FLUOROMONOMERS
MANUFACTURING PROCESS
VE SOUTH CARBON BED
REMOVAL EFFICIENCY AND
VE SOUTH STACK EMISSIONS TEST REPORT
TEST DATES: 16 AND 17 JULY 2019

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FAYETTEVILLE, NORTH CAROLINA

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1. INTRODUCTION

1.1 FACILITY AND BACKGROUND INFORMATION

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

Chemours contracted Weston Solutions, Inc. (Weston) to perform HFPO Dimer Acid Fluoride, captured as HFPO Dimer Acid, emission testing on the Vinyl Ethers (VE) South Carbon Bed and VE South stack at the facility. Testing was performed on 16 and 17 July 2019 and generally followed the "Emission Test Protocol" reviewed and approved by the North Carolina Department of Environmental Quality (NCDEQ). This report provides the results from the emission test program.

1.2 TEST OBJECTIVES

The specific objectives for this test program were as follows:

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

1.3 TEST PROGRAM OVERVIEW

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

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

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

Appendix C includes the summary reports for the laboratory analytical results. The full laboratory data packages are provided separately in electronic format.

Table 1-1
Sampling Plan for VE South Carbon Bed Testing

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

Key:

[1] Sample collected in field.

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

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

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

[5] Actual number of samples collected in field.

[6] Not applicable.

Table 1-2
Sampling Plan for VE South Stack

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

Key:

[1] Sample collected in field.

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

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

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

[5] Actual number of samples collected in field.

[6] Not applicable.

2. SUMMARY OF TEST RESULTS

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

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

Table 2-1
Summary of HFPO Dimer Acid VE South Carbon Bed and Stack Test Results

	Inlet		Outlet		Removal Efficiency	VE South Stack	
	g/sec	lb/hr	g/sec	lb/hr	%	g/sec	lb/hr
R1	4.17E-04	3.31E-03	6.01E-05	4.78E-04	85.6	3.04E-05	2.41E-04
R2	8.50E-05	6.75E-04	1.71E-05	1.36E-04	79.8	2.17E-05	1.72E-04
R3	3.69E-05	2.93E-04	1.95E-05	1.55E-04	47.1	1.58E-05	1.25E-04
Average	1.80E-04	1.43E-03	3.23E-05	2.56E-04	65.9	2.26E-05	1.80E-04

3. PROCESS DESCRIPTIONS

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

3.1 FLUOROMONOMERS

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

The VE South Waste Gas Scrubber and the Tower HVAC are vented to the carbon bed which then vents to the process stack (NEP-Hdr2). In addition, the following building air systems are vented to this stack:

- RV Catch Pots
- Nitrogen Supply to Catch Tanks
- Catalyst Feed Tank Pot Charge Vent

3.2 PROCESS OPERATIONS AND PARAMETERS

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

Source	Operation/Product	Batch or Continuous
VE South	PMVE/PEVE	Semi-continuous – Condensation is continuous, Two Agitated Bed Reactors are batch for 30-40 mins at end of each run*, Refining (ether column) is batch

*Only one Agitated Bed Reactor was running due to cooling limiting capacity during testing.

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

- Fluoromonomers Processes
    - VE South Waste Gas Scrubber
        - Caustic recirculation flow rate

4. DESCRIPTION OF TEST LOCATIONS

4.1 VE SOUTH STACK

Two 6-inch ID test ports are installed on the 42-inch ID steel stack. The ports are placed 150 inches (3.6 diameters) from the location where the carbon bed vent enters the stack and 20 feet (5.7 diameters) from the stack exit.

Per EPA Method 1, a total of 24 traverse points (12 per axis) were used for M0010 isokinetic sampling. It should be noted that near the port locations are a number of small ducts leading to the stack. These are catch pots which, under normal operation, do not discharge to the stack. They are used to vent process gas to the stack in the event of a process upset. For the purpose of test port location, and given the fact that there is no flow from these catch pots, they are not considered a flow contributor or a disturbance.

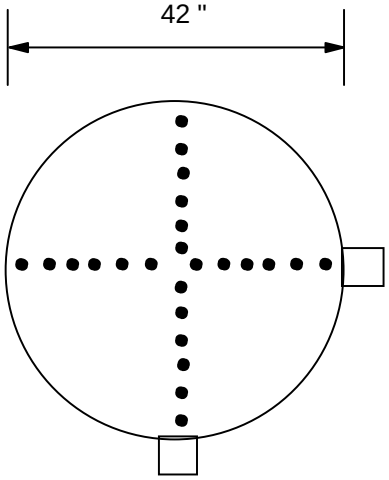
See Figure 4-1 for a schematic of the test port and traverse point locations.

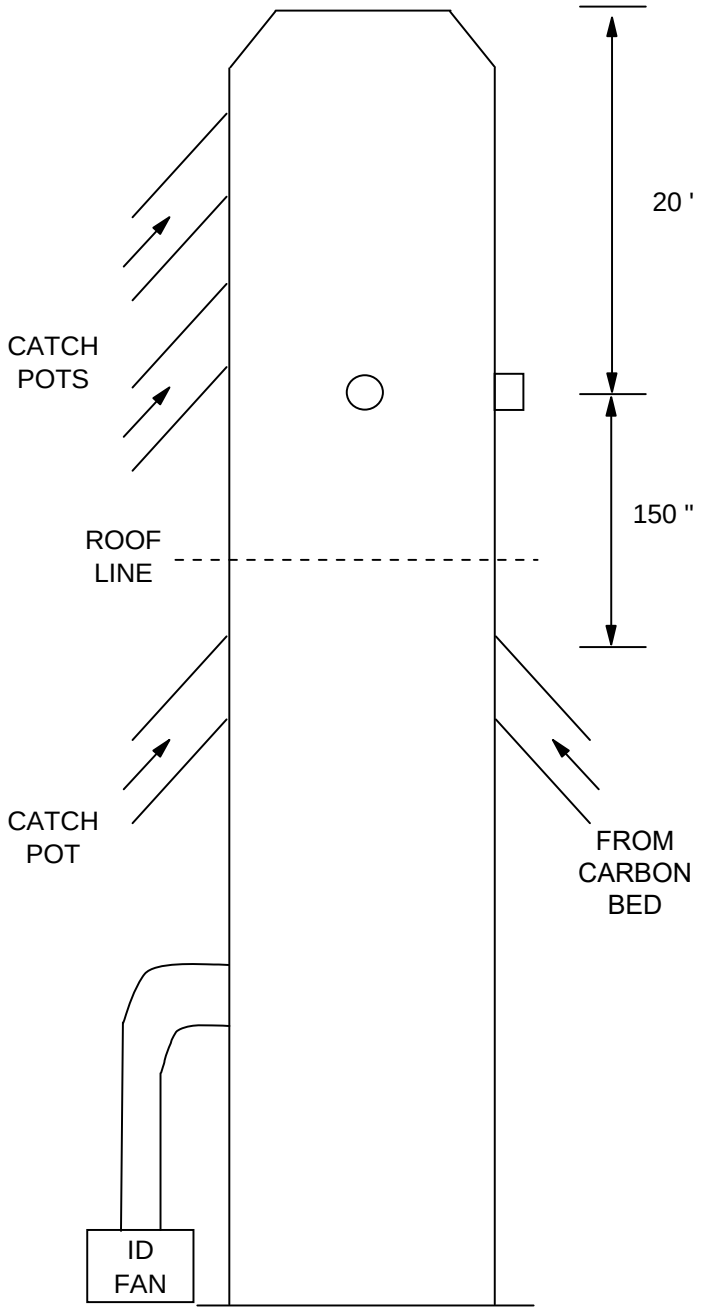
Note: All measurements at the test location were confirmed prior to sampling.

4.2 VE SOUTH CARBON BED INLET AND OUTLET

The fiberglass reinforced plastic (FRP) duct at the inlet of the carbon bed is 36-inch ID. The stainless steel duct at the outlet of the carbon bed is 41.5-inch ID. The test ports are located as shown below. Based on EPA Method 1, a total of 24 traverse points (12 per port) were required for HFPO Dimer Acid sampling at both locations. Figures 4-2 and 4-3 provide schematics of the Carbon Bed inlet and Carbon Bed outlet test port and traverse port locations, respectively.

Location	Distance from Flow Disturbance	
	Downstream (B)	Upstream (A)
Carbon Bed Inlet	35 inches > 0.97 duct diameters	41 inches > 1.1 duct diameters
Carbon Bed Outlet	12.5 feet > 4.2 duct diameters	31 feet > 10.3 duct diameters
VE South Stack	150 inches 3.6 duct diameters	20 feet 5.7 diameters





TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	1
2	2 7/8
3	5
4	7 3/8
5	10 1/2
6	15
7	27
8	31 1/2
9	34 5/8
10	37
11	39 1/8
12	41

DRAWING NOT TO SCALE

FIGURE 4-1
VE SOUTH STACK TEST PORT AND
TRAVERSE POINT LOCATION

IASDATA\CHEMOURS\15418.002.016\FIGURE 4-1 VE SOUTH SCRUBBER STACK

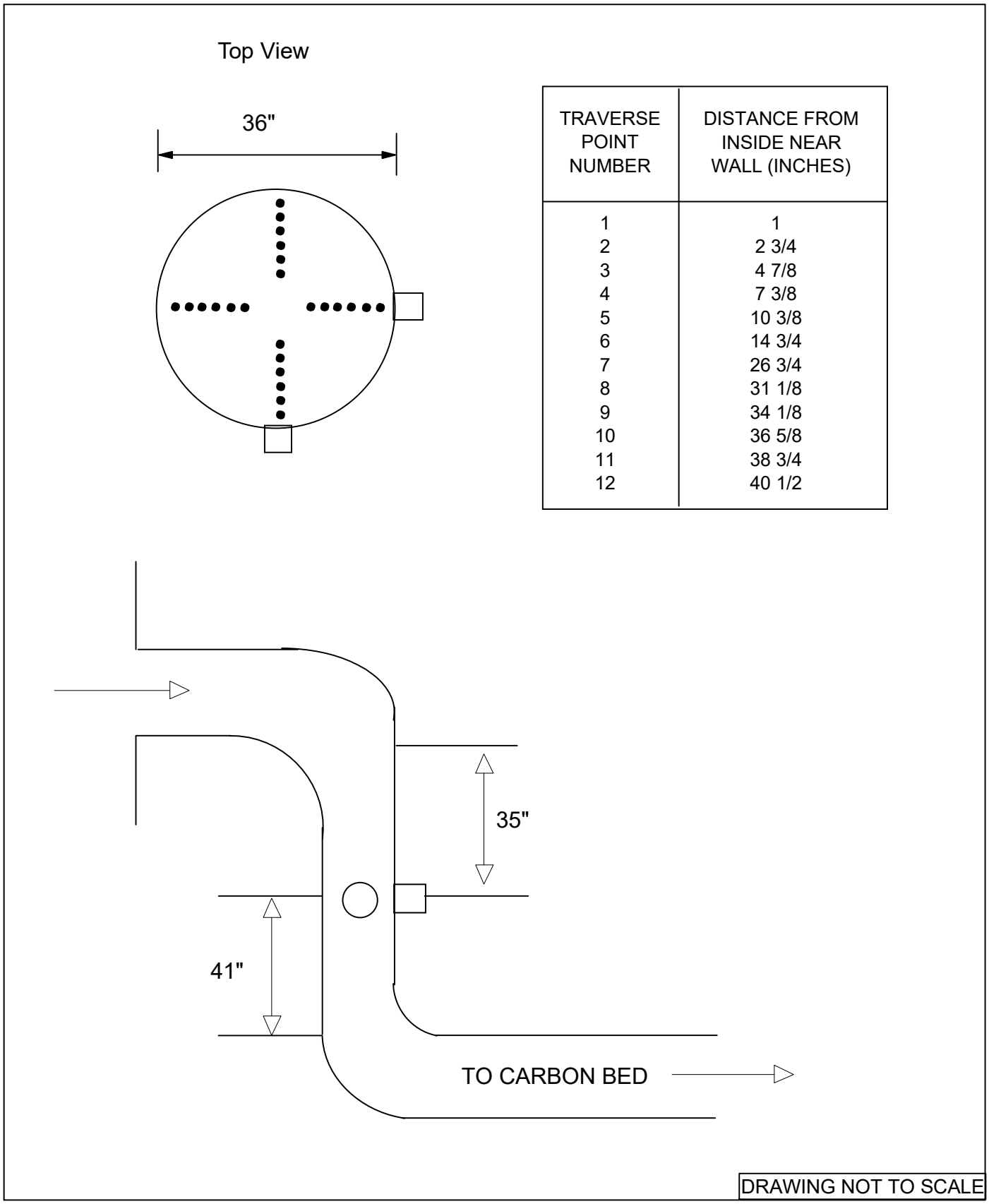


FIGURE 4-2
VE SOUTH CARBON BED INLET SCHEMATIC

IASDATA\CHEMOURS\15418.002.016\FIGURE 4-1 VE SOUTH CB INLET SCHEMATIC

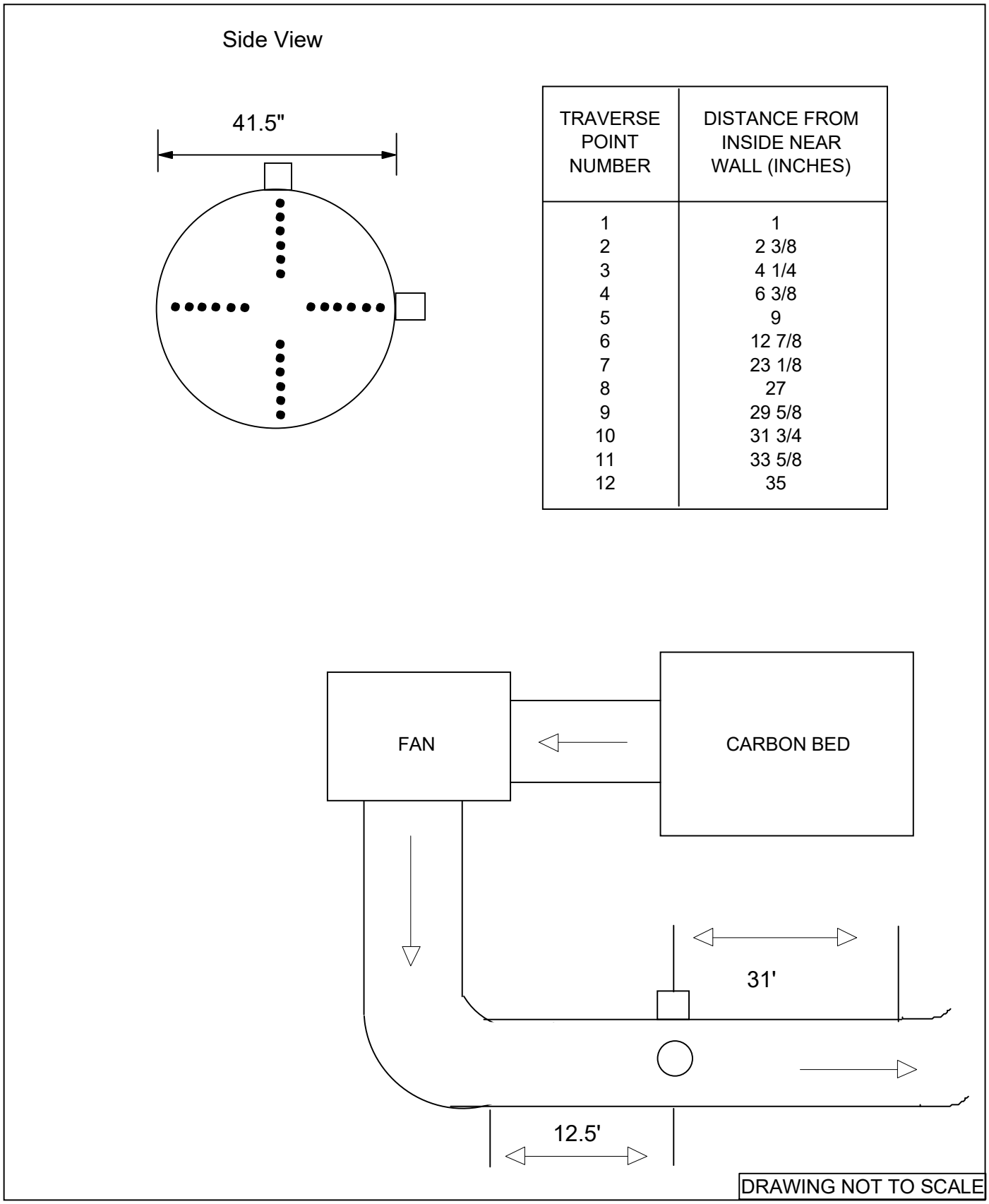


FIGURE 4-3
VE SOUTH CARBON BED OUTLET SCHEMATIC

5. SAMPLING AND ANALYTICAL METHODS

5.1 STACK GAS SAMPLING PROCEDURES

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

5.1.1 Pre-Test Determinations

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

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

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

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

5.2 STACK PARAMETERS

5.2.1 EPA Method 0010

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

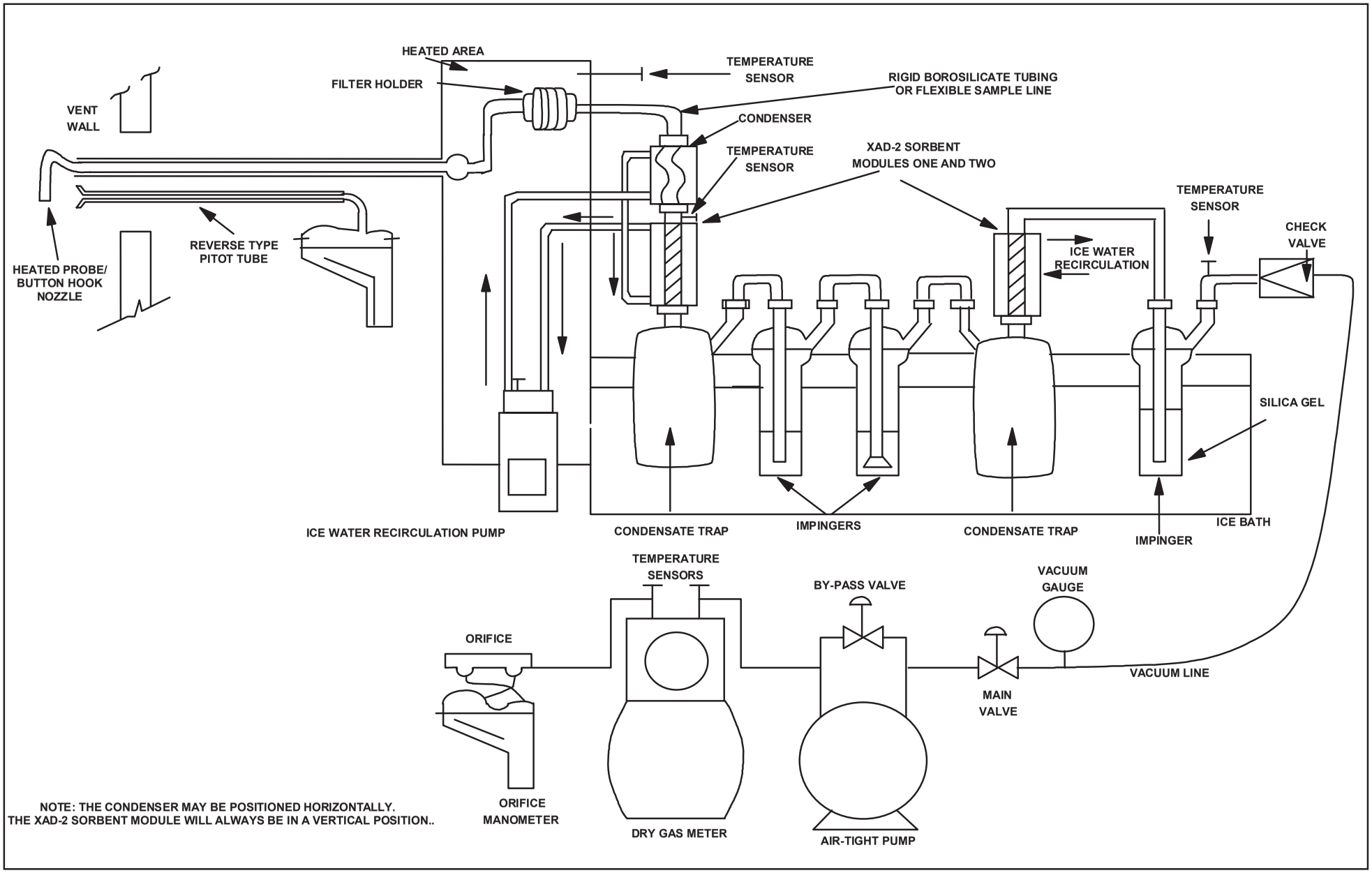


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

IASDATA\CHEMOURS\15418.002.016\FIGURE 5-1 METHOD 0010

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

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

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

5.2.2 EPA Method 0010 Sample Recovery

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

A consistent procedure was employed for sample recovery:

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

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

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

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

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

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

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

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

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

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

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

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

5.2.3 EPA Method 0010 Sample Analysis

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

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

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

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

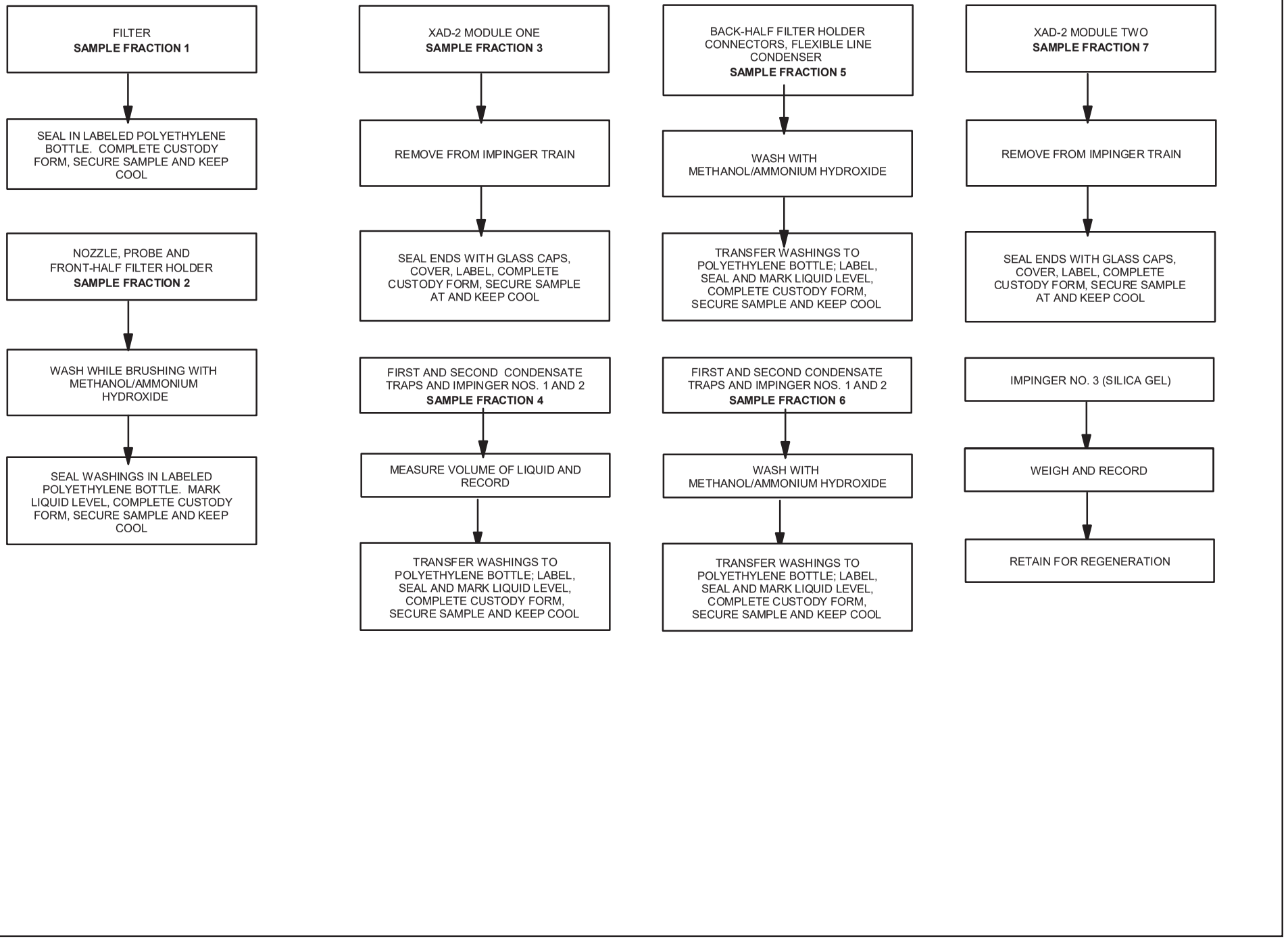


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.016\FIGURE 5-2 EPA 0010

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

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

5.3 GAS COMPOSITION

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

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

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

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

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

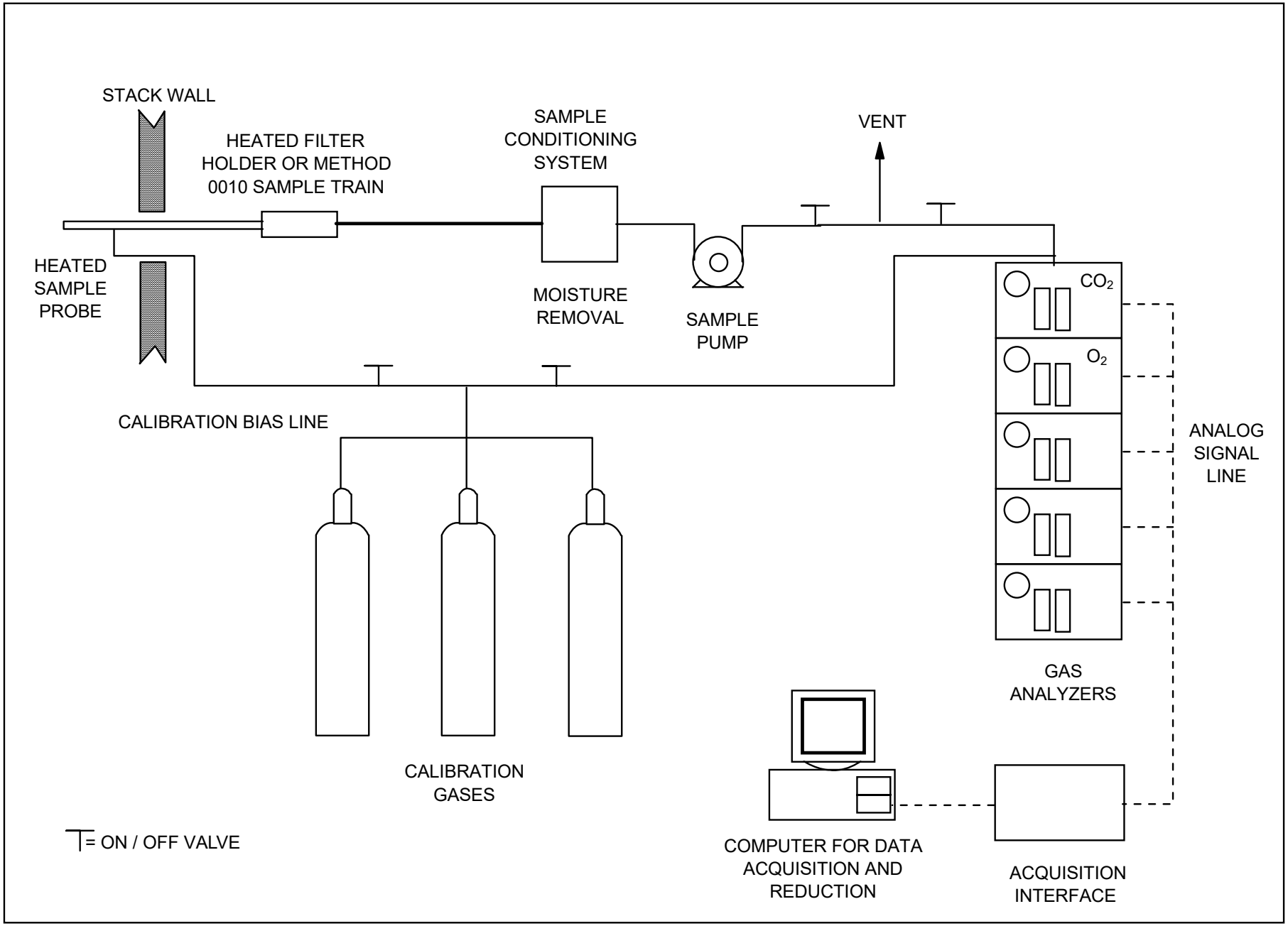


FIGURE 5-5
WESTON SAMPLING SYSTEM

IASDATA\CHEMOURS\15418.002.016\FIGURE 5-5 WESTON SAMPLING SYSTEM

6. DETAILED TEST RESULTS AND DISCUSSION

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

Chemours is continuing to investigate the differences in gas stream velocity and volumetric flow exiting the carbon bed and exiting the stack.

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

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

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

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

Test Data			
Run number	1	2	3
Location	VES CBed Inlet	VES CBed Inlet	VES CBed Inlet
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.160	0.160	0.160
Cross sectional nozzle area, sq.ft.	0.000140	0.000140	0.000140
Barometric pressure, in. Hg	30.06	30.09	30.06
Avg. orifice press. diff., in H_2O	0.97	1.00	1.02
Avg. dry gas meter temp., deg F	102.0	93.6	102.8
Avg. abs. dry gas meter temp., deg. R	562	554	563
Total liquid collected by train, ml	29.5	28.2	48.7
Std. vol. of H_2O vapor coll., cu.ft.	1.39	1.33	2.29
Dry gas meter calibration factor	1.0066	1.0066	1.0066
Sample vol. at meter cond., dcf	50.909	51.412	51.767
Sample vol. at std. cond., dscf [(1)]	48.469	49.741	49.222
Percent of isokinetic sampling	99.7	101.2	101.1
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.028	0.026	0.045
Mole fraction of dry gas	0.972	0.974	0.955
Molecular wt. of wet gas, lb/lb mole	28.53	28.55	28.35
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	-5.50	-5.50	-5.50
Absolute pressure, in. Hg	29.66	29.69	29.66
Avg. temperature, deg. F	100	92	97
Avg. absolute temperature, deg.R	560	552	557
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	66.5	66.1	67.5
Stack/duct cross sectional area, sq.ft.	7.07	7.07	7.07
Avg. gas stream volumetric flow, wacf/min.	28214	28035	28617
Avg. gas stream volumetric flow, dscf/min.	25641	25919	25674

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

*Run 3 conducted prior to Run 2

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

TEST DATA			
Run number	1	2	3
Location	VES CBed Inlet	VES CBed Inlet	VES CBed Inlet
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	47.37	9.79	4.25
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	34.51	6.95	3.05
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	2.15E-09	4.34E-10	1.90E-10
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	3.31E-03	6.75E-04	2.93E-04
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	4.17E-04	8.50E-05	3.69E-05

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

Test Data			
Run number	1	2	3
Location	VES CBed Outlet	VES CBed Outlet	VES CBed Outlet
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.202	0.202	0.202
Cross sectional nozzle area, sq.ft.	0.000223	0.000223	0.000223
Barometric pressure, in. Hg	30.06	30.09	30.06
Avg. orifice press. diff., in H_2O	1.26	1.31	1.32
Avg. dry gas meter temp., deg F	104.7	96.0	107.1
Avg. abs. dry gas meter temp., deg. R	565	556	567
Total liquid collected by train, ml	34.0	24.2	46.4
Std. vol. of H_2O vapor coll., cu.ft.	1.60	1.14	2.19
Dry gas meter calibration factor	1.0069	1.0069	1.0069
Sample vol. at meter cond., dcf	58.439	58.943	59.828
Sample vol. at std. cond., dscf [(1)]	55.427	56.835	56.507
Percent of isokinetic sampling	97.3	98.5	99.2
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.028	0.020	0.037
Mole fraction of dry gas	0.972	0.980	0.963
Molecular wt. of wet gas, lb/lb mole	28.53	28.62	28.43
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	2.40	2.40	2.40
Absolute pressure, in. Hg	30.24	30.27	30.24
Avg. temperature, deg. F	100	98	100
Avg. absolute temperature, deg.R	560	558	560
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	48.0	47.9	48.5
Stack/duct cross sectional area, sq.ft.	9.39	9.39	9.39
Avg. gas stream volumetric flow, wacf/min.	27061	27013	27311
Avg. gas stream volumetric flow, dscf/min.	25043	25357	25032

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

*Run 3 conducted prior to Run 2

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

TEST DATA			
Run number	1	2	3
Location	VES CBed Outlet	VES CBed Outlet	VES CBed Outlet
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	7.99	2.30	2.65
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	5.09	1.43	1.65
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	3.18E-10	8.94E-11	1.03E-10
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	4.78E-04	1.36E-04	1.55E-04
HFPO Dimer Acid (From Inlet Data)	3.31E-03	6.75E-04	2.93E-04
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	6.01E-05	1.71E-05	1.95E-05
Carbon Bed Removal Efficiency, %	85.6	79.8	47.1

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

Test Data			
Run number	1	2	3
Location	VE South Stack	VE South Stack	VE South Stack
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.190	0.190	0.190
Cross sectional nozzle area, sq.ft.	0.000197	0.000197	0.000197
Barometric pressure, in. Hg	30.00	30.07	30.07
Avg. orifice press. diff., in H_2O	0.79	0.79	0.76
Avg. dry gas meter temp., deg F	98.5	87.9	99.0
Avg. abs. dry gas meter temp., deg. R	558	548	559
Total liquid collected by train, ml	45.5	45.1	41.9
Std. vol. of H_2O vapor coll., cu.ft.	2.1	2.1	2.0
Dry gas meter calibration factor	1.0008	1.0008	1.0008
Sample vol. at meter cond., dcf	50.910	49.525	50.263
Sample vol. at std. cond., dscf [(1)]	48.374	48.079	47.822
Percent of isokinetic sampling	106.3	105.3	105.2
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.0	0.0	0.0
O_2, % by volume, dry basis	20.9	20.9	20.9
N_2, % by volume, dry basis	79.1	79.1	79.1
Molecular wt. of dry gas, lb/lb mole	28.84	28.84	28.84
H_20 vapor in gas stream, prop. by vol.	0.042	0.042	0.040
Mole fraction of dry gas	0.958	0.958	0.960
Molecular wt. of wet gas, lb/lb mole	28.38	28.38	28.41
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	2.50	2.50	2.50
Absolute pressure, in. Hg	30.18	30.25	30.25
Avg. temperature, deg. F	100	97	100
Avg. absolute temperature, deg.R	560	557	560
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	24	24	24
Avg. gas stream velocity, ft./sec.	44.1	43.9	43.8
Stack/duct cross sectional area, sq.ft.	9.62	9.62	9.62
Avg. gas stream volumetric flow, wacf/min.	25447	25348	25293
Avg. gas stream volumetric flow, dscf/min.	23157	23242	23134

[(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
VE SOUTH STACK

TEST DATA			
Run number	1	2	3
Location	VE South Stack	VE South Stack	VE South Stack
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	3.8080	2.6950	1.9560
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	2.78	1.98	1.44
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	1.74E-10	1.24E-10	9.02E-11
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	2.41E-04	1.72E-04	1.25E-04
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	3.04E-05	2.17E-05	1.58E-05

APPENDIX A
PROCESS OPERATIONS DATA

Date: 7/16/19

Time	1500				1600				1700				1800				1900			
Stack Testing					RUN 1: 1605 - 1841															
VES Product	PM/PE																			
VES Precursor																				
VES Condensation (HFPO)																				
VES ABR (East)																				
VES ABR (West)													Burnout							
VES Refining																				
VES WGS Recirculation Flow	18500 kg/h																			
Dimer ISO venting																				

Date: 7/17/19

Time	800				900				1000				1100				1200				1300				1400				1500				1600			
Stack Testing					RUN 2: 0905 - 1058																RUN 3: 1250 - 1502															
VES Product	PM/PE																																			
VES Precursor																																				
VES Condensation (HFPO)																																				
VES ABR (East)																																				
VES ABR (West)					Burnout																															
VES Refining																																				
VES WGS Recirculation Flow	18500 kg/h																																			
Dimer ISO venting																																				

APPENDIX B
RAW AND REDUCED TEST DATA

Sample and Velocity Traverse Point Data Sheet - Method 1

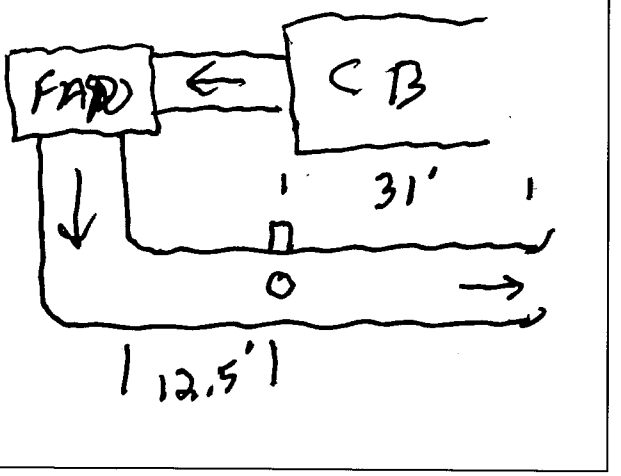
Client: Chemours
Loaction/Plant: Fayetteville
Source: UES CB Out
Operator: DMD/SMA/PG
Date: 7-16-19
W.O. Number:

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	55.5
Port Depth (in.) = D	14
Depth of Duct, diameter (in.) = C-D	~~55.5~~ 41.5
Area of Duct (ft^2)	9.39
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)	31'
Downstream - B (ft)	12'6"
Upstream - A (duct diameters)	10.3
Downstream - B (duct diameters)	4.2

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)	
1	.021	0.8775	14.875	15
2	.067	2.7805	16.780	16 3/4
3	.118	4.897	18.89	18 7/8
4	.177	7.35	21.35	21 3/8
5	.250	10.375	24.375	24 3/8
6	.356	14.77	28.77	28 3/4
7	.644	26.73	40.73	40 3/4
8	.750	31.125	45.125	45 1/8
9	.823	34.155	48.155	48 1/8
10	.882	36.60	50.6	50 5/8
11	.933	38.72	52.72	52 3/4
12	.979	40.63	54.63	54 5/8

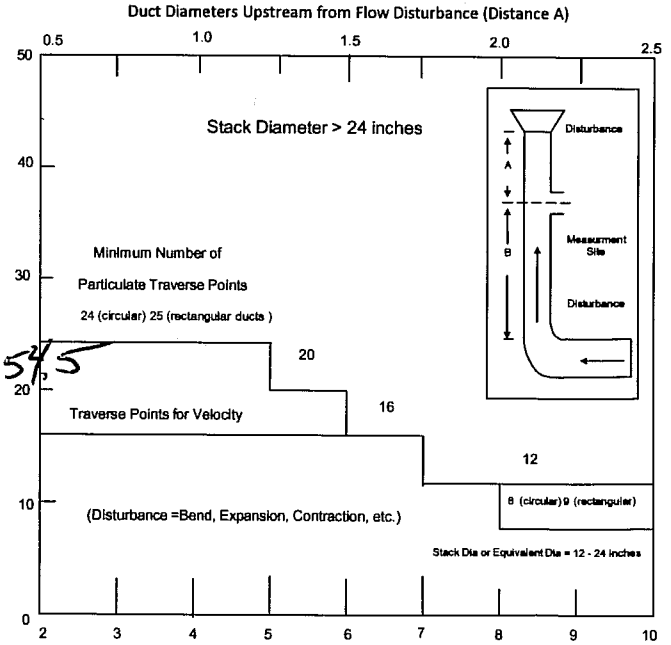
52.72

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

Sample and Velocity Traverse Point Data Sheet - Method 1

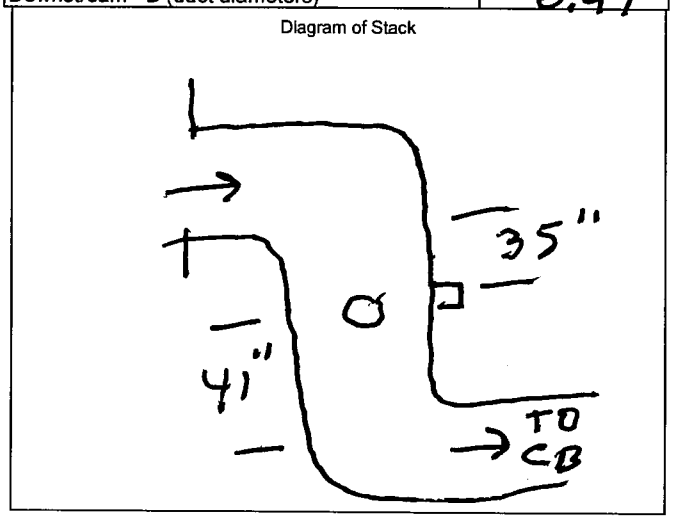
Client: Chemours
Loaction/Plant: Fayetteville
Source: VES CB Inlet
Operator:
Date: 7-16-19
W.O. Number:

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	49.5
Port Depth (in.) = D	9.5+4 = 13.5
Depth of Duct, diameter (in.) = C-D	36
Area of Duct (ft^2)	7.063
Total Traverse Points	24
Total Traverse Points per Port	12
Port Diameter (in.) ---(Flange-Threaded-Hole)	
Monorail Length	9'
Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	X
Total Ports (rectangular duct only)	X
Equivalent Diameter = (2*L*W)/(L+W)	X

Flow Disturbances	
Upstream - A (ft)	41
Downstream - B (ft)	35
Upstream - A (duct diameters)	1.14
Downstream - B (duct diameters)	0.97

Diagram of Stack

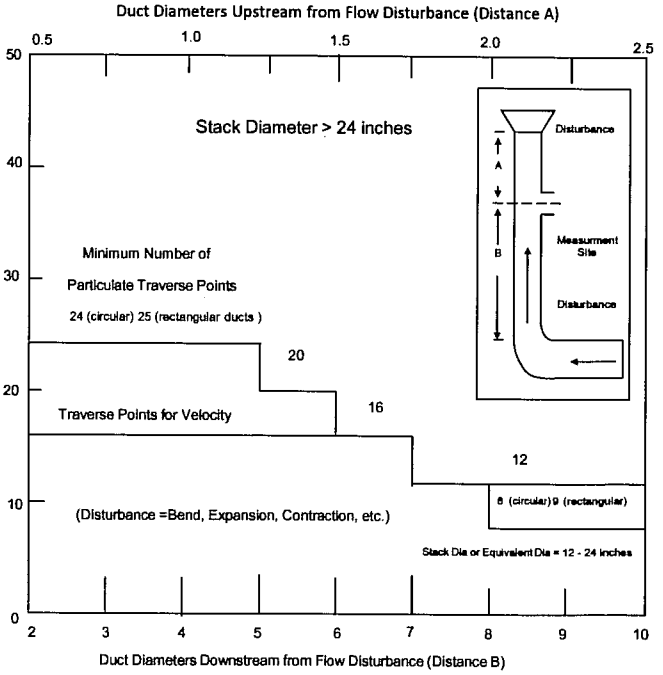


Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	.021	1	14 1/2
2	.067	2 3/8	15 7/8
3	.118	4 1/4	17 3/4
4	.177	6 3/8	19 7/8
5	.250	9	22 1/2
6	.356	12 7/8	26 3/8
7	.644	23 1/8	36 5/8
8	.75	27	40 1/2
9	.823	29 5/8	43
10	.882	31 3/4	45 1/4
11	.933	33 5/8	47
12	.979	35	48 1/2
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

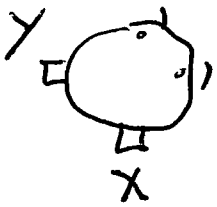
Traverse Point	Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
	1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
	2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
	3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
	4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
	5					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

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

Test Data			
Run number	1	2	3
Location	VES CBed Inlet	VES CBed Inlet	VES CBed Inlet
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
Operator	JDO/NG	KA/NG	KA/NG
Inputs For Calcs.			
Sq. rt. delta P	1.13927	1.14111	1.15441
Delta H	0.9663	0.9988	1.0171
Stack temp. (deg.F)	99.6	91.7	97.1
Meter temp. (deg.F)	102.0	93.6	102.8
Sample volume (act.)	50.909	51.412	51.767
Barometric press. (in.Hg)	30.06	30.09	30.06
Volume H_2O imp. (ml)	12.0	10.0	25.0
Weight change sil. gel (g)	17.5	18.2	23.7
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	7.068	7.068	7.068
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	-5.50	-5.50	-5.50
Nozzle dia. (in.)	0.160	0.160	0.160
Meter box cal.	1.0066	1.0066	1.0066
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

Determination of Stack Gas Velocity - Method 2

Client: Chemours | Operator: JDO/NG | Pitot Coeff (Cp): .840
Location/Plant: Fayetteville | Date: 7/16/19 | Stack Area, ft² (As): 7.068
Source: VES GB Inc | W.O. Number: _____ | Pitot Tube/Thermo ID: P706



Run Number	PRE		
Time	1315-1340		
Barometric Press, in Hg (Pb)	30.05		
Static Press, in H_2O (Pstatic)	-2.7		
Source Moisture, % (BWS)	2.2%		
O_2, %	20.9		
CO_2, %	0.0		

As 7,068

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 yielding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
.05	5	X	1	1.1	101				
0	0		2	1.3	101				
0	0		3	1.2	101				
0	0		4	1.1	100				
.1	6		5	1.2	100				
0	0		6	1.3	99				
0	0		7	1.4	99				
.05	5		8	1.5	99				
0	0		9	1.4	98				
0	0		10	1.5	99				
0	0		11	1.7	98				
0	0		12	1.6	98				
.05	5	Y	1	2.2	99				
0	0		2	2.3	99				
0	0		3	2.1	99				
0	0		4	2.0	99				
.1	8		5	1.8	98				
0	0		6	1.7	98				
0	0		7	1.2	98				
0	0		8	1.0	98				
0	0		9	.80	98				
.05	5		10	.75	98				
0	0		11	.70	98				
0	0		12	.60	98				
Avg Angle	<5		Avg Delta P & Temp	1.39	99				
			avg √DeltaP	1.1609					
			Average gas stream velocity, ft/sec.	67.2					
			Vol. flow rate @ actual conditions, wacf/min	28700					
			Vol. flow rate at standard conditions, dscf/min	26700					

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

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

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

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

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

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

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

Note: Micromanometer is required if:
(A) The average Delta P readings are less than 0.05 inches of water.
(B) For traverses of 12 or more points, more than 10% of the Delta P readings are below 0.05 inches of water.
(C) For traverses of less than 12 points, more than one Delta P readings is below 0.05 inches of water.

WESTON SOLUTIONS

CB Inlet R1

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	**Stack Conditions**	Assumed	Actual	
W.O.#	15418.002.016				
Project ID	Chemours	% Moisture			
Mode/Source ID	Carbon Bed	Impinger Vol (ml)	200		
Samp. Loc. ID	IN	Silica gel (g)	300		
Run No.ID	1	CO2, % by Vol	0		
Test Method ID	M0010	O2, % by Vol	20.9		
Date ID	16 15JUL2019	Temperature (°F)	120		
Source/Location	VE South CB Inlet	Meter Temp (°F)	100		
Sample Date	7-16-19 ✓	Static Press (in H_2O)	-5	-5.5 ✓	
Baro. Press (in Hg)	30.06 ✓				
Operator	JNOING ✓	Ambient Temp (°F)	98+		

Meter Box ID	31
Meter Box Y	1.0066 ✓
Meter Box Del H	1.953
Probe ID / Length	
Probe Material	Boro
Pitot / Thermocouple ID	P706
Pitot Coefficient	0.84 ✓
Nozzle ID	Boro
Nozzle Measurements	.160 .161 .160
Avg Nozzle Dia (in)	.160 ✓
Area of Stack (ft^2)	7.068 ✓
Sample Time	96 ✓
Total Traverse Pts	24 (12) ✓

K Factor .73

	Initial	Mid-Point	Final
Sample Train (ft^3)	.015	.010	.018
Leak Check @ (in Hg)	15	7	6
Pitot leak check good	yes	yes / no	yes
Pitot Inspection good	yes	yes / no	yes
Method 3 System good	NA yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp	97	
Reference Temp	96	
Pass/Fail (+/- 2°)	Pass	Pass / Fail
Temp Change Response ?	yes	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	1605			791.707									
Y 1	4		2.1	1.53	94.4	100	101	121	128	68	5	54		
2	8		2.1	1.53	97.0	100	102	123	124	67	5	48		
3	12		2.0	1.46	800.3	100	102	123	122	66	5	46		
4	16		1.8	1.31	2.3	100	102	123	124	65	4.5	47		
5	20		1.8	1.31	4.9	100	102	123	123	64	4.5	48		
6	24		1.7	1.24	7.4	99	102	123	123	66	4	48		25.044
7	28		1.2	.88	9.2	99	102	125	123	66	4	49		
8	32		.85	.62	11.2	99	102	124	122	66	4	52		
9	36		.65	.45	12.7	100	103	124	122	66	3	52		
10	40		.55	.40	14.1	100	102	124	122	66	2.5	49		
11	44		.55	.40	15.3	101	102	125	123	66	2.	48		
12	48	1653	.50	.37	816.751	101	103	126	123	66	2	48		
	0	1753			816.917									816.917
X 1	4		1.7	1.24	19.3	100	102	126	123	66	5	49		
2	8		1.7	1.24	22.1	99	102	126	124	66	5	48		
3	12		1.5	1.0	24.0	99	103	126	124	66	5	48		
4	16		1.5	1.0	26.0	99	103	125	125	66	5	48		
5	20		1.5	1.0	28.3	99	102	125	125	67	5	49		
6	24		1.5	1.0	30.6	99	102	125	125	67	5	49		25.865
7	28		1.3	.95	32.6	99	102	125	125	67	4	48		
8	32		1.3	.95	35.3	99	103	125	125	67	4	50		
9	36		1.2	.88	37.4	99	102	125	125	67	4	49		
10	40		1.1	.80	39.0	99	102	125	125	67	4	49		
11	44		1.1	.80	41.0	100	102	126	125	66	4	49		
12	48	1841	1.1	.80	842.782	100	102	126	125	66	4	49		
1841			Avg Delta P ✓1.346	Avg Delta H ✓.966	Total Volume ✓50.909	Avg Ts ✓99.58	Avg Tm ✓102	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			Avg Sqrt Delta P ✓1.139	Avg Sqrt Del H .9655	Comments:									

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EPA Method 0010 from EPA SW-846

Initial final leak check was 0.025 LC 99.7 Iso and

the flexible sample line moved the filter slightly 25630 down probe removed. The filter holder was repositioned slightly and the leak check was good.

CB Inlet

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

		Stack Conditions	
Client	Chemours		Assumed / Actual
W.O.#	15418.002.016		
Project ID	Chemours	% Moisture	
Mode/Source ID	Carbon Bed	Impinger Vol (ml)	
Samp. Loc. ID	IN	Silica gel (g)	
Run No.ID	2	CO_2, % by Vol	0
Test Method ID	M0010	O_2, % by Vol	20.9
Date ID	15JUL2019	Temperature (°F)	100 / 91.667
Source/Location	VE South CB Inlet	Meter Temp (°F)	100 / 93.583
Sample Date	7/17/19 ✓	Static Press (in H_2O)	-50 / -.5 ✓
Baro. Press (in Hg)	30.09 ✓		
Operator	KA/NG ✓	Ambient Temp (°F)	87

Meter Box ID	31	Sample Train (ft³)	0.009 / 0.005 / 0.003
Meter Box Y	1.0066 ✓	Leak Check @ (in Hg)	15" / 6" / 6
Meter Box Del H	1.953	Pitot leak check good	yes / no
Probe ID / Length		Pitot Inspection good	yes / no
Probe Material		Method 3 System good	yes / no
Pitot / Thermocouple ID	0706	**Temp Check**	Pre-Test Set / Post-Test Set
Pitot Coefficient	0.84 ✓	Meter Box Temp	
Nozzle ID	.160	Reference Temp	
Nozzle Measurements	.160 / .160 / .160	Pass/Fail (+/- 2°)	Pass / Fail
Avg Nozzle Dia (in)	.160 ✓	Temp Change Response ?	yes / no
Area of Stack (ft²)	1.068 ✓		
Sample Time	96 ✓		
Total Traverse Pts	24 ✓		

K Factor .73

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	0905 ✓			~~848.375~~ KA									
Y 1	4		2.1	1.5	846.8	90	87	126	133	66	5	58		
2	8		2.1	1.5	848.8	90	88	125	129	65	5	50		
3	12		2.1	1.5	851.5	90	88	126	126	63	5	53		
4	16		2.0	1.5	854.1	90	89	124	125	63	5	47		
5	20		1.9	1.4	856.7	90	90	125	126	64	5	44		
6	24		1.7	1.2	859.5	90	90	126	125	65	5	46		24.500
7	28		1.1	.80	861.1	91	91	124	124	KA ~~6~~ 866	3	48		
8	32		~~.8~~ .72	.53	862.8	91	91	124	125	67	2	47		
8	32		.56	.41	864.1	92	92	126	126	66	2	46		
9	36		.45	.33	865.4	92	92	126	126	65	2	46		
10	40		.45	.33	866.7	92	93	126	125	65	2	47		
11	44		.42	.31	867.875	94	93	126	124	66	2	48		
12	48	0953			868.012									
	0													.137
X 1	4	1010	1.8	1.3	KA ~~867~~ 870.6	92	95	125	126	66	5	52		
2	8		1.7	1.2	873.1	92	95	124	125	65	5	48		
3	12		1.6	1.2	875.5	92	95	125	125	65	5	46		
4	16		1.6	1.2	877.8	92	96	126	125	65	5	49		26.912
5	20		1.6	1.2	880.2	92	96	126	125	66	5	49		
6	24		1.6	1.2	882.6	92	97	125	125	66	5	48		
7	28		1.6	1.2	885.0	92	97	126	125	65	5	49		
8	32		1.2	.88	887.0	92	98	125	125	65	4	45		
9	36		1.2	.88	889.0	92	98	126	125	66	4	47		
10	40		1.1	.80	891.0	93	98	124	125	65	4	45		
11	44		1.1	.80	~~892.0~~	93	98	126	124	66	4	47		
12	48	1058 ✓	1.1	.80	894.924	94	99	125	125	66	4	49		
			Avg Delta P 1.367 ✓	Avg Delta H .999 ✓	Total Volume 51.412 ✓	Avg Ts 91.667 ✓	Avg Tm 93.583 ✓	Min/Max 124/126	Min/Max 124/133	Max ~~66~~ 67	Max Vac 5	Min/Max 45/58		
			Avg Sqrt Delta P 1.14 ✓	Avg Sqrt Del H .976 ✓	Comments: ✓									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

2.6% H2O 101.2 I.D. avg
25900 dscfm

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	
Client	Chemours		Assumed / Actual
W.O.#	15418.002.016	% Moisture	
Project ID	Chemours	Impinger Vol (ml)	
Mode/Source ID	Carbon Bed	Silica gel (g)	
Samp. Loc. ID	IN	CO2, % by Vol	0.0
Run No.ID	3	O2, % by Vol	20.9
Test Method ID	M0010	Temperature (°F)	100 / 97.125
Date ID	15JUL2019	Meter Temp (°F)	100 / 102.75
Source/Location	VE South CB Inlet	Static Press (In H_2O)	-5.0 / -5.5 ✓
Sample Date	7/17/19 ✓		
Baro. Press (In Hg)	~~30.09~~ 30.06 ✓	Ambient Temp (°F)	97
Operator	KA/NG ✓		

Meter Box ID	31
Meter Box Y	1.0060 ✓
Meter Box Del H	1.993
Probe ID / Length	Bom
Probe Material	
Pitot / Thermocouple ID	P746
Pitot Coefficient	0.84 ✓
Nozzle ID	.160
Nozzle Measurements	.160 / .160 / .160
Avg Nozzle Dia (in)	.160 ✓
Area of Stack (ft^2)	2.068 ✓
Sample Time	96 ✓
Total Traverse Pts	24 ✓

K Factor	.73		
	Initial	Mid-Point	Final
Sample Train (ft^3)	0.006	~~.005~~	10.008
Leak Check @ (In Hg)	15"	6"	6"
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp			
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) KA	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	1250 ✓			~~845.106~~ 845.237									
X 1	4		1.8	1.3	897.8	96	102	123	123	66	5	60		
2	8		1.8	1.3	900.2	96	102	125	126	66	5	52		
3	12		1.7	1.2	902.8	96	102	126	127	65	5	50		
4	16		1.6	1.2	905.2	96	102	124	126	66	5	54		
5	20		1.6	1.2	907.6	96	103	125	126	66	5	52		27.085
6	24		1.5	1.1	909.9	96	103	124	125	65	5	53		
7	28		1.3	.95	912.0	96	103	125	126	66	4	53		
8	32		1.3	.95	914.3	96	103	125	125	65	4	50		
9	36		1.3	.95	916.5	96	103	124	125	64	4	52		
10	40		1.2	.88	918.3	96	103	125	125	64	4	53		
11	44		1.2	.88	920.3	97	103	125	125	65	4	54		
12	48	1338	1.1	.80	~~922.322~~ 922.593	97	103	126	125	66	4	50		
	0													.271
Y 1	4	1414	2.2	1.6	925.3	98	103	124	126	67	6	55		
2	8		2.2	1.6	928.0	97	103	126	125	65	6	43		
3	12		2.1	1.5	930.7	97	103	125	125	65	6	45		
4	16		2.0	1.5	933.3	97	103	129	126	64	6	45		
5	20		1.9	1.4	936.0	98	103	125	125	64	6	45		21.975
6	24		1.7	1.2	938.4	98	103	125	124	65	5	45		
7	28		1.2	.88	940.3	98	103	126	125	66	4	49		
8	32		.78	.57	942.0	98	102	126	126	66	3	49		
9	36		.63	.46	943.4	99	103	125	125	65	3	46		
10	40		.48	.35	944.7	99	103	124	125	65	2	47		
11	44		.45	.33	946.0	99	102	124	125	65	2	49		
12	48	1502 ✓	.43	.31	947.275	99	103	125	125	60	2	50		
			Avg Delta P ✓ 1.394	Avg Delta H 1.018	Total Volume 51.767	Avg Ts 97.125 ✓	Avg Tm 102.75 ✓	Min/Max 123/126	Min/Max 125/127	Max 67	Max Vac 6	Min/Max 45/60		
			Avg Sqrt Delta P 1.154 ✓	Avg Sqrt Del H .986 ✓	Comments: 1.017									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

amd

VES CB INLET

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418.002.016
Location/Plant	Fayetteville, NC	Source & Location	VE South CB Inlet

Run No. 1 — Sample Date 7-16-19 — Recovery Date 7-19-19

Sample I.D. Chemours - Carbon Bed - IN - 1 - M0010 - — Analyst DNO/DM/RG — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	12	100	100	0					317.5	
Initial	0	100	100	0					300	
Gain	12	0	0	0			12	12	17.5	29.5

Impinger Color all clear — Labeled? ✓ — ✓ ✓

Silica Gel Condition New 95% — Sealed? ✓

Run No. 2 — Sample Date 7/17/19 — Recovery Date 7/17/19

Sample I.D. Chemours - Carbon Bed - IN - 2 - M0010 - — Analyst DNO/DM/RG — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	10	100	100	0					318.2	
Initial	0	100	100	0					300	
Gain	10	0	6	0				10	18.2	29.2

Impinger Color all clear — Labeled? ✓ — ✓ ✓

Silica Gel Condition New 95% — Sealed? ✓

Run No. 3 — Sample Date 7/17/19 — Recovery Date 7/17/19

Sample I.D. Chemours - Carbon Bed - IN - 3 - M0010 - — Analyst DNO/DM/RG — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	20	100	100	5					323.7	
Initial	0	100	100	0					300	
Gain	20	0	0	5				25	23.7	48.7

Impinger Color all clear — Labeled? ✓ — ✓ ✓

Silica Gel Condition New 90% — Sealed? ✓

Check COC for Sample IDs of Media Blanks

VE South BT

SAMPLE RECOVERY FIELD DATA

Client: Chemours
Location/Plant: Fayetteville
W.O. #:
Source & Location: CB Inf/Out BT

Run No. 2
Sample I.D. Blank Train
Sample Date 7-17-19
Analyst JDO/SR
Recovery Date 7-17-19
Filter Number N/A

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents									Silica Gel	
Final	0	100	100	0					300	
Initial	0	100	100	0					300	
Gain	0	0	0	0				0	0	0

Impinger Color: all clear
Silica Gel Condition: blue 100%
Labeled? ✓
Sealed? ✓

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

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents									Silica Gel	
Final										
Initial										
Gain										

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

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

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents									Silica Gel	
Final										
Initial										
Gain										

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

Check COC for Sample IDs of Media Blanks

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

Test Data			
Run number	1	2	3
Location	VES CBed Outlet	VES CBed Outlet	VES CBed Outlet
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
Operator	JM	JM	JM
Inputs For Calcs.			
Sq. rt. delta P	0.83005	0.83224	0.83619
Delta H	1.2600	1.3092	1.3200
Stack temp. (deg.F)	100.2	97.6	100.3
Meter temp. (deg.F)	104.7	96.0	107.1
Sample volume (act.)	58.439	58.943	59.828
Barometric press. (in.Hg)	30.06	30.09	30.06
Volume H_2O imp. (ml)	20.0	10.0	30.0
Weight change sil. gel (g)	14.0	14.2	16.4
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	9.390	9.390	9.390
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	2.40	2.40	2.40
Nozzle dia. (in.)	0.202	0.202	0.202
Meter box cal.	1.0069	1.0069	1.0069
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

Determination of Stack Gas Velocity - Method 2

Client: Chemours | Operator: MJ/IS | Pitot Coeff (Cp): .840
Location/Plant: Fayetteville | Date: 7/16/19 | Stack Area, ft² (As): 9.383
Source: VE's CB OUT | W.O. Number: | Pitot Tube/Thermo ID:

Run Number	PRE		
Time	1350-1400 ✓		
Barometric Press, in Hg (Pb)	30.01 ✓		
Static Press, in H_2O (Pstatic)	+0.4 ✓		
Source Moisture, % (BWS)	~2% ✓		
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 yielding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0	—		1	0.33	109				
0	—		2	0.45	107				
0.01	<5		3	0.50	106				
0	—		4	0.55	105				
0.01	<5		5	0.62	104				
0	—		6	0.70	103				
0	—		7	0.77	102				
0	—		8	0.85	102				
0	—		9	0.91	101				
0.02	<5		10	0.94	101				
0.01	<5		11	1.00	101				
0.02	<5		12	1.00	101				
				0.25					
0.01	<5		1	~~0.350~~	114				
0	—		2	0.32	114				
0	—		3	0.41	112				
0.02	<5		4	0.45	110				
0	—		5	0.48	110				
0	—		6	0.54	108				
0.02	<5		7	0.72	106				
0	—		8	0.85	104				
0.02	<5		9	0.92	102				
0.01	<5		10	0.95	101				
0	—		11	0.98	101				
0	—		12	1.0	101				
Avg Angle		Avg Delta P & Temp		~~0.235~~		→ 0.1687083			
		avg √DeltaP		~~0.48506~~		→ 0.81416			
Average gas stream velocity, ft/sec.				47.24					
Vol. flow rate @ actual conditions, wacf/min				~~26300~~		→ 26025			
Vol. flow rate at standard conditions, dscf/min				~~24300~~		→ 24631			

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

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

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

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

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

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

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

Note: Micromanometer is required if: (A) The average Delta P readings are less than 0.05 inches of water.
(B) For traverses of 12 or more points, more than 10% of the Delta P readings are below 0.05 inches of water.
(C) For traverses of less than 12 points, more than one Delta P readings is below 0.05 inches of water.

WESTON SOLUTIONS

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method2.xls

CB Outlet

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

		Stack Conditions	
Client	Chemours		Assumed / Actual
W.O.#	15418.002.016	% Moisture	2
Project ID	Chemours	Impinger Vol (ml)	
Mode/Source ID	Carbon Bed	Silica gel (g)	
Samp. Loc. ID	OUT	CO2, % by Vol	0
Run No.ID	1	O2, % by Vol	20.9
Test Method ID	M0010	Temperature (°F)	110
Date ID	15JUL2019	Meter Temp (°F)	105
Source/Location	VE South CB Outlet	Static Press (in H_2O)	+2.4 / +2.4
Sample Date	7/16/19		
Baro. Press (in Hg)	30.00 30.06	Ambient Temp (°F)	
Operator	Mills		

Meter Box ID	WC 12	K Factor	1.78
Meter Box Y	1.00069 1.8812	Initial	Mid-Point / Final
Meter Box Del H	1.8812	Sample Train (ft^3)	0.006 / 0.004 / 0.006
Probe ID / Length	STF	Leak Check @ (In Hg)	15 / 7 / 7
Probe Material	Boro	Pitot leak check good	yes / no / yes / no / yes / no
Pitot / Thermocouple ID	P37	Pitot Inspection good	yes / no / yes / no / yes / no
Pitot Coefficient	0.84	Method 3 System good	yes / no / yes / no / yes / no
Nozzle ID		**Temp Check**	Pre-Test Set / Post-Test Set
Nozzle Measurements	0.202 / 0.202 / 0.203	Meter Box Temp	107 / 96
Avg Nozzle Dia (in)	0.202	Reference Temp	106 / 96
Area of Stack (ft^2)	4.39	Pass/Fail (+/- 2°)	Pass / Fail / Pass / Fail
Sample Time	96	Temp Change Response	yes / no / yes / no
Total Traverse Pts	24		

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	1105			220.873									
A1	4		0.42	0.75	222.8	101	106	132	136	68	2.0	65		
2	8		0.48	0.85	225.7	101	107	131	140	68	2.0	55		
3	12		0.52	0.93	227.9	101	108	128	140	66	2.0	47		
4	16		0.58	1.04	229.5	100	108	125	138	65	2.0	45		
5	20		0.59	1.04	231.8	101	108	123	135	65	2.0	46		
6	24		0.68	1.22	234.1	100	107	122	131	65	2.5	46		
7	28		0.76	1.36	236.8	100	107	124	128	64	2.5	45		
8	32		0.82	1.47	239.3	99	107	123	125	62	3	44		
9	36		0.87	1.56	242.0	99	106	123	123	63	3	46		
10	40		0.89	1.59	244.8	99	105	122	130	63	3	46		
11	44	1153	0.93	1.67	247.5	102	106	121	128	64	3	46		
B1	48		0.95	1.70	250.443	100	106	122	129	64	3	46		29.570
	0		—	—	250.625	—	—	—	—	—	—	—		
1	4	1153	0.98	1.75	253.3	100	103	121	119	68	3.5	58		
2	8		0.94	1.68	256.1	100	103	123	123	67	3.5	46		
3	12		0.95	1.70	259.0	100	103	122	120	62	3.5	43		
4	16		0.93	1.67	261.5	100	102	122	126	61	3.5	42		
5	20		0.87	1.56	264.4	100	102	121	127	60	3.5	43		
6	24		0.81	1.43	267.2	101	102	123	125	59	3.0	43		
7	28		0.63	1.13	269.4	100	102	122	127	58	3.0	44		
8	32		0.55	0.98	271.4	100	102	123	127	60	3.0	46		
9	36		0.48	0.85	273.3	100	103	122	122	61	3.0	47		
10	40		0.44	0.79	275.3	100	103	122	121	62	2.5	48		
11	44		0.42	0.75	277.3	100	103	123	120	62	2.0	50		
B2	48	1041	0.42	0.75	279.494	100	103	123	120	62	2.0	51		28.889
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.70416	1.26000	58.439	100.17	104.67							
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.830049	1.109										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

97.42%

25042 dsctn

amd

CB OUTLET #2

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	Assumed	Actual
Client	Chemours	% Moisture	2	
W.O.#	15418.002.016	Impinger Vol (ml)		
Project ID	Chemours	Silica gel (g)		
Mode/Source ID	Carbon Bed	CO2, % by Vol	0	
Samp. Loc. ID	OUT	O2, % by Vol	20.9	
Run No.ID	2	Temperature (°F)	100	
Test Method ID	M0010	Meter Temp (°F)	105	
Date ID	15JUL2019	Static Press (in H_2O)	+2.4	+2.4 ✓
Source/Location	VE South CB Outlet			
Sample Date	7/17/19 ✓			
Baro. Press (in Hg)	30.09 ✓	Ambient Temp (°F)		
Operator	M. Mills ✓			

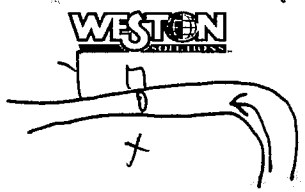
Meter Box ID	WC12	
Meter Box Y	1.0069 ✓	
Meter Box Del H	1.8812	
Probe ID / Length	5FT	
Probe Material	Boro	
Pitot / Thermocouple ID	P375	
Pitot Coefficient	0.84 ✓	
Nozzle ID		
Nozzle Measurements	0.202 / 0.202 / 0.203	Temp Check
Avg Nozzle Dia (in)	0.202 ✓	Meter Box Temp
Area of Stack (ft^2)	9.39 ✓	Reference Temp
Sample Time	96 ✓	Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓	Temp Change Response ?

K Factor 1.83

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.008	0.005	0.004
Leak Check @ (in Hg)	15	8	6
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
Meter Box Temp	86		96
Reference Temp	87		97
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	0905 ✓			280.144									
X TP 1	4		0.44	0.84	282.1	97	91	121	125	68	2.0	63		
2	8		0.48	0.89	284.0	97	91	121	127	65	2.0	45		
3	12		0.54	1.00	286.6	95	91	120	126	63	2.5	45		
4	16		0.58	1.07	288.8	97	92	121	124	60	2.5	46		
5	20		0.61	1.13	291.2	97	93	121	124	60	2.5	46		
6	24		0.67	1.24	293.6	97	93	121	125	60	2.5	46		
7	28		0.79	1.46	296.7	98	94	122	126	61	3.0	45		
8	32		0.82	1.52	298.9	98	94	122	126	61	3.0	43		
9	36		0.87	1.61	301.6	97	95	121	125	61	3.0	41		
10	40		0.90	1.66	304.4	97	95	121	126	60	3.0	42		29.854
TP 11	44		0.95	1.76	307.1	97	96	122	126	60	3.5	41		
TP 12	48	0953	0.93	1.72	310.003	97	96	122	125	59	3.5	42		
	0	1010	—	—	310.168	—	—	—	—	—	—	—		
1	4		0.98	1.81	313.0	98	98	121	132	68	4.0	49		
2	8		0.95	1.76	315.8	98	98	121	127	63	4.0	46		
3	12		0.94	1.74	318.7	98	98	121	130	60	4.0	47		
4	16		0.91	1.68	321.5	98	98	121	126	60	4.0	41		
5	20		0.86	1.59	324.3	98	99	121	125	61	4.0	41		
6	24		0.81	1.49	326.9	98	99	121	122	60	3.5	41		
7	28		0.63	1.16	329.0	98	99	121	124	60	3.5	40		
8	32		0.57	1.05	331.7	98	99	121	127	60	3.0	41		
9	36		0.50	0.93	333.5	98	99	122	130	60	3.0	42		
10	40		0.45	0.83	335.4	98	99	121	130	60	2.5	42		29.089
11	44		0.41	0.76	337.3	98	99	121	131	60	2.5	42		
TP 12	48	1050	0.39	0.72	339.257	98	99	122	124	62	2.0	44		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.705 ✓	1.309 ✓	58.943	97.5	96.04							
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments: ✓	97.6	✓							
			.8377 ✓	1.13224										

EPA Method 0010 from EPA SW-846



and 25360 dscf 98.5 2.0 %

CBarlet

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

		Stack Conditions	Assumed	Actual				
Client	Chemours				Meter Box ID	WC12		
W.O.#	15418.002.016				Meter Box Y	1.0069 ✓		
Project ID	Chemours	% Moisture	2		Meter Box Del H	1.8812		
Mode/Source ID	Carbon Bed	Impinger Vol (ml)			Probe ID / Length	ST		Sample Train (ft^3)
Samp. Loc. ID	OUT	Silica gel (g)			Probe Material	Boro		Leak Check @ (in Hg)
Run No.ID	3	CO2, % by Vol	0.0		Pitot / Thermocouple ID	P375		Pitot leak check good
Test Method ID	M0010	O2, % by Vol	20.9		Pitot Coefficient	0.84 ✓		Pitot Inspection good
Date ID	15JUL2019	Temperature (°F)	105		Nozzle ID			Method 3 System good
Source/Location	VE South CB Outlet	Meter Temp (°F)	105		Nozzle Measurements	0.202	0.202	0.203
Sample Date	7/17/19 ✓	Static Press (in H_2O)	+2.4	+2.4	Avg Nozzle Dia (in)	0.202 ✓		
Baro. Press (in Hg)	30.06 ✓				Area of Stack (ft^2)	9.39 ✓		
Operator	Mills ✓	Ambient Temp (°F)			Sample Time	96 ✓		
					Total Traverse Pts	24 ✓		

Temp Check

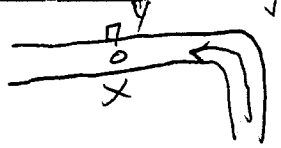
	Pre-Test Set	Post-Test Set
Meter Box Temp	99	105
Reference Temp	100	106
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

K Factor

Initial	Mid-Point	Final
0.006	0.006	0.052
15	10	6
yes / no	yes / no	yes / no
yes / no	yes / no	yes / no
yes / no	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1250 ✓			339.420									
1	4		0.44	0.81	341.6	105	106	123	129	68	2.0	61		
2	8		0.44	0.81	343.7	101	106	122	127	66	2.0	50		
3	13		0.54	1.00	345.8	101	106	121	127	66	3.0	44		
4	16		0.58	1.07	348.1	101	106	121	130	64	3.0	44		
5	20		0.60	1.11	350.5	101	107	120	129	62	3.0	43		
6	24		0.65	1.20	352.9	100	107	122	124	62	3.0	44		
7	28		0.78	1.44	355.6	100	107	122	123	63	3.0	44		
8	33		0.85	1.57	358.0	100	107	122	121	57	3.5	43		
9	36		0.91	1.68	360.7	100	107	122	122	62	3.5	44		
10	40		0.94	1.74	363.5	100	107	121	119	63	4	45		
11	44		0.96	1.78	366.6	100	107	121	119	63	4	41		
12	48	1338	0.98	1.81	369.400	99	107	122	124	64	4	43		
	0		—	—	369.907	—	—	—	—	—	—	—		29.980
1	4	1414	0.96	1.78	372.7	100	106	124	127	68	4	50		
2	8		0.95	1.76	375.6	99	107	123	129	65	4	44		
3	13		0.93	1.72	378.5	99	107	121	127	63	4	44		
4	16		0.90	1.66	381.3	100	108	121	125	63	4	46		
5	20		0.85	1.57	384.1	100	108	122	126	64	4	43		
6	24		0.83	1.52	386.7	100	108	123	122	64	4	44		
7	28		0.65	1.20	389.3	100	108	121	121	64	3.5	44		
8	33		0.57	1.05	391.6	100	108	121	121	65	3.0	45		
9	36		0.53	0.96	393.6	100	108	122	122	65	3.0	43		29.848
10	40		0.48	0.89	395.8	100	108	122	119	65	3.0	43		
11	44		0.44	0.81	397.9	100	108	121	121	65	3.0	43		
12	48	1507	0.42	0.78	399.758	100	107	122	120	65	3.0	45		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.714167	1.3200 ✓	59.878	100.25	107.13							
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.836189	1.13674 ✓										

EPA Method 0010 from EPA SW-846



VES CB Outlet

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418.002.016
Location/Plant	Fayetteville, NC	Source & Location	VE South CB Outlet

Run No. 1 — Sample Date 7-16-19 — Recovery Date 7-16-19

Sample I.D. Chemours - Carbon Bed - OUT - 1 - M0010 - — Analyst JMo/JM/PG — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	15	105	100	0					314	
Initial	0	100	100	0					300	
Gain	15	5	0	0				20	14	34

Impinger Color all clear — Labeled? ✓ — ✓ ✓

Silica Gel Condition blue 95% — Sealed? ✓

Run No. 2 — Sample Date 7-17-19 — Recovery Date 7-17-19

Sample I.D. Chemours - Carbon Bed - OUT - 2 - M0010 - — Analyst JMo/JM/PG — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	10	100	100	6					314.2	
Initial	0	100	100	0					300	
Gain	10	0	0	0				10	14.2	24.2

Impinger Color all clear — Labeled? ✓ — ✓ ✓

Silica Gel Condition blue 90% — Sealed? ✓

Run No. 3 — Sample Date 7-17-19 — Recovery Date 7-17-19

Sample I.D. Chemours - Carbon Bed - OUT - 3 - M0010 - — Analyst JMo/JM/PG — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	20	110	100	0					311.4	
Initial	0	100	100	0					300	
Gain	20	10	0	0				30	11.4	46.4

Impinger Color all clear — Labeled? ✓ — ✓ ✓

Silica Gel Condition blue 90% — Sealed? ✓

Check COC for Sample IDs of Media Blanks

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

Test Data			
Run number	1	2	3
Location	VE South Stack	VE South Stack	VE South Stack
Date	07/16/19	07/17/19	07/17/19
Time period	1605-1841	0905-1058	1250-1502
Operator	MW	MW	MW
Inputs For Calcs.			
Sq. rt. delta P	0.75906	0.75894	0.75569
Delta H	0.7854	0.7854	0.7642
Stack temp. (deg.F)	100.3	97.4	100.4
Meter temp. (deg.F)	98.5	87.9	99.0
Sample volume (act.)	50.910	49.525	50.263
Barometric press. (in.Hg)	30.00	30.07	30.07
Volume H_2O imp. (ml)	33.0	31.0	29.0
Weight change sil. gel (g)	12.5	14.1	12.9
% CO_2	0.0	0.0	0.0
% O_2	20.9	20.9	20.9
% N_2	79.1	79.1	79.1
Area of stack (sq.ft.)	9.620	9.620	9.620
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	2.50	2.50	2.50
Nozzle dia. (in.)	0.190	0.190	0.190
Meter box cal.	1.0008	1.0008	1.0008
Cp of pitot tube	0.84	0.84	0.84
Traverse points	24	24	24

33 12.5

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	Assumed	Actual
Client	Chemours			
W.O.#	15418.002.016			
Project ID	Chemours	% Moisture	=3	
Mode/Source ID	VE South - ~~Scrubber~~	Impinger Vol (ml)		
Samp. Loc. ID	STK	Silica gel (g)		
Run No.ID	1	CO2, % by Vol	0.0	
Test Method ID	M0010	O2, % by Vol	20.9	
Date ID	15JUL2019	Temperature (°F)	=101	
Source/Location	VE South Stack	Meter Temp (°F)	=99	
Sample Date	7/16/19 ✓	Static Press (in H_2O)	~~2.5~~ 2.5 ✓	
Baro. Press (in Hg)	30.00 ✓			
Operator	MRJ WINKELER ✓	Ambient Temp (°F)	=102°F	

Meter Box ID	27		
Meter Box Y	1.0003 ✓		
Meter Box Del H	1.8330		
Probe ID / Length	700 / 6	Sample Train (ft^3)	
Probe Material	Boro	Leak Check @ (in Hg)	
Pitot / Thermocouple ID	P700	Pitot leak check good	
Pitot Coefficient	0.84 ✓	Pitot Inspection good	
Nozzle ID	0.190	Method 3 System good	
Nozzle Measurements	0.300 / 0.300 / 0.300	**Temp Check**	
Avg Nozzle Dia (in)	0.190 ✓	Meter Box Temp	
Area of Stack (ft^2)	9.62 ✓	Reference Temp	
Sample Time	96 ✓	Pass/Fail (+/- 2°)	
Total Traverse Pts	24 ✓	Temp Change Response ?	

Page ____ of ____

K Factor 1.36

	Initial	Mid-Point	Final
Sample Train (ft^3)	0.001	0.001	0.001
Leak Check @ (in Hg)	≤15	≤6	≤6
Pitot leak check good	(yes) / no	(yes) / no	(yes) / no
Pitot Inspection good	(yes) / no	(yes) / no	(yes) / no
Method 3 System good	(yes) / no	(yes) / no	(yes) / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	102		100
Reference Temp	102		99
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	1605 ✓			496.715									
A	1	4		0.60	0.82	499.26	101	101	111	111	67	2	67		
	2	8		0.62	0.82	501.02	101	101	110	110	66	2	66		
	3	12		0.56	0.76	503.30	101	101	110	110	66	2	66		
	4	16		0.59	0.80	505.25	101	101	110	110	66	2	66		24.985
	5	20		0.70	0.95	507.54	101	101	110	110	66	2	66		
	6	24		0.54	0.73	509.99	101	101	110	110	64	2	64		
	7	28		0.50	0.68	511.74	101	101	110	110	64	2	64		
	8	32		0.51	0.69	513.60	100	101	110	110	64	2	64		
	9	36		0.50	0.68	515.30	100	101	111	111	64	2	64		
	10	40		0.52	0.70	517.41	100	101	111	111	64	2	65		
	11	44		0.55	0.74	519.60	100	98	111	111	64	2	65		
	12	48	1653	0.55	0.74	521.700	100	98	111	111	64	2	65		
			1753			521.800									
B	1	4		0.55	0.75	523.80	100	97	111	111	64	2	64		← 1.37 New K-factor
	2	8		0.55	0.75	526.72	100	97	110	110	67	3	67		
	3	12		0.60	0.82	528.20	100	96	110	110	64	2	64		
	4	16		0.60	0.82	530.31	100	96	110	110	64	2	64		
	5	20		0.60	0.82	532.52	100	96	110	110	64	2	64		25.925
	6	24		0.55	0.75	534.62	100	96	110	110	64	2	64		
	7	28		0.70	0.95	536.94	100	96	110	110	64	2	64		
	8	32		0.70	0.95	539.20	100	96	110	110	64	2	64		
	9	36		0.55	0.75	541.35	100	96	110	110	63	2	63		
	10	40		0.54	0.74	543.31	100	97	110	110	63	2	63		
	11	44		0.60	0.82	545.47	100	97	110	110	63	2	63		
	12	48	1841	0.60	0.82	547.725	100	97	110	110	63	2	65		
				Avg Delta P ✓ 0.57750	Avg Delta H ✓ 0.78542	Total Volume ✓ 50.910	Avg Ts ✓ 100	Avg Tm ✓ 98.5	Min/Max 110/111	Min/Max 110/111	Max 67	Max Vac 2	Min/Max 63/65		
				Avg Sqrt Delta P 0.75906	Avg Sqrt Del H 0.88519	Comments:									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

106.7 Iso

23100 dscf and

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

		Stack Conditions	Assumed	Actual				
Client	Chemours				Meter Box ID	d7		
W.O.#	15418.002.016				Meter Box Y	1.0008 ✓		
Project ID	Chemours	% Moisture	≈2		Meter Box Del H	1.8830		
Mode/Source ID	VE South - ~~Scrubber~~	Impinger Vol (ml)			Probe ID / Length	P695	6'	Sample Train (ft³)
Samp. Loc. ID	STK	Silica gel (g)			Probe Material	Boro		Leak Check @ (in Hg)
Run No.ID	2	CO2, % by Vol	0.0		Pitot / Thermocouple ID	695		Pitot leak check good
Test Method ID	M0010	O2, % by Vol	20.9		Pitot Coefficient	0.84 ✓		Pitot Inspection good
Date ID	15JUL2019	Temperature (°F)	≈ 100		Nozzle ID	0.190		Method 3 System good
Source/Location	VE South Stack	Meter Temp (°F)	≈ 85		Nozzle Measurements	0.191	0.190	0.190
Sample Date	7/17/19 ✓	Static Press (in H_2O)	2.5		Avg Nozzle Dia (in)	0.190 ✓		**Temp Check**
Baro. Press (in Hg)	✓ 30.07 AT LOCATION				Area of Stack (ft²)	9.62 ✓		Meter Box Temp
Operator	MDW WINKELER ✓	Ambient Temp (°F)	≈ 84		Sample Time	96 ✓		Reference Temp
					Total Traverse Pts	24 ✓		Pass/Fail (+/- 2°)
								Temp Change Response ?

K Factor ~~1.23~~ 1.3 ✓

	Initial	Mid-Point	Final
Sample Train (ft³)	0.001 ✓0.15	0.001 ✓0.6	0.001 ✓0.4
Leak Check @ (in Hg)	(yes) no	(yes) / no	(yes) / no
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	83		92
Reference Temp	84		92
Pass/Fail (+/- 2°)	(Pass) / Fail		(Pass) / Fail
Temp Change Response ?	(yes) / no		(yes) / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	✓0905	0.60		548.100									
A 1	4	~~0.60~~	~~0.810.60~~	0.81	550.58	100	85	110	110	67	2	67		
2	8		0.60	0.81	552.85	100	85	110	110	66	2	66		
3	12		0.56	0.75	554.55	97	86	110	110	66	2	66		25.100
4	16		0.56	0.75	556.33	97	86	110	110	66	2	66		
5	20		0.60	0.81	558.51	96	86	110	110	66	2	66		
6	24		0.60	0.81	560.990	96	86	110	110	66	2	66		
7	28		0.56	0.75	562.700	96	86	110	110	66	2	66		
8	32		0.56	0.75	564.81	96	86	110	109	66	2	66		
9	36		0.56	0.75	566.85	96	86	110	109	66	2	66		
10	40		0.60	0.81	568.86	96	86	110	110	66	2	66		
11	44		0.56	0.81	571.05	96	87	110	110	66	2	66	← 1.45	NEW K-FACTOR
12	48	0953	0.56	0.81	573.200	96	87	109	109	66	2	66		
		✓1010			573.800									
B 1	4		0.60	0.87	575.42	96	87	109	109	66	2	66		
2	8		0.60	0.87	577.43	100	90	110	110	66	2	66		NEW FRACTION
3	12		0.60	0.81	579.89	98	90	110	110	66	2	66	←	1.35
4	16		0.62	0.84	582.10	98	90	109	109	66	2	66		
5	20		0.62	0.84	584.01	98	90	109	109	66	2	65		24.250
6	24		0.55	0.74	587.31	98	90	109	109	66	2	66		
7	28		0.55	0.74	589.20	98	90	110	110	66	2	66		
8	32		0.56	0.75	591.00	98	90	110	110	66	2	66		
9	36		0.56	0.75	593.00	98	90	110	110	66	2	66		
10	40		0.55	0.74	594.20	98	90	110	110	66	2	66		
11	44		0.55	0.74	596.32	98	90	110	110	66	2	66		
12	48	1058 ✓	0.55	0.74	598.225	98	90	110	110	66	2	66		
			✓ Avg Delta P	✓ Avg Delta H	Total Volume	✓ Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			0.57625	0.78542	49.350	✓ 97	87	109/110	109/110	67	2	66/67		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			0.75894	0.88591	49.525		87.9							

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

amd

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

		Stack Conditions	Assumed	Actual
Client	Chemours			
W.O.#	15418.002.016			
Project ID	Chemours	% Moisture	34	
Mode/Source ID	VE South - ~~Scrubber~~	Impinger Vol (ml)		
Samp. Loc. ID	STK	Silica gel (g)		
Run No.ID	3	CO2, % by Vol	0.0	
Test Method ID	M0010	O2, % by Vol	20.9	
Date ID	15JUL2019	Temperature (°F)	=100	
Source/Location	VE South Stack	Meter Temp (°F)	97	
Sample Date	7/17/19 ✓	Static Press (in H_2O)	2.5 ✓	
Baro. Press (in Hg)	30.07 ✓			
Operator	MW WINKLER ✓	Ambient Temp (°F)	≈99	

Meter Box ID	27		
Meter Box Y	1.0000		
Meter Box Del H	1.8530		
Probe ID / Length	P695	6'	Sample Train (ft³)
Probe Material	Boro		Leak Check @ (In Hg)
Pitot / Thermocouple ID	695		Pitot leak check good
Pitot Coefficient	0.84 ✓		Pitot Inspection good
Nozzle ID	G190		Method 3 System good
Nozzle Measurements	0.193 / 0.190 / 0.190		**Temp Check**
Avg Nozzle Dia (in)	0.190 ✓		Meter Box Temp
Area of Stack (ft²)	9.62 ✓		Reference Temp
Sample Time	96 ✓		Pass/Fail (+/- 2°)
Total Traverse Pts	24 ✓		Temp Change Response ?

K Factor 1.35

	Initial	Mid-Point	Final
Sample Train (ft³)	0.001	0.021	0.071
Leak Check @ (In Hg)	≤6	≤5	≤5
Pitot leak check good	yes / no	yes / no	yes / no
Pitot Inspection good	yes / no	yes / no	yes / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	97		100
Reference Temp	98		100
Pass/Fail (+/- 2°)	Pass / Fail		Pass / Fail
Temp Change Response ?	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1250 ✓			598.742									
~~A~~B 1	4		0.63	0.85	601.32	101	99	110	110	66	2	66		
2	8		0.63	0.85	603.42	101	99	110	110	66	2	66		
3	12		0.60	0.81	605.99	101	99	110	110	66	2	66		24.863
4	16		0.60	0.81	607.20	101	99	110	110	66	2	66		
5	20		0.55	0.74	609.52	101	99	110	110	66	2	66		
6	24		0.55	0.74	611.43	101	99	110	110	66	2	64		
7	28		0.55	0.74	613.55	101	99	110	110	64	2	64		
8	32		0.52	0.70	615.61	100	99	110	109	64	2	64		
9	36		0.52	0.70	618.01	100	99	109	109	64	2	64		
10	40		0.52	0.70	619.65	100	99	109	109	64	2	64		
11	44		0.52	0.70	621.60	100	99	109	109	64	2	64		
12	48	1338	0.52	0.70	623.605	100	99	109	109	64	2	64		
		1414			623.700									
~~B~~A 1	4		0.60	0.81	625.93	100	99	109	109	64	2	66		25.400
2	8		0.60	0.81	627.95	100	99	110	110	66	2	66		
3	12		0.63	0.85	630.72	100	99	110	110	66	2	66		
4	16		0.63	0.85	632.15	100	99	110	110	66	2	66		
5	20		0.57	0.76	634.55	100	99	110	110	66	2	66		
6	24		0.57	0.76	636.61	100	99	110	110	66	2	64		
7	28		0.57	0.76	638.70	100	~~10~~99	110	110	64	2	64		
8	32		0.60	0.70	641.09	100	99	110	110	64	2	64		
9	36		0.56	0.75	642.80	100	99	110	110	64	2	64		
10	40		0.56	0.75	644.90	100	99	110	110	64	2	64		
11	44		0.57	0.76	647.00	101	99	110	110	64	2	64		
12	48	1502 ✓	0.55	0.74	649.100	101	99	110	110	64	2	64		
			Avg Delta P	Avg Delta H	Total Volume ✓	Avg Ts ✓	Avg Tm ✓	Min/Max	Min/Max	Max	Max Vac	Min/Max		
WESTON SOLUTIONS	0.57167		~~0.57250~~	0.76416	50.263	100 ✓	99.0 ✓	109 / 110	109 / 110	69	2	64 / 66		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
	0.75569		~~0.75625~~	0.87366										

EPA Method 0010 from EPA SW-846

0.76417

amd

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client: Chemours | W.O. #: 15418.002.016

Location/Plant: Fayetteville, NC | Source & Location: VE South Stack

Run No. 1 | Sample Date 7/11/19 | Recovery Date 7/16/19

Sample I.D. Chemours - VE South - ~~Scrubber~~ - STK - 1 - M0010 - | Analyst PMM | Filter Number 0004

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	33	100	98	2					312.5	
Initial	0	100	100	0					300	
Gain	33	0	-2	2				33	12.5	45.5

Impinger Color: Clear | Labeled? ✓ ✓ ✓

Silica Gel Condition: Good | Sealed? ✓

Run No. 2 | Sample Date 7/12/19 | Recovery Date 7/16/19

Sample I.D. Chemours - VE South - ~~Scrubber~~ - STK - 2 - M0010 - | Analyst PMM | Filter Number 0005

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	12	98	113	8					304.1	
Initial	0	100	100	0					300	
Gain	12	-2	13	8				31	4.1	45.1

Impinger Color: Clear | Labeled? ✓ ✓ ✓

Silica Gel Condition: Good | Sealed? ✓

Run No. 3 | Sample Date 7/13/19 | Recovery Date 7/16/19

Sample I.D. Chemours - VE South - ~~Scrubber~~ - STK - 3 - M0010 - | Analyst PMM | Filter Number 0006

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	22	102	98	6					312.9	
Initial	0	100	100	0					300	
Gain	22	2	-1	6				29	12.9	41.9

Impinger Color: Clear | Labeled? ✓ ✓ ✓

Silica Gel Condition: Good | Sealed? ✓

Check COC for Sample IDs of Media Blanks

METHODS AND ANALYZERS

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

File: C:\DATA\Chemours\July 2019\071619 VE South Run 1redo.cem
Program Version: 2.1, built 19 May 2017 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

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

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**17.1**

CALIBRATION DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Start Time: 11:37

O_2

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

Calibration Standards

%	**Cylinder ID**
12.1	ALM053372
21.0	CC112489

Calibration Results

Zero	14 mv
Span, 21.0 %	8025 mv

Curve Coefficients

Slope	**Intercept**
381.8	14

CO_2

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

Calibration Standards

%	**Cylinder ID**
9.0	ALM053372
17.1	CC112489

Calibration Results

Zero	-1 mv
Span, 17.1 %	8545 mv

Curve Coefficients

Slope	**Intercept**
501.2	-1

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **16 Jul 2019**

Start Time: 11:37

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 381.8 **Intercept** 14.0

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

CO_2
Method: EPA 3A
Span Conc. 17.1 %
Slope 501.2 **Intercept** -1.0

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

BIAS

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **16 Jul 2019**

Start Time: 11:45

O_2
Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.4	0.4	1.9	Pass
Span	12.0	12.1	0.1	0.5	Pass

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	9.0	8.7	-0.3	-1.8	Pass

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Time	O_2 %	CO_2 %
15:51	20.7	0.1
15:52	20.7	0.1
15:53	20.7	0.1
15:54	20.7	0.1
15:55	20.7	0.1
15:56	20.7	0.1
15:57	20.7	0.1
15:58	20.7	0.1
15:59	20.7	0.1
16:00	20.7	0.1
16:01	20.7	0.1
16:02	20.7	0.1
16:03	20.7	0.1
16:04	20.7	0.1
16:05	20.7	0.1
16:06	20.6	0.1
16:07	20.6	0.1
16:08	20.6	0.2
16:09	20.6	0.2
16:10	20.6	0.2
16:11	20.6	0.2
16:12	20.6	0.2
16:13	20.6	0.2
16:14	20.6	0.2
16:15	20.6	0.2
16:16	20.6	0.2
16:17	20.6	0.2
16:18	20.6	0.2
16:19	20.6	0.2
16:20	20.6	0.2
16:21	20.6	0.2
16:22	20.6	0.2
16:23	20.6	0.2
16:24	20.6	0.2
16:25	20.6	0.2
16:26	20.6	0.2
16:27	20.6	0.2
16:28	20.6	0.2
16:29	20.6	0.2
16:30	20.6	0.2

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Time	O_2 %	CO_2 %
16:31	20.6	0.2
16:32	20.6	0.2
16:33	20.6	0.2
16:34	20.6	0.2
16:35	20.6	0.2
16:36	20.6	0.2
16:37	20.6	0.2
16:38	20.6	0.2
16:39	20.6	0.2
16:40	20.6	0.2
16:41	20.6	0.2
16:42	20.6	0.2
16:43	20.6	0.2
16:44	20.6	0.2
16:45	20.6	0.2
16:46	20.6	0.2
16:47	20.6	0.2
16:48	20.6	0.2
16:49	20.6	0.2
16:50	20.6	0.2
16:51	20.6	0.2
16:52	20.6	0.2
16:53	20.6	0.2
16:54	20.6	0.2
16:55	20.6	0.1
16:56	20.6	0.1
16:57	20.6	0.1
16:58	20.6	0.1
16:59	20.6	0.1
17:00	20.6	0.1
17:01	20.6	0.1
17:02	20.6	0.1
17:03	20.6	0.1
17:04	20.6	0.1
17:05	20.6	0.1
17:06	20.6	0.1
17:07	20.6	0.1
17:08	20.6	0.1
17:09	20.6	0.1
17:10	20.6	0.1

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Time	O_2 %	CO_2 %
17:11	20.6	0.1
17:12	20.6	0.1
17:13	20.6	0.1
17:14	20.6	0.1
17:15	20.6	0.1
17:16	20.6	0.1
17:17	20.6	0.1
17:18	20.6	0.1
17:19	20.6	0.1
17:20	20.6	0.1
17:21	20.6	0.1
17:22	20.6	0.1
17:23	20.6	0.1
17:24	20.6	0.1
17:25	20.6	0.1
17:26	20.6	0.1
17:27	20.6	0.1
17:28	20.6	0.1
17:29	20.6	0.1
17:30	20.6	0.1
17:31	20.6	0.1
17:32	20.6	0.1
17:33	20.6	0.1
17:34	20.6	0.1
17:35	20.6	0.1
17:36	20.6	0.1
17:37	20.6	0.1
17:38	20.6	0.1
17:39	20.6	0.1
17:40	20.7	0.1
17:41	20.7	0.1
17:42	20.6	0.1
17:43	20.6	0.1
17:44	20.7	0.1
17:45	20.7	0.1
17:46	20.7	0.1
17:47	20.7	0.1
17:48	20.7	0.1
17:49	20.7	0.1
17:50	20.6	0.1

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Time	O_2 %	CO_2 %
17:51	20.6	0.1
17:52	20.6	0.1
17:53	20.6	0.1
17:54	20.6	0.1
17:55	20.6	0.2
17:56	20.6	0.2
17:57	20.6	0.2
17:58	20.6	0.1
17:59	20.6	0.1
18:00	20.6	0.2
18:01	20.6	0.1
18:02	20.6	0.1
18:03	20.6	0.1
18:04	20.6	0.1
18:05	20.6	0.1
18:06	20.6	0.1
18:07	20.6	0.1
18:08	20.6	0.1
18:09	20.6	0.1
18:10	20.6	0.1
18:11	20.6	0.1
18:12	20.6	0.1
18:13	20.6	0.1
18:14	20.6	0.1
18:15	20.6	0.1
18:16	20.6	0.1
18:17	20.6	0.1
18:18	20.6	0.1
18:19	20.6	0.1
18:20	20.6	0.1
18:21	20.6	0.1
18:22	20.6	0.1
18:23	20.6	0.1
18:24	20.6	0.1
18:25	20.6	0.1
18:26	20.6	0.1
18:27	20.6	0.1
18:28	20.6	0.1
18:29	20.6	0.1
18:30	20.6	0.1

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Time	O_2 %	CO_2 %
18:31	20.6	0.1
18:32	20.6	0.1
18:33	20.6	0.1
18:34	20.6	0.1
18:35	20.6	0.1
18:36	20.6	0.1
18:37	20.6	0.1
18:38	20.6	0.1
18:39	20.6	0.1
18:40	20.6	0.1
18:41	20.6	0.1
18:42	20.6	0.1
18:43	20.6	0.1
18:44	20.6	0.1
18:45	20.6	0.1
18:46	20.6	0.1
18:47	20.6	0.1
18:48	20.6	0.1
18:49	20.6	0.1
18:50	20.6	0.1
18:51	20.6	0.1
18:52	20.6	0.1
18:53	20.6	0.1
18:54	20.6	0.1
18:55	20.6	0.1
18:56	20.6	0.1
18:57	20.6	0.1
18:58	20.6	0.1
18:59	20.6	0.1
19:00	20.6	0.1
19:01	20.6	0.1
19:02	20.6	0.1
19:03	20.6	0.1
19:04	20.6	0.1
19:05	20.6	0.1
19:06	20.6	0.1
19:07	20.6	0.1
19:08	20.6	0.1
19:09	20.6	0.1
19:10	20.6	0.1

RUN DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **16 Jul 2019**

Time	O_2 %	CO_2 %
19:11	20.6	0.1
Avgs	**20.6**	**0.1**

RUN SUMMARY

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **16 Jul 2019**

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

Time: 15:50 to 19:11

Run Averages

20.6	0.1

Pre-run Bias at 11:45

Zero Bias	0.4	0.1
Span Bias	12.1	8.7
Span Gas	12.1	9.0

Post-run Bias at 19:14

Zero Bias	0.3	0.1
Span Bias	12.0	8.8
Span Gas	12.1	9.0

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

20.9	0.0

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **16 Jul 2019**

Start Time: 19:14

O_2
Method: EPA 3A
Span Conc. 21.0 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.3	0.3	1.4	Pass
Span	12.0	12.0	0.0	0.0	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.4	0.3	-0.1	-0.5	Pass
Span	12.1	12.0	-0.1	-0.5	Pass

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	9.0	8.8	-0.2	-1.2	Pass

Calibration Drift

Standard Gas	Initial* %	Final %	Difference %	Drift %	Status
Zero	0.1	0.1	0.0	0.0	Pass
Span	8.7	8.8	0.1	0.6	Pass

*Bias No. 1

METHODS AND ANALYZERS

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

File: C:\DATA\Chemours\July 2019\071719 VE South Runs 2 and 3.cem
Program Version: 2.1, built 19 May 2017 **File Version:** 2.02
Computer: WSWCAIRSERVICES **Trailer:** 27
Analog Input Device: Keithley KUSB-3108

Channel 1

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

Channel 2

Analyte	**CO_2**
Method	**EPA 3A**, Using Bias
Analyzer Make, Model & Serial No.	**Servomex 4900**
Full-Scale Output, mv	**10000**
Analyzer Range, %	**20.0**
Span Concentration, %	**17.1**

CALIBRATION DATA

Number 1

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Start Time: 06:28

O_2

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

Calibration Standards

%	**Cylinder ID**
12.1	ALM053372
21.0	CC112489

Calibration Results

Zero	10 mv
Span, 21.0 %	7984 mv

Curve Coefficients

Slope	**Intercept**
380.1	10

CO_2

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

Calibration Standards

%	**Cylinder ID**
9.0	ALM053372
17.1	CC112489

Calibration Results

Zero	-4 mv
Span, 17.1 %	8535 mv

Curve Coefficients

Slope	**Intercept**
500.8	-4

CALIBRATION ERROR DATA

Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **17 Jul 2019**

Start Time: 06:28

O_2
Method: EPA 3A
Span Conc. 21.0 %
Slope 380.1 **Intercept** 10.0

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

CO_2
Method: EPA 3A
Span Conc. 17.1 %
Slope 500.8 **Intercept** -4.0

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

BIAS
Number 1

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **17 Jul 2019**

Start Time: 06:37

O_2
Method: EPA 3A
Span Conc. 21.0 %

Bias Results

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

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

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

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
09:05	20.8	0.0
09:06	20.8	0.0
09:07	20.8	0.1
09:08	20.8	0.1
09:09	20.8	0.1
09:10	20.8	0.1
09:11	20.8	0.1
09:12	20.8	0.1
09:13	20.8	0.1
09:14	20.8	0.1
09:15	20.8	0.1
09:16	20.8	0.1
09:17	20.8	0.1
09:18	20.8	0.1
09:19	20.8	0.1
09:20	20.8	0.1
09:21	20.8	0.1
09:22	20.8	0.1
09:23	20.8	0.1
09:24	20.8	0.1
09:25	20.8	0.1
09:26	20.8	0.1
09:27	20.8	0.1
09:28	20.8	0.1
09:29	20.8	0.1
09:30	20.8	0.1
09:31	20.8	0.1
09:32	20.8	0.1
09:33	20.8	0.1
09:34	20.8	0.1
09:35	20.8	0.1
09:36	20.8	0.1
09:37	20.8	0.1
09:38	20.8	0.1
09:39	20.8	0.1
09:40	20.8	0.1
09:41	20.8	0.1
09:42	20.8	0.1
09:43	20.8	0.1
09:44	20.8	0.1

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
09:45	20.8	0.1
09:46	20.8	0.1
09:47	20.8	0.1
09:48	20.8	0.1
09:49	20.8	0.1
09:50	20.8	0.1
09:51	20.8	0.1
09:52	20.8	0.1
09:53	20.8	0.1
09:54	20.8	0.1
09:55	20.8	0.1
09:56	20.8	0.0
09:57	20.8	0.0
09:58	20.8	0.0
09:59	20.8	0.0
10:00	20.8	0.0
10:01	20.8	0.0
10:02	20.8	0.0
10:03	20.8	0.0
10:04	20.8	0.0
10:05	20.8	0.0
10:06	20.8	0.0
10:07	20.8	0.0
10:08	20.8	0.0
10:09	20.8	0.0
10:10	20.8	0.0
10:11	20.8	0.0
10:12	20.8	0.1
10:13	20.8	0.1
10:14	20.8	0.1
10:15	20.8	0.1
10:16	20.8	0.1
10:17	20.8	0.1
10:18	20.8	0.1
10:19	20.8	0.1
10:20	20.8	0.1
10:21	20.8	0.1
10:22	20.8	0.1
10:23	20.8	0.1
10:24	20.8	0.1

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
10:25	20.8	0.1
10:26	20.8	0.1
10:27	20.8	0.1
10:28	20.8	0.1
10:29	20.8	0.1
10:30	20.8	0.1
10:31	20.8	0.1
10:32	20.8	0.1
10:33	20.8	0.1
10:34	20.8	0.1
10:35	20.8	0.1
10:36	20.8	0.1
10:37	20.8	0.1
10:38	20.8	0.1
10:39	20.8	0.1
10:40	20.8	0.1
10:41	20.8	0.1
10:42	20.8	0.1
10:43	20.8	0.1
10:44	20.8	0.1
10:45	20.8	0.1
10:46	20.8	0.1
10:47	20.8	0.1
10:48	20.8	0.1
10:49	20.8	0.1
10:50	20.8	0.1
10:51	20.8	0.1
10:52	20.8	0.1
10:53	20.8	0.1
10:54	20.8	0.1
10:55	20.8	0.1
10:56	20.8	0.1
10:57	20.8	0.1
10:58	20.8	0.1
10:59	20.8	0.1
11:00	20.8	0.0
11:01	20.8	0.0
11:02	20.8	0.0
11:03	20.8	0.0
11:04	20.8	0.0

RUN DATA

Number 2

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
11:05	20.8	0.0
11:06	20.8	0.0
11:07	20.8	0.0
11:08	20.8	0.0
11:09	20.8	0.0
11:10	20.8	0.0
11:11	20.8	0.0
11:12	20.8	0.0
11:13	20.8	0.0
11:14	20.8	0.0
11:15	20.8	0.0
11:16	20.8	0.0
11:17	20.8	0.0
11:18	20.8	0.0
11:19	20.8	0.0
11:20	20.8	0.0
11:21	20.8	0.0
Avgs	**20.8**	**0.1**

RUN SUMMARY

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **17 Jul 2019**

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

Time: 09:04 to 11:21

Run Averages

20.8	0.1

Pre-run Bias at 06:37

Zero Bias	0.0	0.0
Span Bias	12.0	8.9
Span Gas	12.1	9.0

Post-run Bias at 11:22

Zero Bias	0.1	0.1
Span Bias	11.9	8.8
Span Gas	12.1	9.0

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

21.0	0.0

BIAS AND CALIBRATION DRIFT

Number 2

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **17 Jul 2019**

Start Time: 11:22

O_2
Method: EPA 3A
Span Conc. 21.0 %

Bias Results

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

Calibration Drift

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

*Bias No. 1

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

Standard Gas	Cal. %	Bias %	Difference %	Error %	Status
Zero	0.0	0.1	0.1	0.6	Pass
Span	9.0	8.8	-0.2	-1.2	Pass

Calibration Drift

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

*Bias No. 1

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
12:50	20.9	0.1
12:51	20.9	0.1
12:52	20.8	0.1
12:53	20.8	0.1
12:54	20.8	0.1
12:55	20.8	0.1
12:56	20.8	0.1
12:57	20.8	0.1
12:58	20.8	0.1
12:59	20.8	0.1
13:00	20.8	0.1
13:01	20.8	0.1
13:02	20.8	0.1
13:03	20.8	0.1
13:04	20.8	0.1
13:05	20.8	0.1
13:06	20.8	0.1
13:07	20.8	0.1
13:08	20.8	0.1
13:09	20.8	0.1
13:10	20.8	0.1
13:11	20.8	0.1
13:12	20.8	0.1
13:13	20.8	0.1
13:14	20.8	0.1
13:15	20.8	0.1
13:16	20.8	0.1
13:17	20.8	0.1
13:18	20.8	0.1
13:19	20.8	0.1
13:20	20.8	0.1
13:21	20.8	0.1
13:22	20.8	0.1
13:23	20.8	0.1
13:24	20.8	0.1
13:25	20.8	0.1
13:26	20.8	0.1
13:27	20.8	0.1
13:28	20.8	0.1
13:29	20.8	0.1

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
13:30	20.8	0.1
13:31	20.8	0.1
13:32	20.8	0.1
13:33	20.8	0.1
13:34	20.8	0.1
13:35	20.8	0.1
13:36	20.8	0.1
13:37	20.8	0.1
13:38	20.8	0.1
13:39	20.8	0.1
13:40	20.9	0.1
13:41	20.9	0.1
13:42	20.9	0.1
13:43	20.8	0.1
13:44	20.9	0.1
13:45	20.8	0.0
13:46	20.9	0.1
13:47	20.8	0.1
13:48	20.8	0.1
13:49	20.9	0.1
13:50	20.9	0.1
13:51	20.9	0.1
13:52	20.9	0.1
13:53	20.9	0.1
13:54	20.9	0.1
13:55	20.9	0.1
13:56	20.9	0.1
13:57	20.9	0.1
13:58	20.9	0.1
13:59	20.9	0.1
14:00	20.9	0.1
14:01	20.9	0.1
14:02	20.8	0.1
14:03	20.9	0.1
14:04	20.9	0.1
14:05	20.9	0.1
14:06	20.9	0.1
14:07	20.9	0.1
14:08	20.8	0.1
14:09	20.8	0.1

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
14:10	20.8	0.1
14:11	20.8	0.1
14:12	20.8	0.1
14:13	20.8	0.1
14:14	20.8	0.1
14:15	20.8	0.1
14:16	20.8	0.1
14:17	20.8	0.1
14:18	20.8	0.1
14:19	20.8	0.1
14:20	20.8	0.1
14:21	20.8	0.1
14:22	20.8	0.1
14:23	20.8	0.1
14:24	20.8	0.1
14:25	20.8	0.1
14:26	20.8	0.1
14:27	20.8	0.1
14:28	20.8	0.1
14:29	20.8	0.1
14:30	20.8	0.1
14:31	20.8	0.1
14:32	20.8	0.1
14:33	20.8	0.1
14:34	20.8	0.1
14:35	20.8	0.1
14:36	20.8	0.1
14:37	20.8	0.1
14:38	20.8	0.1
14:39	20.8	0.1
14:40	20.8	0.1
14:41	20.8	0.1
14:42	20.8	0.1
14:43	20.8	0.1
14:44	20.8	0.1
14:45	20.8	0.1
14:46	20.8	0.1
14:47	20.8	0.1
14:48	20.8	0.1
14:49	20.8	0.1

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
14:50	20.8	0.1
14:51	20.8	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	20.8	0.1
15:00	20.8	0.1
15:01	20.8	0.1
15:02	20.8	0.1
15:03	20.8	0.1
15:04	20.8	0.1
15:05	20.8	0.1
15:06	20.8	0.1
15:07	20.8	0.1
15:08	20.8	0.1
15:09	20.8	0.1
15:10	20.8	0.1
15:11	20.8	0.1
15:12	20.8	0.1
15:13	20.8	0.1
15:14	20.8	0.1
15:15	20.8	0.1
15:16	20.8	0.1
15:17	20.8	0.1
15:18	20.8	0.1
15:19	20.8	0.1
15:20	20.8	0.1
15:21	20.8	0.1
15:22	20.8	0.1
15:23	20.8	0.1
15:24	20.8	0.1
15:25	20.8	0.1
15:26	20.8	0.1
15:27	20.8	0.1
15:28	20.8	0.1
15:29	20.8	0.1

RUN DATA

Number 3

Client: **Chemours**
Location: **Fayetteville**
Source: **VE South**

Calibration **1**

Project Number: **15418**
Operator: **SDR**
Date: **17 Jul 2019**

Time	O_2 %	CO_2 %
15:30	20.8	0.1
15:31	20.8	0.1
15:32	20.8	0.1
15:33	20.8	0.1
15:34	20.8	0.1
15:35	20.8	0.1
15:36	20.8	0.1
Avgs	**20.8**	**0.1**

RUN SUMMARY

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **17 Jul 2019**

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

Time: 12:49 to 15:36

Run Averages

20.8	0.1

Pre-run Bias at 11:22

Zero Bias	0.1	0.1
Span Bias	11.9	8.8
Span Gas	12.1	9.0

Post-run Bias at 15:38

Zero Bias	0.1	0.0
Span Bias	12.0	8.8
Span Gas	12.1	9.0

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

21.1	0.1

BIAS AND CALIBRATION DRIFT

Number 3

Client: **Chemours** | Project Number: **15418**
Location: **Fayetteville** | Operator: **SDR**
Source: **VE South** | Calibration **1** | Date: **17 Jul 2019**

Start Time: 15:38

O_2
Method: EPA 3A
Span Conc. 21.0 %

Bias Results

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

Calibration Drift

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

*Bias No. 2

CO_2
Method: EPA 3A
Span Conc. 17.1 %

Bias Results

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

Calibration Drift

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

*Bias No. 2

APPENDIX C
LABORATORY ANALYTICAL REPORT

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ANALYTICAL REPORT

Job Number: 140-16060-1

Job Description: VE South Carbon Bed Inlet - M0010

Contract Number: LBIO-67048

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

Attention: Michael Aucoin

Approved for release.
Courtney M Adkins
Project Manager I
7/29/2019 4:09 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
07/29/2019

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Glossary

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

Method Summary

Client: Chemours Company FC, LLC The
Job ID: 140-16060-1
Project/Site: VE South Carbon Bed Inlet - M0010

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

Protocol References:

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

TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

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

Sample Summary

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

Job ID: 140-16060-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-16060-1	G-2347,2348 VES CARBON BED INLET R1 M0010 FH	Air	07/16/19 00:00	07/17/19 20:00	
140-16060-2	G-2349,2350,2352 VES CARBON BED INLET R M0010 BH	Air	07/16/19 00:00	07/17/19 20:00	
140-16060-3	G-2351 VES CARBON BED INLET R1 M0010 IM 1,2&3 CONDENSATE	Air	07/16/19 00:00	07/17/19 20:00	
140-16060-4	G-2353 VES CARBON BED INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/16/19 00:00	07/17/19 20:00	
140-16060-5	G-2354,2355 VES CARBON BED INLET R2 M0010 FH	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-6	G-2356,2357,2359 VES CARBON BED INLET R M0010 BH	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-7	G-2358 VES CARBON BED INLET R2 M0010 IM 1,2&3 CONDENSATE	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-8	G-2360 VES CARBON BED INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-9	G-2361,2362 VES CARBON BED INLET R3 M0010 FH	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-10	G-2363,2364,2366 VES CARBON BED INLET R M0010 BH	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-11	G-2365 VES CARBON BED INLET R3 M0010 IM 1,2&3 CONDENSATE	Air	07/17/19 00:00	07/17/19 20:00	
140-16060-12	G-2367 VES CARBON BED INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/17/19 00:00	07/17/19 20:00	

Job Narrative
140-16060-1

Sample Receipt

The samples were received on July 17, 2019 at 8:00 PM in good condition and properly preserved. The temperature of the cooler at receipt was 0.4º C.

Quality Control and Data Interpretation

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

Method 0010/Method 3542 Sampling Train Preparation

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

LCMS

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

Organic Prep

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

Comments

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

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

LCMS

Analysis Batch: 464589

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

Prep Batch: 465107

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-3	G-2351 VES CARBON BED INLET R1 M0010 IM	Total/NA	Air	None	
140-16060-7	G-2358 VES CARBON BED INLET R2 M0010 IM	Total/NA	Air	None	
140-16060-11	G-2365 VES CARBON BED INLET R3 M0010 IM	Total/NA	Air	None	
MB 280-465107/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465107/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465193

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-2	G-2349,2350,2352 VES CARBON BED INLET R	Total/NA	Air	None	
140-16060-4	G-2353 VES CARBON BED INLET R1 M0010 BF	Total/NA	Air	None	
140-16060-6	G-2356,2357,2359 VES CARBON BED INLET R2	Total/NA	Air	None	
140-16060-8	G-2360 VES CARBON BED INLET R2 M0010 BF	Total/NA	Air	None	
140-16060-10	G-2363,2364,2366 VES CARBON BED INLET R3	Total/NA	Air	None	
140-16060-12	G-2367 VES CARBON BED INLET R3 M0010 BF	Total/NA	Air	None	
MB 280-465193/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465193/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465251

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-1	G-2347,2348 VES CARBON BED INLET R1 M00	Total/NA	Air	None	
140-16060-5	G-2354,2355 VES CARBON BED INLET R2 M00	Total/NA	Air	None	
140-16060-9	G-2361,2362 VES CARBON BED INLET R3 M00	Total/NA	Air	None	
MB 280-465251/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465251/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 465647

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-3	G-2351 VES CARBON BED INLET R1 M0010 IM	Total/NA	Air	8321A	465107
140-16060-7	G-2358 VES CARBON BED INLET R2 M0010 IM	Total/NA	Air	8321A	465107
140-16060-11	G-2365 VES CARBON BED INLET R3 M0010 IM	Total/NA	Air	8321A	465107
MB 280-465107/1-A	Method Blank	Total/NA	Air	8321A	465107
LCS 280-465107/2-A	Lab Control Sample	Total/NA	Air	8321A	465107

Analysis Batch: 465648

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-1	G-2347,2348 VES CARBON BED INLET R1 M00	Total/NA	Air	8321A	465251
140-16060-5	G-2354,2355 VES CARBON BED INLET R2 M00	Total/NA	Air	8321A	465251
140-16060-9	G-2361,2362 VES CARBON BED INLET R3 M00	Total/NA	Air	8321A	465251
MB 280-465251/1-A	Method Blank	Total/NA	Air	8321A	465251
LCS 280-465251/2-A	Lab Control Sample	Total/NA	Air	8321A	465251

Analysis Batch: 465777

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-2	G-2349,2350,2352 VES CARBON BED INLET R	Total/NA	Air	8321A	465193
140-16060-4	G-2353 VES CARBON BED INLET R1 M0010 BF	Total/NA	Air	8321A	465193
140-16060-6	G-2356,2357,2359 VES CARBON BED INLET R2	Total/NA	Air	8321A	465193
140-16060-8	G-2360 VES CARBON BED INLET R2 M0010 BF	Total/NA	Air	8321A	465193

LCMS (Continued)

Analysis Batch: 465777 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16060-10	G-2363,2364,2366 VES CARBON BED INLET R3	Total/NA	Air	8321A	465193
140-16060-12	G-2367 VES CARBON BED INLET R3 M0010 BF	Total/NA	Air	8321A	465193
MB 280-465193/1-A	Method Blank	Total/NA	Air	8321A	465193
LCS 280-465193/2-A	Lab Control Sample	Total/NA	Air	8321A	465193

Client Sample ID: G-2347,2348 VES CARBON BED INLET R1 M0010 FH

Lab Sample ID: 140-16060-1

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.39		0.126	0.0136	ug/Sample		07/22/19 16:15	07/25/19 14:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*92*		*50 - 200*	*07/22/19 16:15*	*07/25/19 14:09*	*1*

Client Sample ID: G-2349,2350,2352 VES CARBON BED INLET R1 M0010 BH

Lab Sample ID: 140-16060-2

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	36.3		0.275	0.0550	ug/Sample		07/22/19 12:45	07/26/19 13:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*76*		*50 - 200*	*07/22/19 12:45*	*07/26/19 13:48*	*1*

Client Sample ID: G-2351 VES CARBON BED INLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16060-3

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	9.68		0.230	0.0117	ug/Sample		07/23/19 09:00	07/25/19 13:20	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*80*		*50 - 200*	*07/23/19 09:00*	*07/25/19 13:20*	*1*

Client Sample ID: G-2353 VES CARBON BED INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16060-4

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/22/19 12:45	07/26/19 13:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*84*		*50 - 200*	*07/22/19 12:45*	*07/26/19 13:51*	*1*

Client Sample ID: G-2354,2355 VES CARBON BED INLET R2 M0010 FH

Lab Sample ID: 140-16060-5

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.14		0.151	0.0163	ug/Sample		07/22/19 16:15	07/25/19 14:13	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*90*		*50 - 200*	*07/22/19 16:15*	*07/25/19 14:13*	*1*

Client Sample ID: G-2356,2357,2359 VES CARBON BED INLET R2 M0010 BH

Lab Sample ID: 140-16060-6

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	7.65		0.275	0.0550	ug/Sample		07/22/19 12:45	07/26/19 13:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*		*50 - 200*	*07/22/19 12:45*	*07/26/19 13:54*	*1*

Client Sample ID: G-2358 VES CARBON BED INLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16060-7

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.205	0.0105	ug/Sample		07/23/19 09:00	07/25/19 13:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*83*		*50 - 200*	*07/23/19 09:00*	*07/25/19 13:24*	*1*

Client Sample ID: G-2360 VES CARBON BED INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16060-8

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/22/19 12:45	07/26/19 13:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*60*		*50 - 200*	*07/22/19 12:45*	*07/26/19 13:58*	*1*

Client Sample ID: G-2361,2362 VES CARBON BED INLET R3 M0010 FH

Lab Sample ID: 140-16060-9

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.95		0.126	0.0136	ug/Sample		07/22/19 16:15	07/25/19 14:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*90*		*50 - 200*	*07/22/19 16:15*	*07/25/19 14:16*	*1*

Client Sample ID: G-2363,2364,2366 VES CARBON BED INLET R3 M0010 BH

Lab Sample ID: 140-16060-10

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.82		0.300	0.0600	ug/Sample		07/22/19 12:45	07/26/19 14:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*100*		*50 - 200*	*07/22/19 12:45*	*07/26/19 14:01*	*1*

Client Sample ID: G-2365 VES CARBON BED INLET R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16060-11

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.480		0.250	0.0128	ug/Sample		07/23/19 09:00	07/25/19 13:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*		*50 - 200*	*07/23/19 09:00*	*07/25/19 13:27*	*1*

Client Sample ID: G-2367 VES CARBON BED INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16060-12

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/22/19 12:45	07/26/19 14:04	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*		*50 - 200*	*07/22/19 12:45*	*07/26/19 14:04*	*1*

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ANALYTICAL REPORT

Job Number: 140-16059-1

Job Description: VE South Carbon Bed Outlet - M0010

Contract Number: LBIO-67048

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

Attention: Michael Aucoin

Approved for release.
Courtney M Adkins
Project Manager I
7/29/2019 4:06 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
07/29/2019

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Definitions/Glossary

Client: Chemours Company FC, LLC The
Job ID: 140-16059-1
Project/Site: VE South Carbon Bed Outlet - M0010

Qualifiers

LCMS

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

Glossary

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

Method Summary

Client: Chemours Company FC, LLC The
Job ID: 140-16059-1
Project/Site: VE South Carbon Bed Outlet - M0010

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

Protocol References:

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

TAL SOP = TestAmerica Laboratories, Standard Operating Procedure

Laboratory References:

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

Sample Summary

Client: Chemours Company FC, LLC The
Job ID: 140-16059-1
Project/Site: VE South Carbon Bed Outlet - M0010

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-16059-1	A-5947,5948 VES CARBON BED OUTLET R1 M0010 FH	Air	07/16/19 00:00	07/17/19 20:00	
140-16059-2	A-5949,5950,5952 VES CARBON BED OUTLET R1 M0010 BH	Air	07/16/19 00:00	07/17/19 20:00	
140-16059-3	A-5951 VES CARBON BED OUTLET R1 M0010 IMP 1,2&3 CONDENSATE	Air	07/16/19 00:00	07/17/19 20:00	
140-16059-4	A-5953 VES CARBON BED OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/16/19 00:00	07/17/19 20:00	
140-16059-5	A-5954,5955 VES CARBON BED OUTLET R2 M0010 FH	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-6	A-5956,5957,5959 VES CARBON BED OUTLET R2 M0010 BH	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-7	A-5958 VES CARBON BED OUTLET R2 M0010 IMP 1,2&3 CONDENSATE	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-8	A-5960 VES CARBON BED OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-9	A-5961,5962 VES CARBON BED OUTLET R3 M0010 FH	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-10	A-5963,5964,5966 VES CARBON BED OUTLET R3 M0010 BH	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-11	A-5965 VES CARBON BED OUTLET R3 M0010 IMP 1,2&3 CONDENSATE	Air	07/17/19 00:00	07/17/19 20:00	
140-16059-12	A-5967 VES CARBON BED OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/17/19 00:00	07/17/19 20:00	

Job Narrative
140-16059-1

Sample Receipt

The samples were received on July 17, 2019 at 8:00 PM in good condition and properly preserved. The temperature of the cooler at receipt was 0.2º C.

Quality Control and Data Interpretation

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

Method 0010/Method 3542 Sampling Train Preparation

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

LCMS

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

Organic Prep

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

Comments

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

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

QC Association Summary

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

Job ID: 140-16059-1

LCMS

Analysis Batch: 464589

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

Prep Batch: 465059

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16059-2	A-5949,5950,5952 VES CARBON BED OUTLET	Total/NA	Air	None	
140-16059-4	A-5953 VES CARBON BED OUTLET R1 M0010	Total/NA	Air	None	
140-16059-6	A-5956,5957,5959 VES CARBON BED OUTLET	Total/NA	Air	None	
140-16059-8	A-5960 VES CARBON BED OUTLET R2 M0010	Total/NA	Air	None	
140-16059-10	A-5963,5964,5966 VES CARBON BED OUTLET	Total/NA	Air	None	
140-16059-12	A-5967 VES CARBON BED OUTLET R3 M0010	Total/NA	Air	None	
MB 280-465059/13-A	Method Blank	Total/NA	Air	None	
MB 280-465059/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465059/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465107

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16059-3	A-5951 VES CARBON BED OUTLET R1 M0010	Total/NA	Air	None	
140-16059-7	A-5958 VES CARBON BED OUTLET R2 M0010	Total/NA	Air	None	
140-16059-11	A-5965 VES CARBON BED OUTLET R3 M0010	Total/NA	Air	None	
MB 280-465107/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465107/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465251

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16059-1	A-5947,5948 VES CARBON BED OUTLET R1 M	Total/NA	Air	None	
140-16059-5	A-5954,5955 VES CARBON BED OUTLET R2 M	Total/NA	Air	None	
140-16059-9	A-5961,5962 VES CARBON BED OUTLET R3 M	Total/NA	Air	None	
MB 280-465251/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465251/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 465646

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16059-2	A-5949,5950,5952 VES CARBON BED OUTLET	Total/NA	Air	8321A	465059
140-16059-4	A-5953 VES CARBON BED OUTLET R1 M0010	Total/NA	Air	8321A	465059
140-16059-6	A-5956,5957,5959 VES CARBON BED OUTLET	Total/NA	Air	8321A	465059
140-16059-8	A-5960 VES CARBON BED OUTLET R2 M0010	Total/NA	Air	8321A	465059
140-16059-10	A-5963,5964,5966 VES CARBON BED OUTLET	Total/NA	Air	8321A	465059
140-16059-12	A-5967 VES CARBON BED OUTLET R3 M0010	Total/NA	Air	8321A	465059
MB 280-465059/13-A	Method Blank	Total/NA	Air	8321A	465059
MB 280-465059/1-A	Method Blank	Total/NA	Air	8321A	465059
LCS 280-465059/2-A	Lab Control Sample	Total/NA	Air	8321A	465059

Analysis Batch: 465647

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16059-3	A-5951 VES CARBON BED OUTLET R1 M0010	Total/NA	Air	8321A	465107
140-16059-7	A-5958 VES CARBON BED OUTLET R2 M0010	Total/NA	Air	8321A	465107
140-16059-11	A-5965 VES CARBON BED OUTLET R3 M0010	Total/NA	Air	8321A	465107
MB 280-465107/1-A	Method Blank	Total/NA	Air	8321A	465107
LCS 280-465107/2-A	Lab Control Sample	Total/NA	Air	8321A	465107

QC Association Summary

Client: Chemours Company FC, LLC The
Job ID: 140-16059-1
Project/Site: VE South Carbon Bed Outlet - M0010

LCMS

Analysis Batch: 465648

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16059-1	A-5947,5948 VES CARBON BED OUTLET R1 M	Total/NA	Air	8321A	465251
140-16059-5	A-5954,5955 VES CARBON BED OUTLET R2 M	Total/NA	Air	8321A	465251
140-16059-9	A-5961,5962 VES CARBON BED OUTLET R3 M	Total/NA	Air	8321A	465251
MB 280-465251/1-A	Method Blank	Total/NA	Air	8321A	465251
LCS 280-465251/2-A	Lab Control Sample	Total/NA	Air	8321A	465251

Client Sample ID: A-5947,5948 VES CARBON BED OUTLET R1 M0010 FH

Lab Sample ID: 140-16059-1

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.07		0.102	0.0110	ug/Sample		07/22/19 16:15	07/25/19 14:00	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*92*		*50 - 200*	*07/22/19 16:15*	*07/25/19 14:00*	*1*

Client Sample ID: A-5949,5950,5952 VES CARBON BED OUTLET R1 M0010 BH

Lab Sample ID: 140-16059-2

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	4.91		0.300	0.0600	ug/Sample		07/19/19 14:50	07/25/19 12:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*76*		*50 - 200*	*07/19/19 14:50*	*07/25/19 12:18*	*1*

Client Sample ID: A-5951 VES CARBON BED OUTLET R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16059-3

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.01		0.222	0.0113	ug/Sample		07/23/19 09:00	07/25/19 13:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*79*		*50 - 200*	*07/23/19 09:00*	*07/25/19 13:11*	*1*

Client Sample ID: A-5953 VES CARBON BED OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16059-4

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 12:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*75*		*50 - 200*	*07/19/19 14:50*	*07/25/19 12:25*	*1*

Client Sample ID: A-5954,5955 VES CARBON BED OUTLET R2 M0010 FH

Lab Sample ID: 140-16059-5

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.04		0.126	0.0136	ug/Sample		07/22/19 16:15	07/25/19 14:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*85*		*50 - 200*	*07/22/19 16:15*	*07/25/19 14:03*	*1*

Client Sample ID: A-5956,5957,5959 VES CARBON BED OUTLET R2 M0010 BH

Lab Sample ID: 140-16059-6

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.983		0.275	0.0550	ug/Sample		07/19/19 14:50	07/25/19 12:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*79*		*50 - 200*	*07/19/19 14:50*	*07/25/19 12:28*	*1*

Client Sample ID: A-5958 VES CARBON BED OUTLET R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16059-7

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.281		0.210	0.0107	ug/Sample		07/23/19 09:00	07/25/19 13:14	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*81*		*50 - 200*	*07/23/19 09:00*	*07/25/19 13:14*	*1*

Client Sample ID: A-5960 VES CARBON BED OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16059-8

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 12:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*		*50 - 200*	*07/19/19 14:50*	*07/25/19 12:31*	*1*

Client Sample ID: A-5961,5962 VES CARBON BED OUTLET R3 M0010 FH

Lab Sample ID: 140-16059-9

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.10		0.126	0.0136	ug/Sample		07/22/19 16:15	07/25/19 14:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*86*		*50 - 200*	*07/22/19 16:15*	*07/25/19 14:06*	*1*

Client Sample ID: A-5963,5964,5966 VES CARBON BED OUTLET R3 M0010 BH

Lab Sample ID: 140-16059-10

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.34		0.275	0.0550	ug/Sample		07/19/19 14:50	07/25/19 12:35	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*		*50 - 200*	*07/19/19 14:50*	*07/25/19 12:35*	*1*

Client Sample ID: A-5965 VES CARBON BED OUTLET R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16059-11

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.206	J	0.230	0.0117	ug/Sample		07/23/19 09:00	07/25/19 13:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*80*		*50 - 200*	*07/23/19 09:00*	*07/25/19 13:17*	*1*

Client Sample ID: A-5967 VES CARBON BED OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16059-12

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 12:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*78*		*50 - 200*	*07/19/19 14:50*	*07/25/19 12:38*	*1*

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ANALYTICAL REPORT

Job Number: 140-16057-1

Job Description: VE South Stack - M0010

Contract Number: LBIO-67048

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

Attention: Michael Aucoin

Approved for release.
Courtney M Adkins
Project Manager I
7/29/2019 4:01 PM

Courtney M Adkins, Project Manager I
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
07/29/2019

Table of Contents

Table of Contents

Definitions/Glossary

Client: Chemours Company FC, LLC The
Project/Site: VE South Stack - M0010

Job ID: 140-16057-1

Qualifiers

LCMS

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

Glossary

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

Method Summary

Client: Chemours Company FC, LLC The
Project/Site: VE South Stack - M0010

Job ID: 140-16057-1

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

Protocol References:

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

Laboratory References:

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

Sample Summary

Client: Chemours Company FC, LLC The
Project/Site: VE South Stack - M0010

Job ID: 140-16057-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-16057-1	R-2305,2306 VES STK R1 M0010 FH	Air	07/16/19 00:00	07/17/19 20:00	
140-16057-2	R-2307,2308,2310 VES STK R1 M0010 BH	Air	07/16/19 00:00	07/17/19 20:00	
140-16057-3	R-2309 VES STK R1 M0010 IMP 1,2&3 CONDENSATE	Air	07/16/19 00:00	07/17/19 20:00	
140-16057-4	R-2311 VES STK R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/16/19 00:00	07/17/19 20:00	
140-16057-5	R-2312,2313 VES STK R2 M0010 FH	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-6	R-2314,2315,2317 VES STK R2 M0010 BH	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-7	R-2316 VES STK R2 M0010 IMP 1,2&3 CONDENSATE	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-8	R-2318 VES STK R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-9	R-2319,2320 VES STK R3 M0010 FH	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-10	R-2321,2322,2324 VES STK R3 M0010 BH	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-11	R-2323 VES STK R3 M0010 IMP 1,2&3 CONDENSATE	Air	07/17/19 00:00	07/17/19 20:00	
140-16057-12	R-2325 VES STK R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE	Air	07/17/19 00:00	07/17/19 20:00	

Job Narrative
140-16057-1

Sample Receipt

The samples were received on July 17, 2019 at 8:00 PM in good condition and properly preserved. The temperatures of the 2 coolers at receipt time were 0.3º C and 0.7º C.

Quality Control and Data Interpretation

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

Method 0010/Method 3542 Sampling Train Preparation

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

LCMS

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

Organic Prep

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

Comments

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

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

LCMS

Analysis Batch: 464589

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

Prep Batch: 465059

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-2	R-2307,2308,2310 VES STK R1 M0010 BH	Total/NA	Air	None	
140-16057-4	R-2311 VES STK R1 M0010 BREAKTHROUGH	Total/NA	Air	None	
140-16057-6	R-2314,2315,2317 VES STK R2 M0010 BH	Total/NA	Air	None	
140-16057-8	R-2318 VES STK R2 M0010 BREAKTHROUGH	Total/NA	Air	None	
MB 280-465059/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465059/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465107

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-3	R-2309 VES STK R1 M0010 IMP 1,2&3 CONDEI	Total/NA	Air	None	
140-16057-7	R-2316 VES STK R2 M0010 IMP 1,2&3 CONDEI	Total/NA	Air	None	
140-16057-11	R-2323 VES STK R3 M0010 IMP 1,2&3 CONDEI	Total/NA	Air	None	
MB 280-465107/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465107/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465193

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-10	R-2321,2322,2324 VES STK R3 M0010 BH	Total/NA	Air	None	
140-16057-12	R-2325 VES STK R3 M0010 BREAKTHROUGH	Total/NA	Air	None	
MB 280-465193/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465193/2-A	Lab Control Sample	Total/NA	Air	None	

Prep Batch: 465251

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-1	R-2305,2306 VES STK R1 M0010 FH	Total/NA	Air	None	
140-16057-5	R-2312,2313 VES STK R2 M0010 FH	Total/NA	Air	None	
140-16057-9	R-2319,2320 VES STK R3 M0010 FH	Total/NA	Air	None	
MB 280-465251/1-A	Method Blank	Total/NA	Air	None	
LCS 280-465251/2-A	Lab Control Sample	Total/NA	Air	None	

Analysis Batch: 465646

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-2	R-2307,2308,2310 VES STK R1 M0010 BH	Total/NA	Air	8321A	465059
140-16057-4	R-2311 VES STK R1 M0010 BREAKTHROUGH	Total/NA	Air	8321A	465059
140-16057-6	R-2314,2315,2317 VES STK R2 M0010 BH	Total/NA	Air	8321A	465059
140-16057-8	R-2318 VES STK R2 M0010 BREAKTHROUGH	Total/NA	Air	8321A	465059
MB 280-465059/1-A	Method Blank	Total/NA	Air	8321A	465059
LCS 280-465059/2-A	Lab Control Sample	Total/NA	Air	8321A	465059

Analysis Batch: 465647

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-3	R-2309 VES STK R1 M0010 IMP 1,2&3 CONDEI	Total/NA	Air	8321A	465107
140-16057-7	R-2316 VES STK R2 M0010 IMP 1,2&3 CONDEI	Total/NA	Air	8321A	465107
140-16057-11	R-2323 VES STK R3 M0010 IMP 1,2&3 CONDEI	Total/NA	Air	8321A	465107
MB 280-465107/1-A	Method Blank	Total/NA	Air	8321A	465107
LCS 280-465107/2-A	Lab Control Sample	Total/NA	Air	8321A	465107

QC Association Summary

Client: Chemours Company FC, LLC The
Project/Site: VE South Stack - M0010

Job ID: 140-16057-1

LCMS

Analysis Batch: 465648

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-1	R-2305,2306 VES STK R1 M0010 FH	Total/NA	Air	8321A	465251
140-16057-5	R-2312,2313 VES STK R2 M0010 FH	Total/NA	Air	8321A	465251
140-16057-9	R-2319,2320 VES STK R3 M0010 FH	Total/NA	Air	8321A	465251
MB 280-465251/1-A	Method Blank	Total/NA	Air	8321A	465251
LCS 280-465251/2-A	Lab Control Sample	Total/NA	Air	8321A	465251

Analysis Batch: 465777

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-16057-10	R-2321,2322,2324 VES STK R3 M0010 BH	Total/NA	Air	8321A	465193
140-16057-12	R-2325 VES STK R3 M0010 BREAKTHROUGH	Total/NA	Air	8321A	465193
MB 280-465193/1-A	Method Blank	Total/NA	Air	8321A	465193
LCS 280-465193/2-A	Lab Control Sample	Total/NA	Air	8321A	465193

Client Sample ID: R-2305,2306 VES STK R1 M0010 FH

Lab Sample ID: 140-16057-1

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.62		0.102	0.0110	ug/Sample		07/22/19 16:15	07/25/19 13:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*94*		*50 - 200*	*07/22/19 16:15*	*07/25/19 13:43*	*1*

Client Sample ID: R-2307,2308,2310 VES STK R1 M0010 BH

Lab Sample ID: 140-16057-2

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.91		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 11:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*67*		*50 - 200*	*07/19/19 14:50*	*07/25/19 11:49*	*1*

Client Sample ID: R-2309 VES STK R1 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16057-3

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.278		0.230	0.0117	ug/Sample		07/23/19 09:00	07/25/19 12:51	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*82*		*50 - 200*	*07/23/19 09:00*	*07/25/19 12:51*	*1*

Client Sample ID: R-2311 VES STK R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16057-4

Date Collected: 07/16/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 11:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*77*		*50 - 200*	*07/19/19 14:50*	*07/25/19 11:52*	*1*

Client Sample ID: R-2312,2313 VES STK R2 M0010 FH

Lab Sample ID: 140-16057-5

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.980		0.126	0.0136	ug/Sample		07/22/19 16:15	07/25/19 13:46	1

Client Sample ID: R-2312,2313 VES STK R2 M0010 FH

Lab Sample ID: 140-16057-5

Date Collected: 07/17/19 00:00
Date Received: 07/17/19 20:00
Sample Container: Air Train

Matrix: Air

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	88		50 - 200	07/22/19 16:15	07/25/19 13:46	1

Client Sample ID: R-2314,2315,2317 VES STK R2 M0010 BH

Lab Sample ID: 140-16057-6

Date Collected: 07/17/19 00:00
Date Received: 07/17/19 20:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.54		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 11:56	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	70		50 - 200	07/19/19 14:50	07/25/19 11:56	1

Client Sample ID: R-2316 VES STK R2 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16057-7

Date Collected: 07/17/19 00:00
Date Received: 07/17/19 20:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.175	J	0.216	0.0110	ug/Sample		07/23/19 09:00	07/25/19 12:54	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	90		50 - 200	07/23/19 09:00	07/25/19 12:54	1

Client Sample ID: R-2318 VES STK R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16057-8

Date Collected: 07/17/19 00:00
Date Received: 07/17/19 20:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/19/19 14:50	07/25/19 11:59	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	76		50 - 200	07/19/19 14:50	07/25/19 11:59	1

Client Sample ID: R-2319,2320 VES STK R3 M0010 FH

Lab Sample ID: 140-16057-9

Date Collected: 07/17/19 00:00
Date Received: 07/17/19 20:00
Sample Container: Air Train

Matrix: Air

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.28		0.101	0.0109	ug/Sample		07/22/19 16:15	07/25/19 13:50	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	92		50 - 200	07/22/19 16:15	07/25/19 13:50	1

Client Sample ID: R-2321,2322,2324 VES STK R3 M0010 BH

Lab Sample ID: 140-16057-10

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.464		0.225	0.0450	ug/Sample		07/22/19 12:45	07/26/19 13:38	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*88*		*50 - 200*	*07/22/19 12:45*	*07/26/19 13:38*	*1*

Client Sample ID: R-2323 VES STK R3 M0010 IMP 1,2&3 CONDENSATE

Lab Sample ID: 140-16057-11

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.212	J	0.224	0.0114	ug/Sample		07/23/19 09:00	07/25/19 12:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*85*		*50 - 200*	*07/23/19 09:00*	*07/25/19 12:57*	*1*

Client Sample ID: R-2325 VES STK R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

Lab Sample ID: 140-16057-12

Date Collected: 07/17/19 00:00
Matrix: Air
Date Received: 07/17/19 20:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.200	0.0400	ug/Sample		07/22/19 12:45	07/26/19 13:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*63*		*50 - 200*	*07/22/19 12:45*	*07/26/19 13:41*	*1*

APPENDIX D
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 1 | **Test Date: 07/16/19**
Test Location: VES CBed Inlet | **Test Period: 1605-1841**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{47.4 \times 2.2046 \times 10\text{-}9}{48.469}$$

Conc1 = 2.15E-09

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 = 47.4 / (48.469 x 0.02832)

Conc2 = 34.5

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

$MR1_{(Inlet)}$ = 2.15E-09 x 25641 x 60

$MR1_{(Inlet)}$ = 3.31E-03

Where:

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

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

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

$MR2_{(Inlet)}$ = 3.31E-03 x 453.59 /3600

$MR2_{(Inlet)}$ = 4.17E-04

Where:

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

453.59 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

5. HFPO Dimer Acid Removal Efficiency, %

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

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

RE = 99.6

Where:

RE = Carbon Bed Removal Efficiency.

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

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

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 1	Test Date: 07/16/19
Test Location: VES-Carbon Bed Inlet	Test Period: 1605-1841

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

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

$$Vm(std) = \frac{17.64 \times 1.0066 \times 50.909 \times \left(30.06 + \frac{0.966}{13.6} \right)}{101.96 + 460} = 48.469$$

Where:

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

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

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

$$Vw(std) = (0.04707 \times 12.0) + (0.04715 \times 17.5) = 1.39$$

Where:

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

3. Moisture content

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

$$bws = \frac{1.39}{1.39 + 48.469} = 0.028$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.028 = 0.972$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

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

$$MWd = 28.84$$

Where:

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

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

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

$$MWs = (28.84 \times 0.972) +(18 (1 - 0.972)) = 28.53$$

Where:

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

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

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

$$Vs = 85.49 \times 0.84 \times 1.13927 \times \left(\frac{560}{29.66 \times 28.53} \right)^{\wedge}1/2 = 66.5$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

Cp = Pitot tube coefficient, dimensionless.

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

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

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

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

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

$$Qs(act) = 60 \times 66.5 \times 7.07 = 28214$$

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.

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

$$Qs(std) = 17.64 \times 0.972 \times \frac{29.66}{559.6} \times 28214$$

$$Qs(std) = 25641$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 560 \times 48.469}{66.5 \times 96 \times 29.66 \times 0.972 \times (0.160)^{\wedge}2} = 99.7$$

Where:

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

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 1 | **Test Date: 07/16/19**
Test Location: VES CBed Outlet | **Test Period: 1605-1841**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{8.0 \times 2.2046 \times 10\text{-}9}{55.427}$$

Conc1 = 3.18E-10

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 = 8.0 / (55.427 x 0.02832)

Conc2 = 5.1

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

$MR1_{(Inlet)}$ = 3.18E-10 x 25043 x 60

$MR1_{(Inlet)}$ = 4.78E-04

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

$MR2_{(Inlet)}$ = 4.78E-04 x 453.59 /3600

$MR2_{(Inlet)}$ = 6.01E-05

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, %

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

$$RE = \frac{(3.31E\text{-}03) - (4.78E\text{-}04)}{3.31E\text{-}03}$$

RE = 85.6

Where:

RE = Carbon Bed Removal Efficiency.

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

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

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 1	Test Date: 07/16/19
Test Location: VES-Carbon Bed Outlet	Test Period: 1605-1841

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

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

$$Vm(std) = \frac{17.64 \times 1.0069 \times 58.439 \times \left(30.06 + \frac{1.260}{13.6} \right)}{104.67 + 460} = 55.427$$

Where:

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

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

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

$$Vw(std) = (0.04707 \times 20.0) + (0.04715 \times 14.0) = 1.60$$

Where:

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

3. Moisture content

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

$$bws = \frac{1.60}{1.60 + 55.427} = 0.028$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.028 = 0.972$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

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

$$MWd = 28.84$$

Where:

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

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

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

$$MWs = (28.84 \times 0.972) +(18 (1 - 0.972)) = 28.53$$

Where:

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

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

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

$$Vs = 85.49 \times 0.84 \times 0.83005 \times \left(\frac{560}{30.24 \times 28.53} \right)^{\wedge}1/2 = 48.0$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

Cp = Pitot tube coefficient, dimensionless.

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

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

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

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

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

$$Qs(act) = 60 \times 48.0 \times 9.39 = 27061$$

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.

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

$$Qs(std) = 17.64 \times 0.972 \times \frac{30.24}{560.2} \times 27061$$

$$Qs(std) = 25043$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 560 \times 55.427}{48.0 \times 96 \times 30.24 \times 0.972 \times (0.202)^{\wedge}2} = 97.3$$

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 | **Plant: Fayetteville, NC**
Test Number: Run 3 | **Test Date: 07/17/19**
Test Location: VE South Stack | **Test Period: 1250-1502**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{2.0 \times 2.2046 \times 10\text{-}9}{47.822}$$

Conc1 = 9.02E-11

Where:

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

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

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

2. HFPO Dimer Acid concentration, ug/dscm.

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

Conc2 = 2.0 / (47.822 x 0.02832)

Conc2 = 1.44

Where:

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

0.02832 = Conversion factor from cubic feet to cubic meters.

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

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

$MR1_{(Outlet)}$ = 9.02E-11 x 23134 x 60

$MR1_{(Outlet)}$ = 1.25E-04

Where:

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

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

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

$MR2_{(Outlet)}$ = 1.25E-04 x 453.59 /3600

$MR2_{(Outlet)}$ = 1.58E-05

Where:

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

453.6 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

EXAMPLE CALCULATIONS FOR
VOLUMETRIC FLOW AND MOISTURE AND ISOKINETICS

Client: Chemours	Facility: Fayetteville, NC
Test Number: Run 3	Test Date: 07/17/19
Test Location: VE South Stack	Test Period: 1250-1502

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

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

$$Vm(std) = \frac{17.64 \times 1.0008 \times 50.263 \times \left(30.07 + \frac{0.764}{13.6} \right)}{99.00 + 460} = 47.822$$

Where:

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

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

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

$$Vw(std) = (0.04707 \times 29.0) + (0.04715 \times 12.9) = 1.97$$

Where:

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

3. Moisture content

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

$$bws = \frac{1.97}{1.97 + 47.822} = 0.040$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.040 = 0.960$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

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

$$MWd = 28.84$$

Where:

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

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

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

$$MWs = (28.84 \times 0.960) +(18 (1 - 0.960)) = 28.41$$

Where:

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

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

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

$$Vs = 85.49 \times 0.84 \times 0.75569 \times \left(\frac{560}{30.25 \times 28.41} \right)^{\wedge}1/2 = 43.8$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

Cp = Pitot tube coefficient, dimensionless.

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

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

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

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

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

$$Qs(act) = 60 \times 43.8 \times 9.62 = 25293$$

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.

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

$$Qs(std) = 17.64 \times 0.960 \times \frac{30.25}{560.4} \times 25293$$

$$Qs(std) = 23134$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 560 \times 47.822}{43.8 \times 96 \times 30.25 \times 0.960 \times (0.190)^{\wedge}2} = 105.2$$

Where:

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

APPENDIX E
EQUIPMENT CALIBRATION RECORDS

INTERFERENCE CHECK

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

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

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

Chad Walker

INTERFERENCE CHECK

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

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

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

Chad Walker

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	160-401424145-1
Cylinder Number:	ALM053372	Cylinder Volume:	150.5 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12019	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Feb 26, 2019

Expiration Date: Feb 26, 2027

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	9.000 %	9.020 %	G1	+/- 0.6% NIST Traceable	02/26/2019
OXYGEN	12.00 %	12.07 %	G1	+/- 0.3% NIST Traceable	02/26/2019
NITROGEN	Balance			-	

CALIBRATION STANDARDS

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

ANALYTICAL EQUIPMENT

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

Triad Data Available Upon Request

Signature on file
Approved for Release

Airgas
an Air Liquide company

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI62E15A0224	Reference Number:	82-401196512-1
Cylinder Number:	CC112489	Cylinder Volume:	157.2 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	May 12, 2018

Expiration Date: May 12, 2026

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	17.00 %	17.05 %	G1	+/- 0.7% NIST Traceable	05/12/2018
OXYGEN	21.00 %	20.98 %	G1	+/- 0.5% NIST Traceable	05/12/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060731	CC413777	16.939 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 08, 2019
NTRM	09061420	CC273671	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

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

Triad Data Available Upon Request

Signature on file
Approved for Release

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

Calibrator MDW | **Meter Box Number** 31 | **Ambient Temp** 72

Date 12-Feb-19 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 17485128

Baro Press, in Hg (Pb)	29.75

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	616.970	72.0	76.00	76.00	76.5	12.8	1.0092	1.8419
		621.960		77.00	77.00				
		4.990		76.50	76.50				
1.0	5.0	623.935	72.0	77.00	77.00	77.0	9.3	1.0079	1.9429
		628.930		77.00	77.00				
		4.995		77.00	77.00				
1.5	10.0	629.910	72.0	77.00	77.00	77.0	15.3	1.0067	1.9719
		639.900		77.00	77.00				
		9.990		77.00	77.00				
2.0	10.0	640.885	72.0	77.00	77.00	77.0	13.3	1.0054	1.9868
		650.875		77.00	77.00				
		9.990		77.00	77.00				
3.0	10.0	651.915	70.0	78.00	78.00	78.0	11.0	1.0036	2.0195
		661.955		78.00	78.00				
		10.040		78.00	78.00				
							Average	**1.0066**	**1.9526**

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 %

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

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN
VES CARBON BED INLET
METER BOX NO. 31
07/16/19 and 07/17/19

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

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

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

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

MWd =	28.84	28.84	28.84

Tma = Source Temperature, absolute(^{o}R)			
Tm = Average dry gas meter temperature , deg F.	102.0	93.6	102.8

$$Tma = Ts + 460$$

$$Tma = 101.96 + 460$$

Tma =	561.96	553.58	562.75

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	0.97	1.00	1.02
Pb = Barometric Pressure, in Hg.	30.06	30.09	30.06

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

$$Pm = 30.06 + (0.96625 / 13.6)$$

Pm =	30.13	30.16	30.13

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.	50.909	51.412	51.767
Y = Dry gas meter calibration factor (based on full calibration)	1.0066	1.0066	1.0066
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.9530	1.9530	1.9530
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.9656	0.9758	0.9859
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 50.91) * SQRT (0.0319 * 561.96 * 29) / (1.95 * 30.13 * 28.84) * 0.97$$

$$Yqa = 1.886 * SQRT\ 519.868 / 1{,}696.822 * 0.97$$

Yqa =	1.008	1.000	1.013

Diff = Absolute difference between Yqa and Y	0.14	0.66	0.64

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

$$Diff = ((1.0066 - 1.008) / 1.0066) * 100$$

Average Diff = 0.48

Allowable = 5.0

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

Calibrator MDW | **Meter Box Number** 12 | **Ambient Temp** 72

Date 10-Sep-18 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 14244707

Baro Press, in Hg (Pb)	29.96

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)	Time, min (O)	Y	ΔH
0.5	5.0	885.853	73.0	75.00	12.60	1.0097	1.7823
		890.822		76.00			
		4.969		75.50			
1.0	5.0	892.810	73.0	76.00	9.1	1.0071	1.8559
		897.795		77.00			
		4.985		76.50			
1.5	10.0	898.799	73.0	77.00	15.20	1.0036	1.9381
		908.810		78.00			
		10.011		77.50			
2.0	10.0	915.870	73.0	78.00	13.1	1.0094	1.9158
		925.830		79.00			
		9.960		78.50			
3.0	10.0	926.870	73.0	79.00	10.70	1.0048	1.9137
		936.870		80.00			
		10.000		79.50			
						1.0069	**1.8812**

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	32.0	0.0%
212	212	212	212	212	212	212	212.0	0.0%
932	932	932	932	932	932	932	932.0	0.0%
1832	1834	1834	1834	1834	1834	1834	1834.0	-0.1%

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

2 - Acceptable Temperature Difference less than 1.5 %

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

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN
VES CARBON BED OUTLET
METER BOX NO. 12
07/16/19 and 07/17/19

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

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

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

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

MWd =	28.84	28.84	28.84

Tma = Source Temperature, absolute(^{o}R)			
Tm = Average dry gas meter temperature , deg F.	104.7	96.0	107.1

$$Tma = Ts + 460$$

$$Tma = 104.67 + 460$$

Tma =	564.67	556.04	567.13

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	1.26	1.31	1.32
Pb = Barometric Pressure, in Hg.	30.06	30.09	30.06

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

$$Pm = 30.06 + (1.26 / 13.6)$$

Pm =	30.15	30.19	30.16

Yqa = dry gas meter calibration check value, dimensionless.			
0.03 = (29.92/528)(0.75)2 (in. Hg/°/R) cfm2.			
29.00 = dry molecular weight of air, lb/lb-mole.			
Vm = Volume of gas sample measured by the dry gas meter at meter conditions, dcf.	58.439	58.943	59.828
Y = Dry gas meter calibration factor (based on full calibration)	1.0069	1.0069	1.0069
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.8812	1.8812	1.8812
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.1102	1.1322	1.1367
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 58.44) * SQRT (0.0319 * 564.67 * 29) / (1.88 * 30.15 * 28.84) * 1.11$$

$$Yqa = 1.643 * SQRT\ 522.373 / 1{,}635.525 * 1.11$$

Yqa =	1.031	1.033	1.033

Diff = Absolute difference between Yqa and Y	2.39	2.59	2.59

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

$$Diff = ((1.0069 - 1.031) / 1.0069) * 100$$

Average Diff = 2.52

Allowable = 5.0

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

Calibrator MDW | **Meter Box Number** 27 | **Ambient Temp** 72

Date 12-Jul-19 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 16787479

Baro Press, in Hg (Pb)	29.76

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	449.945	72.0	76.00	76.00	76.0	12.8	1.0035	1.8430
		454.959		76.00	76.00				
		5.014		76.00	76.00				
1.0	5.0	456.064	72.0	76.00	76.00	76.0	9.0	0.9998	1.8223
		461.090		76.00	76.00				
		5.026		76.00	76.00				
1.5	10.0	462.195	72.0	76.00	76.00	76.0	15.1	1.0033	1.9237
		472.200		76.00	76.00				
		10.005		76.00	76.00				
2.0	10.0	474.425	72.0	77.00	77.00	77.0	13.0	1.0044	1.8975
		484.425		77.00	77.00				
		10.000		77.00	77.00				
3.0	10.0	486.010	72.0	77.00	77.00	77.0	10.7	0.9930	1.9283
		496.100		77.00	77.00				
		10.090		77.00	77.00				
							Average	**1.0008**	**1.8830**

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	31	31		31.6	0.1%
212	212	212	212	211	211		211.6	0.1%
932	932	932	932	931	931		931.6	0.0%
1832	1831	1831	1831	1830	1830		1830.6	0.1%

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

2 - Acceptable Temperature Difference less than 1.5 %

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

Y Factor Calibration Check Calculation

MODIFIED METHOD 0010 TEST TRAIN

VE SOUTH STACK

METER BOX NO. 27

07/16/2019 & 07/17/2019

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

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

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

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

MWd =	28.84	28.84	28.84

Tma = Source Temperature, absolute(^{o}R)			
Tm = Average dry gas meter temperature , deg F.	98.5	87.9	99.0

$$Tma = Ts + 460$$

$$Tma = 98.46 + 460$$

Tma =	558.46	547.88	559.00

Ps = Absolute meter pressure, inches Hg.			
13.60 = Specific gravity of mercury.			
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	0.79	0.79	0.76
Pb = Barometric Pressure, in Hg.	30.00	30.07	30.07

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

$$Pm = 30 + (0.785416666666667 / 13.6)$$

Pm =	30.06	30.13	30.13

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.	50.910	49.525	50.263
Y = Dry gas meter calibration factor (based on full calibration)	1.0008	1.0008	1.0008
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.8330	1.8330	1.8330
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	0.8852	0.8859	0.8737
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 50.91) * SQRT (0.0319 * 558.46 * 29) / (1.83 * 30.06 * 28.84) * 0.89$$

$$Yqa = 1.886 * SQRT\ 516.630 / 1,588.863 * 0.89$$

Yqa =	0.9518	0.9688	0.9509

Diff = Absolute difference between Yqa and Y	4.90	3.20	4.99

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

$$Diff = ((1.0008 - 0.952) / 1.0008) * 100$$

Average Diff = 4.36

Allowable = 5.0

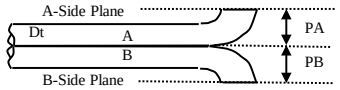
Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection KS

If all Criteria PASS
Cp is equal to 0.84

PASS/FAIL



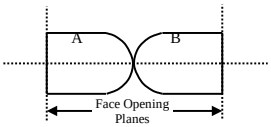
Distance to A Plane (PA) - inches 0.45 PASS

Distance to B Plane (PB) - inches 0.45 PASS

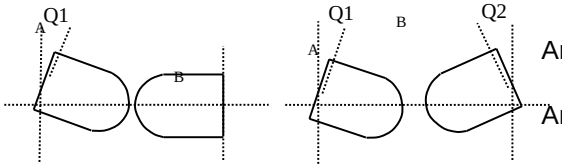
Pitot OD (D_t) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



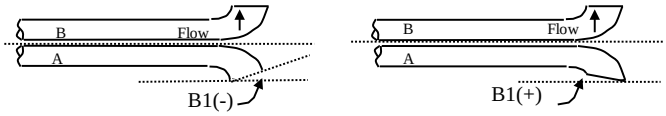
Are Open Faces Aligned Perpendicular to the Tube Axis (●) YES ( ) NO PASS



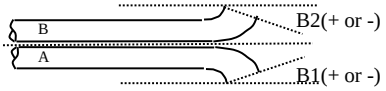
Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS

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

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



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

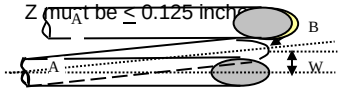


Angle of B1 from vertical B Tube- degrees (absolute) 0 PASS

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

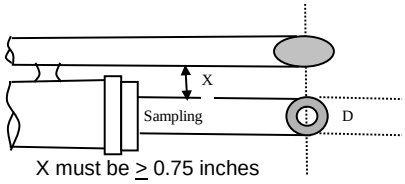
Horizontal offset between A and B Tubes (Z) - inches 0.006 PASS

Z must be $\leq$ 0.125 inches



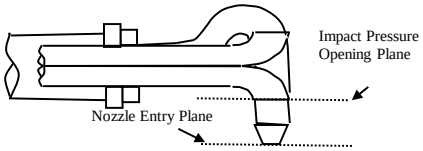
Vertical offset between A and B Tubes (W) - inches 0.012 PASS

W must be $\leq$ 0.03125 inches

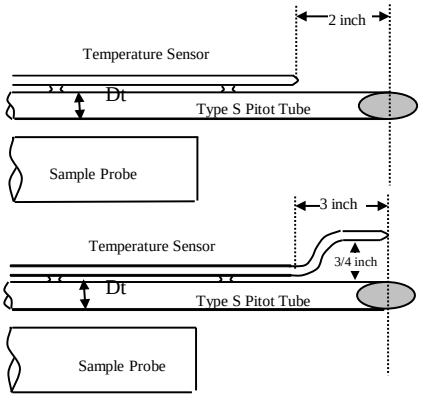


Distance between Sample Nozzle and Pitot (X) - inches 0.79 PASS

X must be $\geq$ 0.75 inches



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



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

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

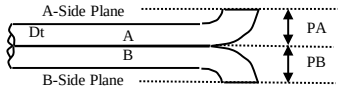
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-376**

Inspection Date 2/19/18 Individual Conducting Inspection KS

If all Criteria PASS
Cp is equal to 0.84

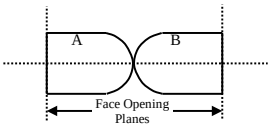
PASS/FAIL



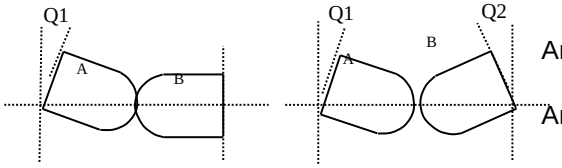
Distance to A Plane (PA) - inches 0.417 PASS
Distance to B Plane (PB) - inches 0.417 PASS
Pitot OD (D_t) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

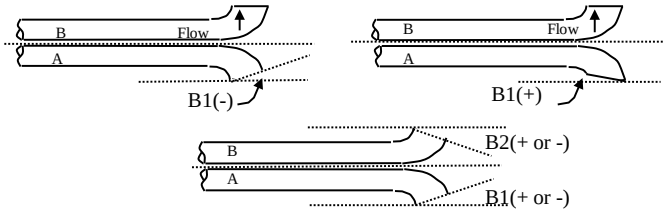


Are Open Faces Aligned Perpendicular to the Tube Axis (●) YES ( ) NO PASS



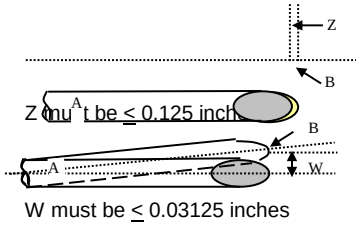
Angle of Q1 from vertical A Tube- degrees (absolute) 2 PASS
Angle of Q2 from vertical B Tube- degrees (absolute) 1 PASS

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



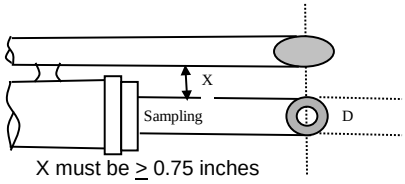
Angle of B1 from vertical A Tube- degrees (absolute) 2 PASS
Angle of B1 from vertical B Tube- degrees (absolute) 2 PASS

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



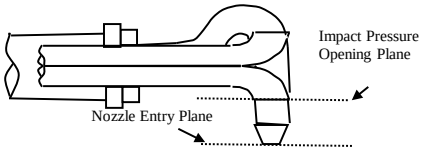
Horizontal offset between A and B Tubes (Z) - inches 0.028 PASS
Vertical offset between A and B Tubes (W) - inches 0.012 PASS

W must be ≤ 0.03125 inches

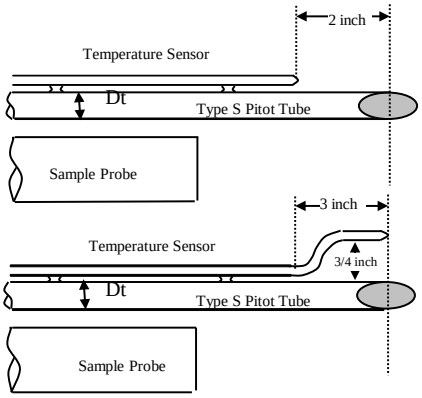


Distance between Sample Nozzle and Pitot (X) - inches 0.984 PASS

X must be ≥ 0.75 inches



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



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

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

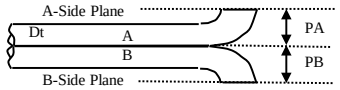
Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection ks

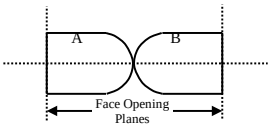
If all Criteria PASS
Cp is equal to 0.84

		PASS/FAIL
Distance to A Plane (PA) - inches	0.459	PASS
Distance to B Plane (PB) - inches	0.459	PASS
Pitot OD (D_t) - inches	0.375	

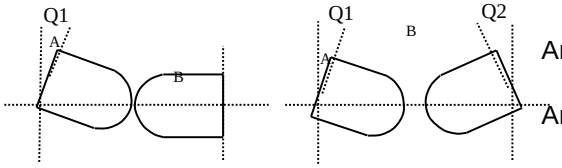


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

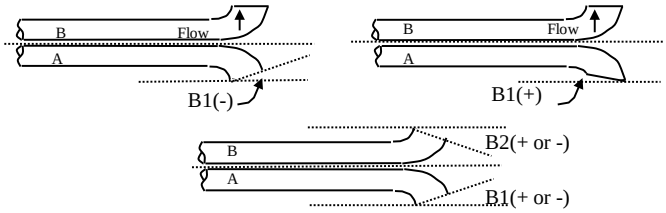


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



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

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

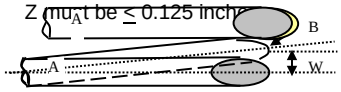


Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

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

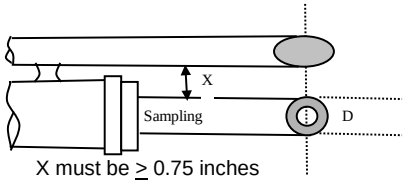
Horizontal offset between A and B Tubes (Z) - inches	0.003	PASS

Z must be $\leq$ 0.125 inches



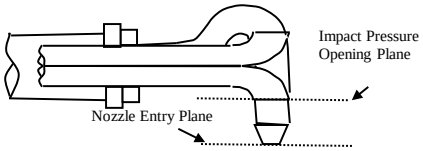
Vertical offset between A and B Tubes (W) - inches	0.012	PASS

W must be $\leq$ 0.03125 inches

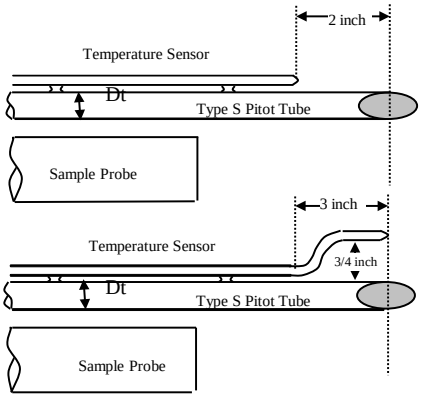


Distance between Sample Nozzle and Pitot (X) - inches	0.93	PASS

X must be $\geq$ 0.75 inches



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



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

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

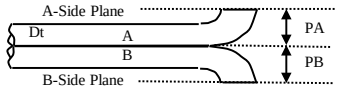
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-695**

Inspection Date 2/19/19 Individual Conducting Inspection ks

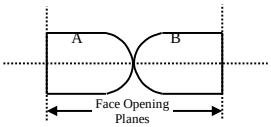
If all Criteria PASS
Cp is equal to 0.84

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

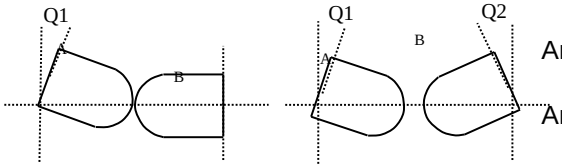


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



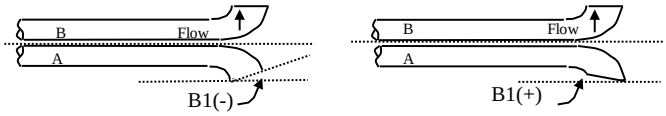
Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



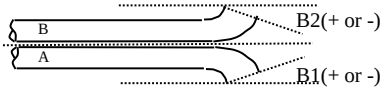
Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS

Angle of Q2 from vertical B Tube- degrees (absolute) 1 PASS

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



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

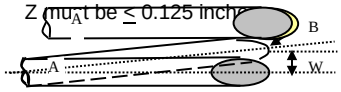


Angle of B1 from vertical B Tube- degrees (absolute) 0 PASS

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

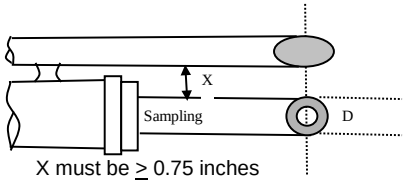
Horizontal offset between A and B Tubes (Z) - inches 0.006 PASS

Z must be $\leq$ 0.125 inches



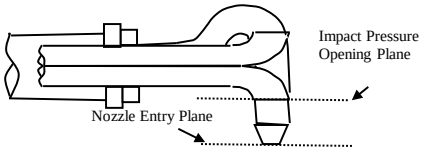
Vertical offset between A and B Tubes (W) - inches 0.018 PASS

W must be $\leq$ 0.03125 inches

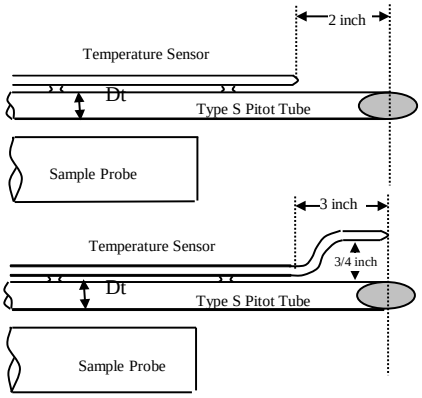


Distance between Sample Nozzle and Pitot (X) - inches 0.78 PASS

X must be $\geq$ 0.75 inches



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



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

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

APPENDIX F
LIST OF PROJECT PARTICIPANTS

The following WESTON employees participated in this project.

Paul Meeter	Senior Project Manager
Jeff O'Neill	Team Member
Matt Winkeler	Team Member
Nick Guarino	Team Member
Kris Ansley	Team Member
Paul Greene	Team Member
Steve Rathfon	Team Member
Jack Mills	Team Member
Colin Mihalak	Team Member