016~~ .9960
Meter Box Del H	KD ~~1.904~~ 1.992
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	KD ~~96~~ 704
Pitot Coefficient	0.84
Nozzle ID	.247
Nozzle Measurements	.215 / .215 / .216
Avg Nozzle Dia (in)	.215
Area of Stack (ft^2)	6.305
Sample Time	96 min
Total Traverse Pts	24

K Factor	KD 3.14	2.5	
	Initial	Mid-Point	Final
Sample Train (ft^3)	.002	.001 .002	.001
Leak Check @ (in Hg)	15	6 6	8
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp			
Reference Temp			
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	14:40			397.404									
B 12	4		.38	.88	399.41	103	99	126	129	57	3	57		
11	8		.38	.88	401.48	103	99	125	130	60	4	52		
10	12		.38	.88	403.51	103	100	125	130	60	4	51		
9	16		.42	1.1	405.75	103	101	124	128	60	4	52		
8	20		.42	1.1	407.95	103	102	125	128	60	4	53		
7	24		.44	1.1	410.16	103	102	125	129	60	4	54		27.791
6	28		.54	1.4	412.65	103	103	125	130	60	4	54		
5	32		.56	1.4	415.18	103	104	125	129	60	5	52		
4	36		.58	1.5	417.79	103	105	125	128	60	6	51		
3	40		.55	1.4	420.29	103	106	125	129	60	6	53		
2	44		.55	1.4	422.76	103	106	125	128	60	5	55		
1	48	15:28	.54	1.4	425.195	103	105	125	128	60	5	55		425.375
A 1	52	15:50	.32	.80	427.25	103	107	125	130	62	4	56		
2	56		.32	.80	429.17	104	107	125	128	61	4	56		
3	60		.32	.80	431.11	104	107	125	128	60	4	56		
4	64		.38	.98	433.12	104	107	125	128	60	4	56		42.38
5	68		.40	1.0	435.27	104	106	125	129	60	5	58		
6	72		.44	1.1	437.53	104	106	125	129	60	5	56		
7	76		.65	1.6	440.18	103	106	125	129	60	6	56		
8	80		.70	1.8	443.04	103	106	125	130	61	6	58		
9	84		.75	1.9	446.00	103	106	125	129	62	6	58		
10	88		.77	1.9	448.91	103	106	125	130	61	6	56		
11	92		.72	1.8	451.78	103	106	125	129	62	6	57		
12	96	16:38	.77	1.9	454.755	103	106	125	129	62	6	58		
					57.171									
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min Max		
			.512	1.2800	~~57.571~~	103.208	104.500	125/126	129/130	62	6	51/58		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			.70806	1.1316										

WESTON SOLUTIONS 0.51167

EPA Method 001 from EPA SW-846

98.7 Io 4.54 %m

14095 scfm 53.4 Vm

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.005

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

Run No. 1 | Sample Date 6/15/18 | Recovery Date 6/15/18

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

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20		XAD-1	XAD-2			Silica Gel	
Final	15	100	100	3	305.7	302.5			323	
Initial	0	100	100	0	295.8	302.1			300	
Gain	15	0	0	3	9.9	0.4		28.3	23	51.3

Impinger Color: all clear | Labeled? ✓

Silica Gel Condition: blue 40% | Sealed? ✓

Run No. 2 | Sample Date 6/15/18 | Recovery Date 6/15/18

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

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20		XAD-1	XAD-2			Silica Gel	
Final	18	100	100	0	307.6	308.7			328.1	
Initial	0	100	100	0	300.1	308.4			300	
Gain	18	0	0	0	7.5	0.3		25.8	28.1	53.9

Impinger Color: all clear | Labeled? ✓

Silica Gel Condition: blue 40% | Sealed? ✓

Run No. 3 | Sample Date _____ | Recovery Date _____

Sample I.D. Chemours - VE North Carbon Bed - OUT - 3 - M0010 - | Analyst _____ | Filter Number _____

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

Impinger Color _____ | Labeled? _____

Silica Gel Condition _____ | Sealed? _____

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

METHODS AND ANALYZERS

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

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **13 Jun 2018**

File: E:\Chemours\Chemours Division Stack June 2018.cem
Program Version: 2.0, built 21 Feb 2015 **File Version:** 2.02
Computer: WINDOWS-2GHELJO **Trailer:** 26
Analog Input Device: MCC USB-1608G

Channel 1

Analyte	**O_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 1440 S/N 0144001**
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 1440 S/N 0144001**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**16.6**

WESTON

CALIBRATION DATA

Number 1

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

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **13 Jun 2018**

Start Time: 11:55

O_2

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

Calibration Standards

%	Cylinder ID
11.9	CC429490
21.0	SG9169108

Calibration Results

Zero	3 mv
Span, 21.0 %	843 mv

Curve Coefficients

Slope	Intercept
40.00	3

CO_2

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

Calibration Standards

%	Cylinder ID
8.9	CC429490
16.6	SG9169108

Calibration Results

Zero	4 mv
Span, 16.6 %	837 mv

Curve Coefficients

Slope	Intercept
50.24	4

WESTON

CALIBRATION ERROR DATA

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **13 Jun 2018**

Start Time: 11:55

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 40.00 **Intercept** 3.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
11.9	11.9	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.6 %
Slope 50.24 **Intercept** 4.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.9	0.0	0.0	Pass
16.6	16.6	0.0	0.0	Pass

BIAS

Number 1

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

Calibration **1**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **13 Jun 2018**

Start Time: 12:16

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	11.9	11.9	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	0.2	0.2	1.2	Pass
Span	8.9	9.0	0.1	0.6	Pass

WESTON SOLUTIONS

CALIBRATION DATA

Number 2

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

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Start Time: 07:15

O_2

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

Calibration Standards

%	Cylinder ID
11.9	CC429490
21.0	SG9169108

Calibration Results

Zero	15 mv
Span, 21.0 %	848 mv

Curve Coefficients

Slope	Intercept
39.67	15

CO_2

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

Calibration Standards

%	Cylinder ID
8.9	CC429490
16.6	SG9169108

Calibration Results

Zero	6 mv
Span, 16.6 %	841 mv

Curve Coefficients

Slope	Intercept
50.36	6

CALIBRATION ERROR DATA

Number 2

Client: **Chemours** | Project Number: **15418.002.005.0001**
Location: **Fayetteville, NC** | Operator: **Dryden**
Source: **VE North Carbon Bed** | Calibration **1** | Date: **15 Jun 2018**

Start Time: 07:15

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 40.00 **Intercept** 3.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
11.9	11.9	0.0	0.0	Pass
21.0	21.0	0.0	0.0	Pass

CO_2
Method: EPA 3A
Span Conc. 16.6 %
Slope 50.24 **Intercept** 4.0

Standard %	Result %	Difference %	Error %	Status
Zero	0.0	0.0	0.0	Pass
8.9	8.9	0.0	0.0	Pass
16.6	16.6	0.0	0.0	Pass

BIAS

Number 2

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Start Time: 07:20

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	11.9	11.9	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	0.1	0.1	0.6	Pass
Span	8.9	8.9	0.0	0.0	Pass

RUN DATA

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
RESPONSE TIMES		
08:50:12	21.1	0.0
08:50:22	21.1	0.0
08:50:32	20.1	0.1
08:50:42	4.0	0.3
08:50:52	0.1	0.0
O2/CO2 UP		
08:51:02	0.0	0.0
08:51:12	0.0	0.0
08:51:22	0.0	0.0
08:51:32	0.0	0.0
08:51:42	5.7	2.4
08:51:52	11.6	8.4
08:52:02	11.9	8.7
O2/CO2 DOWN		
08:52:12	11.9	8.7
08:52:22	11.9	8.8
08:52:32	11.9	8.8
08:52:42	10.6	8.6
08:52:52	1.0	1.6
08:53:02	0.0	0.2
END RESPONSE TIMES		
08:53:12	0.0	0.1
08:53:22	0.0	0.1
08:53:32	0.0	0.1
Avgs	**6.8**	**2.7**

WESTON SOLUTIONS

RUN DATA

Number 1

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
RUN 1 START		
09:21	20.9	0.1
09:22	20.9	0.1
09:23	20.9	0.1
09:24	20.9	0.1
09:25	20.9	0.2
09:26	20.9	0.2
09:27	20.9	0.1
09:28	20.9	0.2
09:29	20.9	0.2
09:30	20.9	0.2
09:31	21.0	0.2
09:32	21.0	0.2
09:33	20.9	0.2
09:34	20.9	0.2
09:35	20.9	0.2
09:36	20.9	0.2
09:37	20.9	0.1
09:38	20.9	0.1
09:39	20.9	0.1
09:40	21.0	0.1
09:41	21.0	0.1
09:42	21.0	0.1
09:43	21.0	0.1
09:44	21.0	0.1
09:45	21.0	0.1
09:46	21.0	0.1
09:47	20.9	0.1
09:48	20.9	0.1
09:49	20.9	0.1
09:50	20.9	0.1
09:51	20.9	0.1
09:52	20.9	0.1
09:53	20.9	0.1
09:54	21.0	0.1
09:55	21.0	0.0
09:56	21.0	0.0
09:57	21.0	0.0
09:58	21.0	0.1
09:59	21.0	0.1
10:00	21.0	0.1
10:01	21.0	0.1

WESTON

RUN DATA

Number 1

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
10:02	21.0	0.1
10:03	21.0	0.1
10:04	21.0	0.1
10:05	21.0	0.1
10:06	21.0	0.0
10:07	21.0	0.0
PORT CHANGE RESTART		
11:00	21.1	0.0
11:01	21.1	0.0
11:02	21.1	0.0
11:03	21.1	0.1
11:04	21.1	0.1
11:05	21.1	0.1
11:06	21.0	0.1
11:07	21.0	0.1
11:08	21.0	0.1
11:09	21.0	0.1
11:10	21.0	0.1
11:11	21.0	0.1
11:12	21.0	0.1
11:13	21.1	0.1
11:14	21.1	0.1
11:15	21.1	0.1
11:16	21.1	0.1
11:17	21.1	0.1
11:18	21.1	0.1
11:19	21.1	0.1
11:20	21.1	0.1
11:21	21.0	0.1
11:22	21.1	0.1
11:23	21.1	0.1
11:24	21.0	0.1
11:25	21.1	0.1
11:26	21.1	0.1
11:27	21.1	0.1
11:28	21.1	0.1
11:29	21.1	0.1
11:30	21.1	0.1
11:31	21.1	0.1
11:32	21.1	0.1
11:33	21.1	0.1

WESTON SOLUTIONS

RUN DATA

Number 1

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
11:34	21.1	0.1
11:35	21.1	0.1
11:36	21.1	0.1
11:37	21.1	0.1
11:38	21.1	0.1
11:39	21.1	0.1
11:40	21.1	0.1
11:41	21.1	0.1
11:42	21.1	0.1
11:43	21.1	0.1
11:44	21.1	0.1
11:45	21.1	0.1
11:46	21.1	0.1
11:47	21.1	0.1
11:48	21.1	0.1
	END TEST	
Avgs	**21.0**	**0.1**

RUN SUMMARY

Number 1

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

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

Time: 09:20 to 11:48

Run Averages

21.0	0.1

Pre-run Bias at 07:20

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

Post-run Bias at 11:50

Zero Bias	0.0	0.0
Span Bias	12.0	8.8
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

21.0	0.1

WESTON

BIAS AND CALIBRATION DRIFT

Number 3

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Start Time: 11:50

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	11.9	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	11.9	12.0	0.1	0.5	Pass

*Bias No. 2

CO_2

Method: EPA 3A
Span Conc. 16.6 %

Bias Results

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

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.0	-0.1	-0.6	Pass
Span	8.9	8.8	-0.1	-0.6	Pass

*Bias No. 2

WESTON SOLUTIONS

RUN DATA

Number 2

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
RUN 2 START		
14:41	20.9	0.1
14:42	20.8	0.1
14:43	20.8	0.1
14:44	20.8	0.1
14:45	20.9	0.1
14:46	20.9	0.1
14:47	20.9	0.1
14:48	20.9	0.1
14:49	20.9	0.1
14:50	20.9	0.1
14:51	20.9	0.1
14:52	20.8	0.1
14:53	20.8	0.1
14:54	20.8	0.1
14:55	20.8	0.1
14:56	20.8	0.1
14:57	20.8	0.1
14:58	20.8	0.1
14:59	20.9	0.1
15:00	20.9	0.1
15:01	20.9	0.1
15:02	20.9	0.1
15:03	20.9	0.1
15:04	20.9	0.1
15:05	20.9	0.1
15:06	20.8	0.1
15:07	20.9	0.1
15:08	20.8	0.1
15:09	20.8	0.1
15:10	20.8	0.1
15:11	20.9	0.1
15:12	20.9	0.1
15:13	20.9	0.1
15:14	20.9	0.1
15:15	20.9	0.1
15:16	20.9	0.1
15:17	20.9	0.1
15:18	20.9	0.1
15:19	20.9	0.1
15:20	20.9	0.1
15:21	20.9	0.1

WESTON

RUN DATA

Number 2

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
15:22	20.9	0.1
15:23	20.9	0.1
15:24	20.9	0.1
15:25	20.9	0.1
15:26	20.9	0.1
15:27	20.9	0.1
15:28	20.9	0.1
PORT CHANGE		
RESTART		
15:50	20.8	0.1
15:51	20.8	0.0
15:52	20.8	0.1
15:53	20.9	0.1
15:54	20.9	0.1
15:55	20.9	0.1
15:56	20.9	0.2
15:57	20.9	0.2
15:58	20.9	0.2
15:59	20.9	0.2
16:00	20.8	0.2
16:01	20.8	0.3
16:02	20.8	0.3
16:03	20.8	0.2
16:04	20.8	0.2
16:05	20.8	0.2
16:06	20.8	0.2
16:07	20.9	0.2
16:08	20.9	0.2
16:09	20.8	0.2
16:10	20.9	0.2
16:11	20.8	0.2
16:12	20.9	0.2
16:13	20.8	0.2
16:14	20.8	0.2
16:15	20.8	0.2
16:16	20.9	0.1
16:17	20.9	0.1
16:18	20.9	0.1
16:19	20.9	0.1
16:20	20.9	0.1
16:21	20.9	0.1
16:22	20.9	0.1

WESTON SOLUTIONS

RUN DATA

Number 2

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Time	O_2 %	CO_2 %
16:23	20.9	0.1
16:24	20.9	0.1
16:25	20.9	0.1
16:26	20.9	0.1
16:27	20.9	0.1
16:28	20.9	0.1
16:29	20.9	0.1
16:30	20.9	0.1
16:31	20.9	0.1
16:32	20.9	0.1
16:33	20.9	0.0
16:34	20.9	0.0
16:35	20.9	0.0
16:36	20.9	0.0
16:37	20.9	0.0
16:38	20.9	0.0
	END RUN 2	
Avgs	**20.9**	**0.1**

RUN SUMMARY

Number 2

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

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

Time: 14:40 to 16:38

Run Averages

	20.9	0.1

Pre-run Bias at 11:50

Zero Bias	0.0	0.0
Span Bias	12.0	8.8
Span Gas	11.9	8.9

Post-run Bias at 16:43

Zero Bias	0.0	0.0
Span Bias	11.9	8.8
Span Gas	11.9	8.9

Averages corrected for the average of the pre-run and post-run bias

	20.8	0.1

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 4

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

Calibration **2**

Project Number: **15418.002.005.0001**
Operator: **Dryden**
Date: **15 Jun 2018**

Start Time: 16:43

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	11.9	11.9	0.0	0.0	Pass

Calibration Drift

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

*Bias No. 3

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. 3

WESTON SOLUTIONS

APPENDIX C
LABORATORY ANALYTICAL DESCRIPTION AND ANALYTICAL REPORT

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

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Chemours PPA Carbon Bed Inlet Test Analytical Report
TestAmerica Job No. 140-11834-1
July 20, 2018

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

- E-1803,1804,1806 PPA INLET R1 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)
- E-1810,1811,1813 PPA INLET R2 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

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

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

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

- E-1803,1804,1806 PPA INLET R1 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

$$(4030\,ug) \times \left(\frac{69}{48}\right) = 5800\,ug$$

- E-1810,1811,1813 PPA INLET R2 M0010 Back Half Composite (XAD-2 Resin and Glassware Rinses)

$$(9140\,ug) \times \left(\frac{67}{64}\right) = 9570\,ug$$

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Inlet - M0010

TestAmerica Job ID: 140-11834-1

Client Sample ID: E-1801,1802 PPA INLET R1 M0010 FH

Lab Sample ID: 140-11834-1
Matrix: Air

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	451		3.75	3.75	ug/Sample		06/21/18 02:02	06/27/18 10:34	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*78*	*D*	*50 - 200*	*06/21/18 02:02*	*06/27/18 10:34*	*50*

Client Sample ID: E-1803,1804,1806 PPA INLET R1 M0010 BH

Lab Sample ID: 140-11834-2
Matrix: Air

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	5290	E	10.0	10.0	ug/Sample		06/21/18 02:07	06/27/18 11:36	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*48*	*X D*	*50 - 200*	*06/21/18 02:07*	*06/27/18 11:36*	*50*

Method: 8321A - PFOA and PFOS - REDL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	4030	H	50.0	50.0	ug/Sample		07/12/18 08:55	07/18/18 16:34	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*69*	*D*	*50 - 200*	*07/12/18 08:55*	*07/18/18 16:34*	*10*

Client Sample ID: E-1805 PPA INLET R1 M0010 COND

Lab Sample ID: 140-11834-3
Matrix: Air

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1380	E	2.50	0.128	ug/Sample		06/29/18 13:48	07/02/18 12:29	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*64*	*D*	*50 - 200*	*06/29/18 13:48*	*07/02/18 12:29*	*50*

Method: 8321A - HFPO-DA - RE

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1330		10.4	0.531	ug/Sample		07/19/18 18:27	07/20/18 10:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*64*		*50 - 200*	*07/19/18 18:27*	*07/20/18 10:15*	*1*

Client Sample ID: E-1807 PPA INLET R1 M0010 XAD-2

Lab Sample ID: 140-11834-4
Matrix: Air

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.285		0.200	0.200	ug/Sample		06/21/18 02:07	06/27/18 11:40	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Inlet - M0010

TestAmerica Job ID: 140-11834-1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	55		50 - 200	06/21/18 02:07	06/27/18 11:40	1

Client Sample ID: E-1808,1809 PPA INLET R2 M0010 FH

Lab Sample ID: 140-11834-5
Matrix: Air
Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	577		6.25	6.25	ug/Sample		06/21/18 02:02	06/27/18 10:38	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	69	D	50 - 200	06/21/18 02:02	06/27/18 10:38	50

Client Sample ID: E-1810,1811,1813 PPA INLET R2 M0010 BH

Lab Sample ID: 140-11834-6
Matrix: Air
Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	7850	E	10.0	10.0	ug/Sample		06/21/18 02:07	06/27/18 11:43	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	64	D	50 - 200	06/21/18 02:07	06/27/18 11:43	50

Method: 8321A - PFOA and PFOS - REDL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	9140	H	62.5	62.5	ug/Sample		07/12/18 08:55	07/18/18 16:38	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	67	D	50 - 200	07/12/18 08:55	07/18/18 16:38	10

Client Sample ID: E-1812 PPA INLET R2 M0010 COND

Lab Sample ID: 140-11834-7
Matrix: Air
Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2060	E	2.50	0.128	ug/Sample		06/29/18 13:48	07/02/18 12:33	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	60	D	50 - 200	06/29/18 13:48	07/02/18 12:33	50

Method: 8321A - HFPO-DA - RE

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2080		12.5	0.638	ug/Sample		07/19/18 18:27	07/20/18 10:18	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	68		50 - 200	07/19/18 18:27	07/20/18 10:18	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Inlet - M0010

TestAmerica Job ID: 140-11834-1

Client Sample ID: E-1814 PPA INLET R2 M0010 XAD-2
Lab Sample ID: 140-11834-8
Date Collected: 06/12/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/21/18 02:07	06/27/18 11:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*56*		*50 - 200*	*06/21/18 02:07*	*06/27/18 11:46*	*1*

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11829-1

Client Sample ID: D-1401,1402 PPA OUTLET R1 M0010 FH

Lab Sample ID: 140-11829-1

Date Collected: 06/12/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	9.19		0.100	0.100	ug/Sample		06/19/18 07:49	06/25/18 12:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:16*	*1*

Client Sample ID: D-1403,1404,1406 PPA OUTLET R1 M0010 BH

Lab Sample ID: 140-11829-2

Date Collected: 06/12/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*54*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:18*	*1*

Client Sample ID: D-1405 PPA OUTLET R1 M0010 COND

Lab Sample ID: 140-11829-3

Date Collected: 06/12/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.166		0.0500	0.00255	ug/Sample		07/07/18 13:16	07/09/18 10:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*51*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:43*	*1*

Client Sample ID: D-1407 PPA OUTLET R1 M0010 XAD-2

Lab Sample ID: 140-11829-4

Date Collected: 06/12/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:21	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*59*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:21*	*1*

Client Sample ID: D-1408,1409 PPA OUTLET R2 M0010 FH

Lab Sample ID: 140-11829-5

Date Collected: 06/12/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	23.2		0.125	0.125	ug/Sample		06/19/18 07:49	06/25/18 12:20	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11829-1

Client Sample ID: D-1408,1409 PPA OUTLET R2 M0010 FH

Lab Sample ID: 140-11829-5

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:20*	*1*

Client Sample ID: D-1410,1411,1413 PPA OUTLET R2 M0010 BH

Lab Sample ID: 140-11829-6

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**0.239**		0.200	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*53*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:25*	*1*

Client Sample ID: D-1412 PPA OUTLET R2 M0010 COND

Lab Sample ID: 140-11829-7

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**0.338**		0.0500	0.00255	ug/Sample		07/07/18 13:16	07/09/18 10:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*53*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:46*	*1*

Client Sample ID: D-1414 PPA OUTLET R2 M0010 XAD-2

Lab Sample ID: 140-11829-8

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:28*	*1*

Client Sample ID: C-1601,1602 QC M0010 BT FH

Lab Sample ID: 140-11829-9

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:49	06/25/18 12:23	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*62*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:23*	*1*

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11829-1

Client Sample ID: C-1603,1604,1606 QC M0010 BT BH

Lab Sample ID: 140-11829-10

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.205		0.200	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*53*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:31*	*1*

Client Sample ID: C-1605 QC M0010 BT COND

Lab Sample ID: 140-11829-11

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.0500	0.00255	ug/Sample		07/07/18 13:16	07/09/18 10:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:49*	*1*

Client Sample ID: C-1607 QC M0010 BT XAD-2

Lab Sample ID: 140-11829-12

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:34	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:34*	*1*

Client Sample ID: C-1608 QC M0010 DI WATER RB

Lab Sample ID: 140-11829-13

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.00250	0.000128	ug/Sample		07/07/18 13:16	07/09/18 10:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:52*	*1*

Client Sample ID: C-1609 QC M0010 MEOH WITH 5% NH4OH RB

Lab Sample ID: 140-11829-14

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:52	06/25/18 13:41	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11829-1

Client Sample ID: C-1609 QC M0010 MEOH WITH 5% NH4OH RB

Lab Sample ID: 140-11829-14

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*68*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:41*	*1*

Client Sample ID: C-1610 QC M0010 XAD-2 RESIN TUBE RB

Lab Sample ID: 140-11829-15

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*52*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:44*	*1*

Client Sample ID: C-1611 QC M0010 MEOH WITH 5% NH4OH TB

Lab Sample ID: 140-11829-16

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:52	06/25/18 13:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*72*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:48*	*1*

Client Sample ID: C-1612 QC M0010 XAD-2 RESIN TUBE TB

Lab Sample ID: 140-11829-17

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*51*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:51*	*1*

Client Sample ID: C-1613 QC M0010 COMBINED GW RINSES (MEOH/5% NH4OH) PB

Lab Sample ID: 140-11829-18

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:52	06/25/18 13:54	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: PPA Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11829-1

Client Sample ID: C-1613 QC M0010 COMBINED GW RINSES (MEOH/5% NH4OH) PB

Lab Sample ID: 140-11829-18

Date Collected: 06/11/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	65		50 - 200	06/19/18 07:52	06/25/18 13:54	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Carbon Bed Inlet - M0010

TestAmerica Job ID: 140-11834-2

Client Sample ID: G-1901,1902 DIV INLET R1 M0010 FH

Lab Sample ID: 140-11834-9
Matrix: Air

Date Collected: 06/12/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	77.4		1.00	1.00	ug/Sample		06/21/18 02:02	06/27/18 10:41	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*	*D*	*50 - 200*	*06/21/18 02:02*	*06/27/18 10:41*	*10*

Client Sample ID: G-1903,1904,1906 DIV INLET R1 M0010 BH

Lab Sample ID: 140-11834-10
Matrix: Air

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	192		2.50	2.50	ug/Sample		06/21/18 02:07	06/27/18 11:49	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*24*	*X D*	*50 - 200*	*06/21/18 02:07*	*06/27/18 11:49*	*10*

Client Sample ID: G-1905 DIV INLET R1 M0010 COND

Lab Sample ID: 140-11834-11
Matrix: Air

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	86.2		0.977	0.0498	ug/Sample		06/26/18 17:28	06/28/18 10:43	20

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*	*D*	*50 - 200*	*06/26/18 17:28*	*06/28/18 10:43*	*20*

Client Sample ID: G-1907 DIV INLET R1 M0010 XAD-2

Lab Sample ID: 140-11834-12
Matrix: Air

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/21/18 02:07	06/27/18 11:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*44*	*X*	*50 - 200*	*06/21/18 02:07*	*06/27/18 11:53*	*1*

Client Sample ID: G-1908,1909 DIV INLET R2 M0010 FH

Lab Sample ID: 140-11834-13
Matrix: Air

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	44.6		0.250	0.250	ug/Sample		06/21/18 02:02	06/27/18 10:44	2

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Carbon Bed Inlet - M0010

TestAmerica Job ID: 140-11834-2

Client Sample ID: G-1908,1909 DIV INLET R2 M0010 FH

Lab Sample ID: 140-11834-13

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*71*	*D*	*50 - 200*	*06/21/18 02:02*	*06/27/18 10:44*	*2*

Client Sample ID: G-1910,1911,1913 DIV INLET R2 M0010 BH

Lab Sample ID: 140-11834-14

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**363**		3.50	3.50	ug/Sample		06/21/18 02:07	06/27/18 11:56	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*49*	*X D*	*50 - 200*	*06/21/18 02:07*	*06/27/18 11:56*	*10*

Client Sample ID: G-1912 DIV INLET R2 M0010 COND

Lab Sample ID: 140-11834-15

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**206**		2.50	0.128	ug/Sample		06/26/18 17:28	06/28/18 10:46	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*	*D*	*50 - 200*	*06/26/18 17:28*	*06/28/18 10:46*	*50*

Client Sample ID: G-1914 DIV INLET R2 M0010 XAD-2

Lab Sample ID: 140-11834-16

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/21/18 02:07	06/27/18 11:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*49*	*X*	*50 - 200*	*06/21/18 02:07*	*06/27/18 11:59*	*1*

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Stack Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11827-1

Client Sample ID: R-2701,2702 DIV OUTLET R1 FH

Lab Sample ID: 140-11827-1
Matrix: Air
Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	7.57		0.125	0.125	ug/Sample		06/19/18 07:49	06/25/18 12:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*65*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:04*	*1*

Client Sample ID: R-2703,2704,2706 DIV OUTLET R1 BH

Lab Sample ID: 140-11827-2
Matrix: Air
Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.500		0.275	0.275	ug/Sample		06/19/18 07:52	06/25/18 12:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*06/19/18 07:52*	*06/25/18 12:36*	*1*

Client Sample ID: R-2705 DIV OUTLET R1 COND

Lab Sample ID: 140-11827-3
Matrix: Air
Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.09		0.0500	0.00255	ug/Sample		07/07/18 13:16	07/09/18 10:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*52*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:26*	*1*

Client Sample ID: R-2707 DIV OUTLET R1 XAD-2

Lab Sample ID: 140-11827-4
Matrix: Air
Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 12:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*54*		*50 - 200*	*06/19/18 07:52*	*06/25/18 12:39*	*1*

Client Sample ID: R-2708,2709 DIV OUTLET R2 FH

Lab Sample ID: 140-11827-5
Matrix: Air
Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.99		0.125	0.125	ug/Sample		06/19/18 07:49	06/25/18 12:07	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Stack Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11827-1

Client Sample ID: R-2708,2709 DIV OUTLET R2 FH

Lab Sample ID: 140-11827-5

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*66*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:07*	*1*

Client Sample ID: R-2710,2711,2713 DIV OUTLET R2 BH

Lab Sample ID: 140-11827-6

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
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		0.300	0.300	ug/Sample		06/19/18 07:52	06/25/18 12:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*54*		*50 - 200*	*06/19/18 07:52*	*06/25/18 12:42*	*1*

Client Sample ID: R-2712 DIV OUTLET R2 COND

Lab Sample ID: 140-11827-7

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**0.167**		0.0500	0.00255	ug/Sample		07/07/18 13:16	07/09/18 10:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*52*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:30*	*1*

Client Sample ID: R-2714 DIV OUTLET R2 XAD-2

Lab Sample ID: 140-11827-8

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 12:46	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*48*	*X*	*50 - 200*	*06/19/18 07:52*	*06/25/18 12:46*	*1*

Client Sample ID: A-6101,6102 QC M0010 BT FH

Lab Sample ID: 140-11827-9

Date Collected: 06/15/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**0.0821**		0.0250	0.0250	ug/Sample		06/19/18 07:49	06/25/18 12:10	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*60*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:10*	*1*

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Stack Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11827-1

Client Sample ID: A-6103,6104,6106 QC M0010 BT BH

Lab Sample ID: 140-11827-10

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 12:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*43*	*X*	*50 - 200*	*06/19/18 07:52*	*06/25/18 12:49*	*1*

Client Sample ID: A-6105 QC M0010 BT COND

Lab Sample ID: 140-11827-11

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0847		0.0489	0.00249	ug/Sample		07/07/18 13:16	07/09/18 10:33	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*57*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:33*	*1*

Client Sample ID: A-6107 QC M0010 BT XAD-2

Lab Sample ID: 140-11827-12

Date Collected: 06/15/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 12:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*06/19/18 07:52*	*06/25/18 12:52*	*1*

Client Sample ID: A-6108 QC M0010 DI WATER RB

Lab Sample ID: 140-11827-13

Date Collected: 06/13/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.00250	0.000128	ug/Sample		07/07/18 13:16	07/09/18 10:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*54*		*50 - 200*	*07/07/18 13:16*	*07/09/18 10:36*	*1*

Client Sample ID: A-6109 QC M0010 MEOH WITH 5% NH4OH RB

Lab Sample ID: 140-11827-14

Date Collected: 06/13/18 00:00
Matrix: Air
Date Received: 06/16/18 11:05
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.0250	0.0250	ug/Sample		06/19/18 07:52	06/25/18 12:55	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Stack Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11827-1

Client Sample ID: A-6109 QC M0010 MEOH WITH 5% NH4OH RB

Lab Sample ID: 140-11827-14

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*67*		*50 - 200*	*06/19/18 07:52*	*06/25/18 12:55*	*1*

Client Sample ID: A-6110 QC M0010 XAD-2 RESIN TUBE RB

Lab Sample ID: 140-11827-15

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 12:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*54*		*50 - 200*	*06/19/18 07:52*	*06/25/18 12:59*	*1*

Client Sample ID: A-6111 QC M0010 MEOH WITH 5% NH4OH TB

Lab Sample ID: 140-11827-16

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:52	06/25/18 13:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:05*	*1*

Client Sample ID: A-6112 QC M0010 XAD-2 RESIN TUBE

Lab Sample ID: 140-11827-17

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*55*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:08*	*1*

Client Sample ID: A-6113 QC M0010 COMBINED GW RINSES (MEOH/5% HN4OH) PB

Lab Sample ID: 140-11827-18

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:52	06/25/18 13:12	1

Client Sample Results

Client: Chemours Company FC, LLC The
Project/Site: Division Stack Carbon Bed Outlet - M0010

TestAmerica Job ID: 140-11827-1

Client Sample ID: A-6113 QC M0010 COMBINED GW RINSES (MEOH/5% HN4OH) PB

Lab Sample ID: 140-11827-18

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
Sample Container: Air Train

Matrix: Air

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*67*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:12*	*1*

Client Sample ID: A-6479 MEDIA CHECK XAD

Lab Sample ID: 140-11827-19

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
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	0.200	ug/Sample		06/19/18 07:52	06/25/18 13:15	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*54*		*50 - 200*	*06/19/18 07:52*	*06/25/18 13:15*	*1*

Client Sample ID: A-6480 MEDIA CHECK FILTER

Lab Sample ID: 140-11827-20

Date Collected: 06/13/18 00:00
Date Received: 06/16/18 11:05
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		0.0250	0.0250	ug/Sample		06/19/18 07:49	06/25/18 12:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*62*		*50 - 200*	*06/19/18 07:49*	*06/25/18 12:13*	*1*

APPENDIX D
SAMPLE CALCULATIONS

EXAMPLE CALCULATIONS FOR VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 1	Test Date: 06/15/18
Test Location: VE North Carbon Bed Inlet	Test Period: 0920-1148

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

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

$$Vm(std) = \frac{17.64 \times 0.9916 \times 54.050 \times \left(29.95 + \frac{1.086}{13.6} \right)}{105.25 + 460} = 50.228$$

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 x Vwc) + (0.04715 x Wwsg)

Vw(std) = (0.04707 x 29.2) + (0.04715 x 21.8) = 2.40

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

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

$$bws = \frac{2.40}{2.40 + 50.228} = 0.046$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.046 = 0.954$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

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

$$= 28.84$$

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.

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

$$MWs = (28.84 \times 0.954) + (18 (1 - 0.954)) = 28.34$$

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.

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

$$Vs = 85.49 \times 0.84 \times 0.63825 \times \left(\frac{553}{29.64 \times 28.34}\right)^{\wedge}1/2 = 37.2$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

Cp = Pitot tube coefficient, dimensionless.

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

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

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

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

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

$$Qs(act) = 60 \times 37.2 \times 6.31 = 14064$$

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.

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

$$Qs(std) = 17.64 \times 0.954 \times \frac{29.64}{552.7} \times 14064$$

$$= 12698$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 553 \times 50.228}{37.2 \times 96 \times 29.64 \times 0.954 \times (0.218)\text{^}2} = 100.3$$

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
Test Number: Run 1
Test Location: VE N. Carbon Bed IN

Plant: Fayetteville, NC
Test Date: 6/15/2018
Test Period: 0920-1148

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{355.6 \times 2.2046 \times 10\text{-}9}{50.228}$$

Conc1 = 1.56E-08

Where:

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

Conc1 = HFPO Dimer Acid concentration, lbs/dscf.

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

2. HFPO Dimer Acid concentration, ug/dscm.

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

Conc2 = 355.6 / (50.228 x 0.02832)

Conc2 = 250.0

Where:

Conc2 = HFPO Dimer Acid concentration, ug/dscm.

0.02832 = Conversion factor from cubic feet to cubic meters.

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

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

$MR1_{(Inlet)}$ = 1.56E-08 x 12698 x 60

$MR1_{(Inlet)}$ = 1.19E-02

Where:

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

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

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

$MR2_{(Inlet)}$ = 1.19E-02 x 453.59 /3600

$MR2_{(Inlet)}$ = 1.50E-03

Where:

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

453.59 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

5. HFPO Dimer Acid Removal Efficiency, %

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

$$RE = \frac{(1.19E\text{-}2) - (3.06E\text{-}4)}{1.19E\text{-}02}$$

RE = 97.43

Where:

RE = Carbon Bed Removal Efficiency.

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

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

APPENDIX E
EQUIPMENT CALIBRATION RECORDS

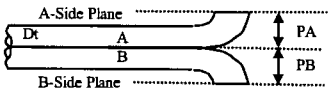
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-696**

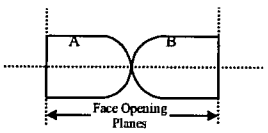
Inspection Date 1/5/18 Individual Conducting Inspection PM

If all Criteria PASS
Cp is equal to 0.84

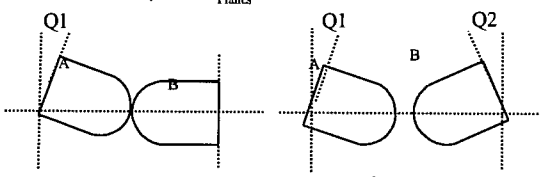
		PASS/FAIL
Distance to A Plane (PA) - inches	0.46	PASS
Distance to B Plane (PB) - inches	0.46	PASS
Pitot OD (D_t) - inches	0.375	



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

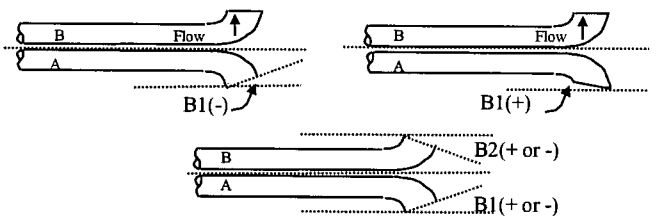


Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



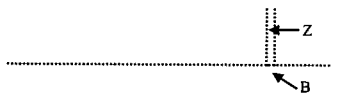
Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

Q1 and Q2 must be ≤ 10°



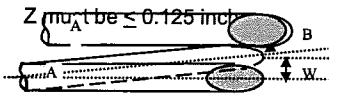
Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be ≤ 5°



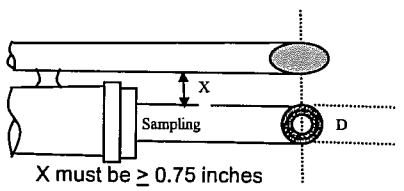
Z must be ≤ 0.125 inch

Horizontal offset between A and B Tubes (Z) - inches	0.005	PASS



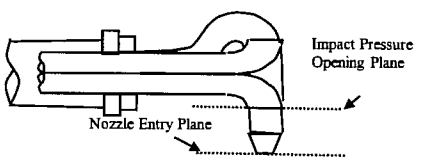
Vertical offset between A and B Tubes (W) - inches	0.014	PASS

W must be ≤ 0.03125 inches

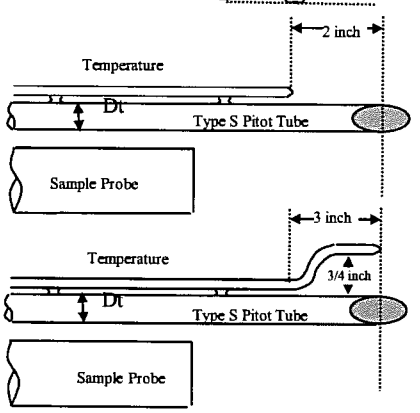


Distance between Sample Nozzle and Pitot (X) - inches	0.8	PASS

X must be ≥ 0.75 inches



Impact Pressure Opening Plane is above the Nozzle Entry Plane: ◉ YES ○ NO ○ NA



Thermocouple meets the Distance Criteria in the adjacent figure: ◉ YES ○ NO ○ NA

Thermocouple meets the Distance Criteria in the adjacent figure: ○ YES ○ NO ◉ NA

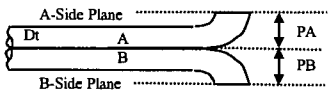
Type S Pitot Tube Insp ction ata Form

Pitot Tube Identification Number: **P-697**

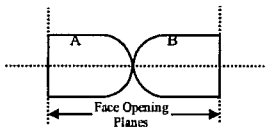
Inspection Date 1/5/18 Individual Conducting Inspection PM

If all Criteria PASS Cp is equal to 0.84

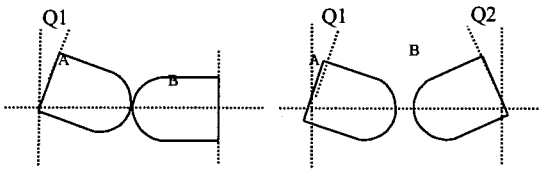
		PASS/FAIL
Distance to A Plane (PA) - inches	0.46	PASS
Distance to B Plane (PB) - inches	0.46	PASS
Pitot OD (D_t) - inches	0.375	



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

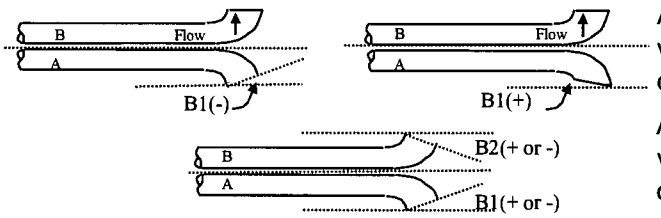


Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



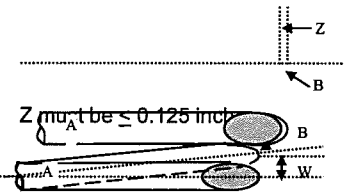
Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

Q1 and Q2 must be ≤ 10°



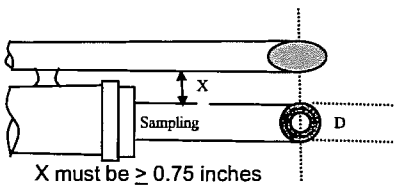
Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be ≤ 5°



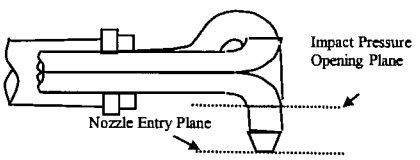
Horizontal offset between A and B Tubes (Z) - inches	0.007	PASS
Vertical offset between A and B Tubes (W) - inches	0.018	PASS

W must be ≤ 0.03125 inches

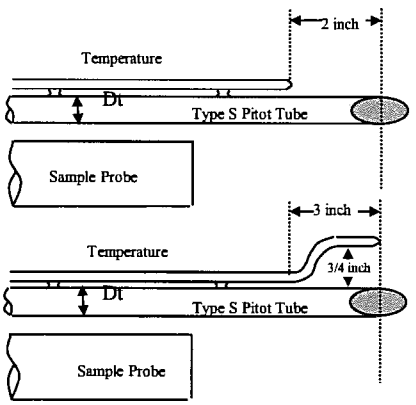


Distance between Sample Nozzle and Pitot (X) - inches: 0.8 — PASS

X must be ≥ 0.75 inches



Impact Pressure Opening Plane is above the Nozzle Entry Plane: ◉ YES ○ NO ○ NA



Thermocouple meets the Distance Criteria in the adjacent figure: ◉ YES ○ NO ○ NA

Thermocouple meets the Distance Criteria in the adjacent figure: ○ YES ○ NO ◉ NA

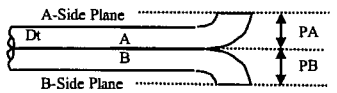
Type S Pitot Tube Inspection Data Form

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

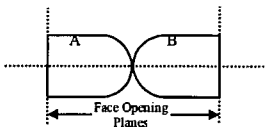
Inspection Date 5/30/18 Individual Conducting Inspection SR

If all Criteria PASS Cp is equal to 0.84

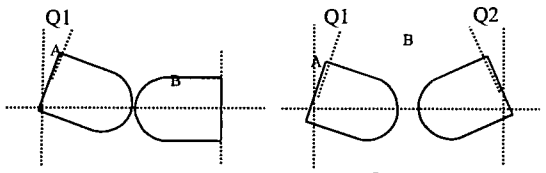
		PASS/FAIL
Distance to A Plane (PA) - inches	0.466	PASS
Distance to B Plane (PB) - inches	0.466	PASS
Pitot OD (D_t) - inches	0.375	



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

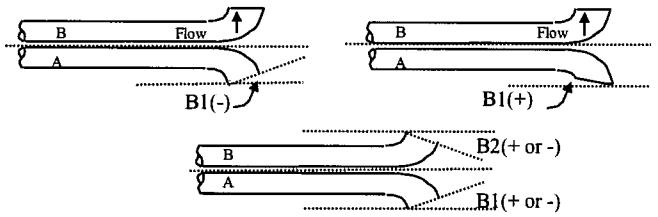


Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



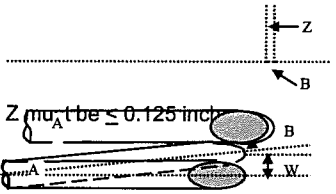
Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

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

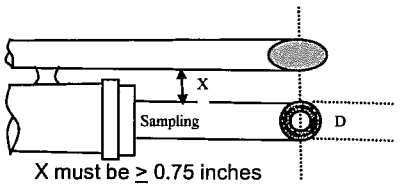
B1 or B2 must be ≤ 5°



Z must be ≤ 0.125 inch

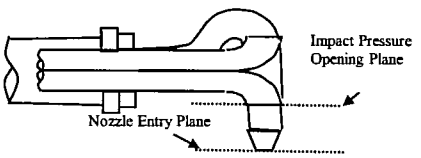
Horizontal offset between A and B Tubes (Z) - inches	0.008	PASS
Vertical offset between A and B Tubes (W) - inches	0.02	PASS

W must be ≤ 0.03125 inches

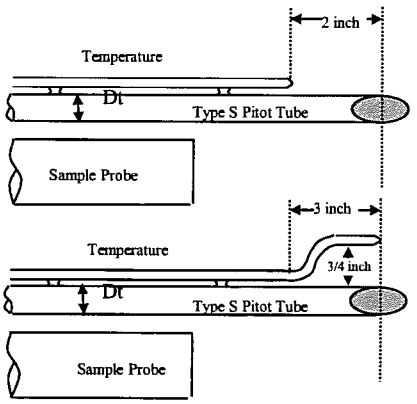


Distance between Sample Nozzle and Pitot (X) - inches: 0.89 — PASS

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

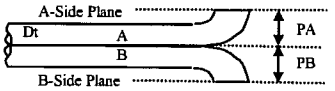
Type S Pitot Tube Insp ction ata Form

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

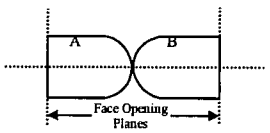
Inspection Date 5/30/18 Individual Conducting Inspection SR

If all Criteria PASS Cp is equal to 0.84

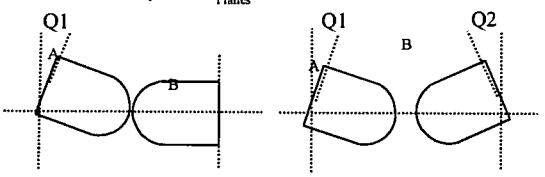
		PASS/FAIL
Distance to A Plane (PA) - inches	0.453	PASS
Distance to B Plane (PB) - inches	0.453	PASS
Pitot OD (D_t) - inches	0.375	



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



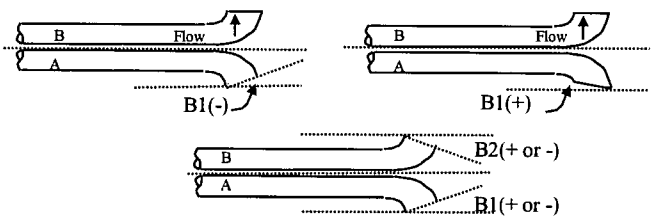
Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



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°



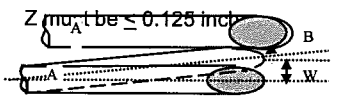
Angle of B1 from vertical A Tube- degrees (absolute) 0 PASS

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

B1 or B2 must be ≤ 5°

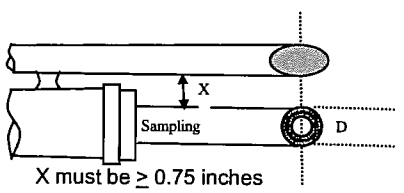
Horizontal offset between A and B Tubes (Z) - inches 0.006 PASS

Z must be ≤ 0.125 inch



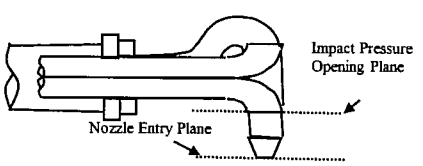
Vertical offset between A and B Tubes (W) - inches 0.022 PASS

W must be ≤ 0.03125 inches

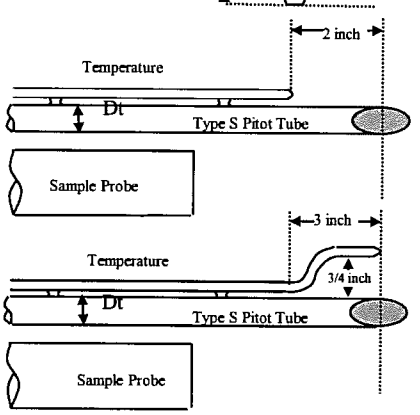


Distance between Sample Nozzle and Pitot (X) - inches 0.84 PASS

X must be ≥ 0.75 inches



Impact Pressure Opening Plane is above the Nozzle Entry Plane: ◉ YES ○ NO ○ NA



Thermocouple meets the Distance Criteria in the adjacent figure: ◉ YES ○ NO ○ NA

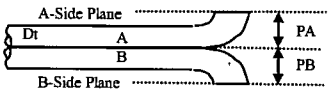
Thermocouple meets the Distance Criteria in the adjacent figure: ○ YES ○ NO ◉ NA

Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-704**

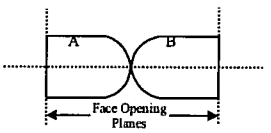
Inspection Date 5/30/18 Individual Conducting Inspection SR

If all Criteria PASS Cp is equal to 0.84

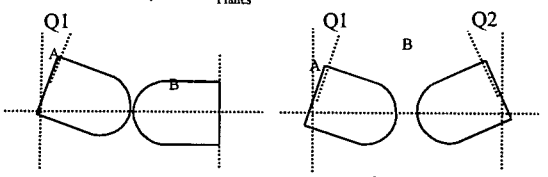


		PASS/FAIL
Distance to A Plane (PA) - inches	0.46	PASS
Distance to B Plane (PB) - inches	0.46	PASS
Pitot OD (D_t) - inches	0.375	

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

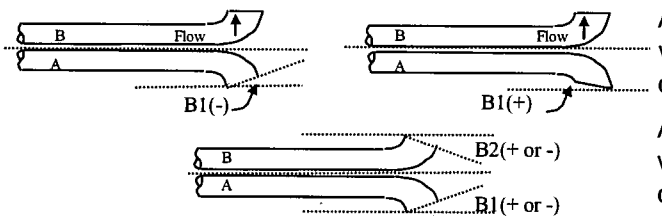


Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



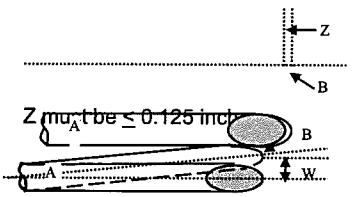
Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

Q1 and Q2 must be ≤ 10°



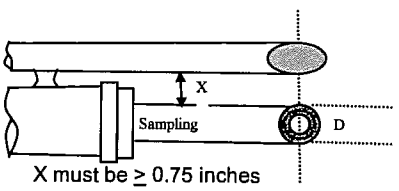
Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be ≤ 5°



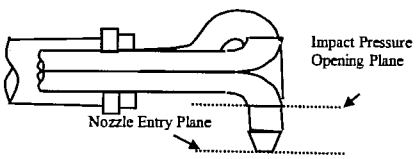
Horizontal offset between A and B Tubes (Z) - inches	0.015	PASS
Vertical offset between A and B Tubes (W) - inches	0.025	PASS

W must be ≤ 0.03125 inches

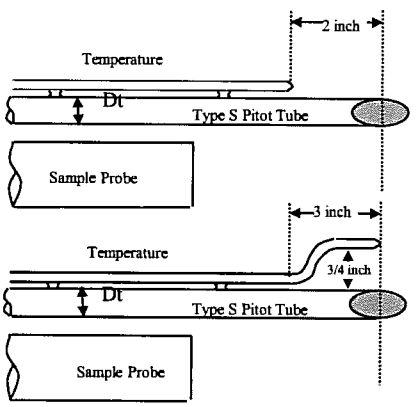


Distance between Sample Nozzle and Pitot (X) - inches	0.79	PASS

X must be ≥ 0.75 inches



Impact Pressure Opening Plane is above the Nozzle Entry Plane: ◉ YES ○ NO ○ NA



Thermocouple meets the Distance Criteria in the adjacent figure: ◉ YES ○ NO ○ NA

Thermocouple meets the Distance Criteria in the adjacent figure: ○ YES ○ NO ◉ NA

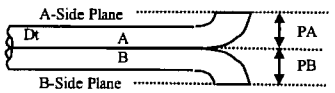
Type S Pitot Tube Inspection Data Form

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

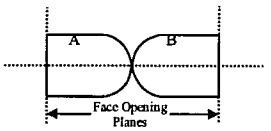
Inspection Date 6/15/18 Individual Conducting Inspection KS

If all Criteria PASS
Cp is equal to 0.84

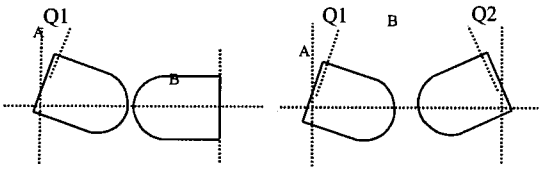
		PASS/FAIL
Distance to A Plane (PA) - inches	0.454	PASS
Distance to B Plane (PB) - inches	0.454	PASS
Pitot OD (D_t) - inches	0.375	



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

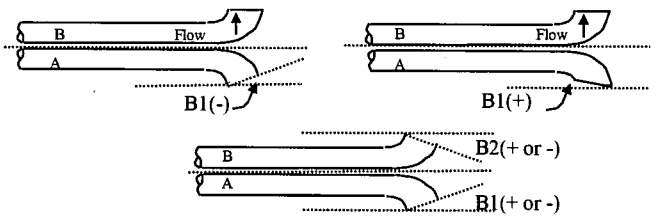


Are Open Faces Aligned Perpendicular to the Tube Axis: ◉ YES ○ NO — PASS



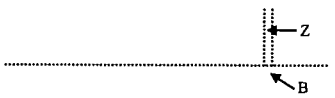
Angle of Q1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of Q2 from vertical B Tube- degrees (absolute)	0	PASS

Q1 and Q2 must be ≤ 10°



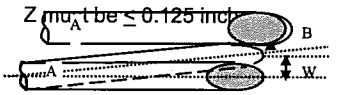
Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

B1 or B2 must be ≤ 5°



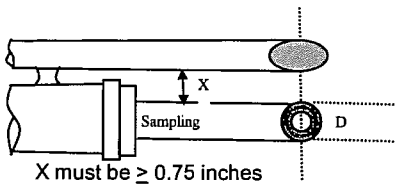
Horizontal offset between A and B Tubes (Z) - inches	0.009	PASS

Z must be ≤ 0.125 inch



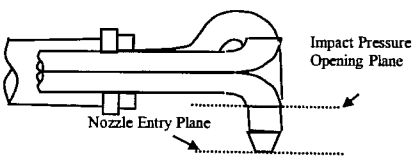
Vertical offset between A and B Tubes (W) - inches	0.016	PASS

W must be ≤ 0.03125 inches

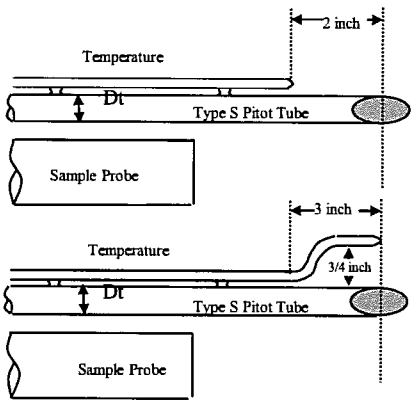


Distance between Sample Nozzle and Pitot (X) - inches	0.89	PASS

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 PM **Meter Box Number** 25 **Ambient Temp** 71

Date 7-Feb-18 **Wet Test Meter Number** P-2952 **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 16300943

Baro Press, in Hg (Pb)	29.74

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	127.282	69.5	71.00	71.00	71.0	12.9	1.0008	1.8731
		132.286		71.00	71.00				
		5.004		71.00	71.00				
1.0	5.0	132.286	69.5	71.00	71.00	71.5	9.2	0.9971	1.9036
		137.307		72.00	72.00				
		5.021		71.50	71.50				
1.5	13.0	137.307	69.5	72.00	72.00	72.5	20.3	0.9959	2.0527
		150.386		73.00	73.00				
		13.079		72.50	72.50				
2.0	10.0	150.386	69.5	74.00	74.00	74.5	13.6	0.9930	2.0683
		160.502		75.00	75.00				
		10.116		74.50	74.50				
3.0	10.0	160.502	69.5	75.00	75.00	75.5	11.1	0.9931	2.0628
		170.611		76.00	76.00				
		10.109		75.50	75.50				
							Average	**0.9960**	**1.9921**

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

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

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

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

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

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

2 - Acceptable Temperature Difference less than 1.5 %

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

Y Factor Calibration Check Calculation

PPA CARBON BED INLET

METER BOX NO. 25

6/12/2018

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

Tma = Source Temperature, absolute(°R)			
Tm = Average dry gas meter temperature , deg F.	70.3	74.8	

$$Tma = Ts + 460$$

$$Tma = 70.29 + 460$$

Tma = 530.29 534.75

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	0.84	0.93	
Pb = Barometric Pressure, in Hg.	30.09	30.08	

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

$$Pm = 30.09 + (0.838333333333333 / 13.6)$$

Pm = 30.15 30.15

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.	48.990	51.520	
Y = Dry gas meter calibration factor (based on full calibration)	0.9960	0.9960	
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.9921	1.9921	
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.9140	0.9620	
O = Total sampling time, minutes.	96	96	

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

$$Yqa = (96.00 / 48.99) * SQRT (0.0319 * 530.29 * 29) / (1.99 * 30.15 * 28.84) * 0.91$$

$$Yqa = 1.960 * SQRT\ 490.573 / 1{,}731.942 * 0.91$$

Yqa = 0.9532 0.9580

Diff = Absolute difference between Yqa and Y	4.30	3.82	

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

$$Diff = ((0.996 - 0.953) / 0.996) * 100$$

Average Diff = 4.06

Allowable = 5.0

Y Factor Calibration Check Calculation

VE NORTH CARBON BED INLET

METER BOX NO. 31

6/15/2018

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

Tma = Source Temperature, absolute(°R)			
Tm = Average dry gas meter temperature , deg F.	105.3	105.3	

$$Tma = Ts + 460$$

$$Tma = 105.25 + 460$$

Tma = 565.25 565.25

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	1.09	1.31	
Pb = Barometric Pressure, in Hg.	29.95	29.92	

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

$$Pm = 29.95 + (1.08625 / 13.6)$$

Pm = 30.03 30.02

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.	54.050	59.659	
Y = Dry gas meter calibration factor (based on full calibration)	0.9916	0.9916	
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	2.0587	2.0587	
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.0402	1.1341	
O = Total sampling time, minutes.	96	96	

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

$$Yqa = (96.00 / 54.05) * SQRT (0.0319 * 565.25 * 29) / (2.06 * 30.03 * 28.84) * 1.04$$

$$Yqa = 1.776 * SQRT\ 522.913 / 1{,}782.721 * 1.04$$

Yqa = 1.0006 0.9885

Diff = Absolute difference between Yqa and Y	0.91	0.31	

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

$$Diff = ((0.9916 - 1.001) / 0.9916) * 100$$

Average Diff = 0.61

Allowable = 5.0

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

Calibrator PM **Meter Box Number** 31 **Ambient Temp** 71

Date 4-Feb-18 **Wet Test Meter Number** P-2952 **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 17485128

Baro Press, in Hg (Pb)	29.79

Setting	Gas Volume		Temperatures					Calibration Results	
Orifice Manometer	Wet Test Meter	Dry gas Meter	Wet Test Meter	Dry Gas Meter					
in H_20 (ΔH)	ft^3 (Vw)	ft^3 (Vd)	°F (Tw)	Outlet, °F (Td_o)	Inlet, °F (Td_i)	Average, °F (Td)	Time, min (O)	Y	ΔH
0.5	5.0	449.372	70.0	69.00	69.00	70.0	13.0	0.9976	1.9063
		454.378		71.00	71.00				
		5.006		70.00	70.00				
1.0	5.0	454.378	70.0	71.00	71.00	71.5	9.5	0.9972	2.0302
		459.394		72.00	72.00				
		5.016		71.50	71.50				
1.5	10.07	459.394	70.0	74.00	74.00	74.0	16.0	0.9918	2.1197
		469.586		74.00	74.00				
		10.192		74.00	74.00				
2.0	10.0	469.586	70.0	74.00	74.00	74.5	13.7	0.9894	2.0992
		479.729		75.00	75.00				
		10.143		74.50	74.50				
3.0	10.0	479.729	70.0	75.00	75.00	75.5	11.3	0.9819	2.1383
		489.943		76.00	76.00				
		10.214		75.50	75.50				
							Average	**0.9916**	**2.0587**

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

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

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

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

Reference Temperature	Temperature Reading from Individual Thermocouple Input [1]						Average Temperature Reading	Temp Difference [2] (%)
Select Temperature ○ °C ◉ °F	Channel Number							
	1	2	3	4	5	6		
32	32	32	32	32	32		32.0	0.0%
212	212	213	213	212	212		212.4	-0.1%
932	932	933	933	932	932		932.4	0.0%
1832	1832	1833	1833	1832	1832		1832.4	0.0%

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

2 - Acceptable Temperature Difference less than 1.5 %

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

Y Factor Calibration Check Calculation

PPA CARBON BED OUTLET STACK

METER BOX NO. 31

6/12/2018

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

Tma = Source Temperature, absolute(°R)			
Tm = Average dry gas meter temperature , deg F.	70.1	75.2	

$$Tma = Ts + 460$$

$$Tma = 70.08 + 460$$

Tma = 530.08 535.17

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	0.77	0.62	
Pb = Barometric Pressure, in Hg.	29.99	29.98	

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

$$Pm = 29.99 + (0.77125 / 13.6)$$

Pm = 30.05 30.03

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.	43.540	39.820	
Y = Dry gas meter calibration factor (based on full calibration)	0.9916	0.9916	
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	2.0587	2.0587	
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.8695	0.7835	
O = Total sampling time, minutes.	96	96	

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

$$Yqa = (96.00 / 43.54) * SQRT (0.0319 * 530.08 * 29) / (2.06 * 30.05 * 28.84) * 0.87$$

$$Yqa = 2.205 * SQRT\ 490.380 / 1{,}783.908 * 0.87$$

Yqa = 1.0052 0.9954

Diff = Absolute difference between Yqa and Y	1.37	0.38	

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

$$Diff = ((0.9916 - 1.005) / 0.9916) * 100$$

Average Diff = 0.88

Allowable = 5.0

Y Factor Calibration Check Calculation

PPA CARBON BED INLET
METER BOX NO. 31
6/12/2018

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

Tma = Source Temperature, absolute(°R)			
Tm = Average dry gas meter temperature , deg F.	97.4	104.5	

$$Tma = Ts + 460$$

$$Tma = 97.42 + 460$$

Tma = 557.42 564.50

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	1.20	1.28	
Pb = Barometric Pressure, in Hg.	29.95	29.92	

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

$$Pm = 29.95 + (1.2 / 13.6)$$

Pm = 30.04 30.01

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.	57.139	57.171	
Y = Dry gas meter calibration factor (based on full calibration)	0.9960	0.9960	
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.9921	1.9921	
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.0847	1.1190	
O = Total sampling time, minutes.	96	96	

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

$$Yqa = (96.00 / 57.14) * SQRT (0.0319 * 557.42 * 29) / (1.99 * 30.04 * 28.84) * 1.08$$

$$Yqa = 1.680 * SQRT\ 515.666 / 1{,}725.624 * 1.08$$

Yqa = 0.9963 1.0341

Diff = Absolute difference between Yqa and Y	0.03	3.83	

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

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

Average Diff = 1.93

Allowable = 5.0

Airgas
an Air Liquide company

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	82-401044875-1
Cylinder Number:	CC429490	Cylinder Volume:	150.5 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52017	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Nov 21, 2017

Expiration Date: Nov 21, 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	9.000 %	8.913 %	G1	+/- 0.7% NIST Traceable	11/21/2017
OXYGEN	12.00 %	11.93 %	G1	+/- 0.4% NIST Traceable	11/21/2017
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060408	CC412683	7.489 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 14, 2019
NTRMplus	09060208	CC262337	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 08, 2018

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

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

Approved for Release

APPENDIX F
LIST OF PROJECT PARTICIPANTS

The following WESTON employees participated in this project.

Paul Meeter	Senior Project Manager
Jeff O'Neill	Senior Project Manager
Steve Rathfon	Team Leader
Kyle Schweitzer	Team Member
Matt Winkeler	Team Member
Jack Mills	Team Member
Kris Ansley	Team Member
Kyle DeShazo	Team Member
Jacob Little	Team Member
Austin Squires	Team Member
Steve Dryden	Team Member