IXM MANUFACTURING PROCESS
E2 STACK EMISSIONS TEST REPORT
TEST DATES: 4-5 DECEMBER 2019

THE CHEMOURS COMPANY
FAYETTEVILLE, NORTH CAROLINA

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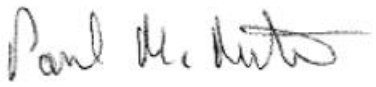
Weston Solutions, Inc. (WESTON®) is a commercial laboratory operating within full accreditation of the Louisiana Environmental Laboratory Accreditation Program under Certificate Number 03024. The qualifications to provide defensible quality data as a certified commercial environmental testing firm as Agency Interest No. 30815 was granted by the Louisiana Department of Environmental Quality under the Louisiana Administrative Code of LAC 33.1 Chapter 45 et al.

I certify that I have personally examined and am familiar with the information contained herein. Based on my information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.



Paul M. Meeter
Weston Solutions, Inc.

TABLE OF CONTENTS

Section **Page**

LIST OF FIGURES

Title **Page**

LIST OF TABLES

Title **Page**

1. INTRODUCTION

1.1 FACILITY AND BACKGROUND INFORMATION

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

Chemours contracted Weston Solutions, Inc. (Weston) to perform HFPO Dimer Acid Fluoride, captured as HFPO Dimer Acid, emission testing on the E2 stack at the facility. Testing was performed on 4-5 December 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 E2 stack which is located in the IXM process area.
- 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 the test location.

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

Section 2 provides a summary of test results. A description of the processes is provided in Section 3. Section 4 provides a description of the test locations. The sampling and analytical

procedures are provided in Section 5. Detailed test results and discussion are provided in Section 6.

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

Table 1-1
Sampling Plan for E2 Stack

Sampling Point & Location	**E2 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]	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]	0 set	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	6[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 were performed on the E2 stack. Table 2-1 provides a summary of the HFPO Dimer Acid emissions test results. Detailed test results summaries are provided in Section 6.

It is important to note that emphasis is being placed on the characterization of the emissions based on the stack test results. Research conducted in developing the protocol for stack testing HFPO Dimer Acid Fluoride, HFPO Dimer Acid Ammonium Salt and HFPO Dimer Acid realized that the resulting testing, including collection of the air samples and extraction of the various fraction of the sampling train, would result in all three compounds being expressed as simply the HFPO Dimer Acid. However, it should be understood that the total HFPO Dimer Acid results provided 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 E2 Stack Test Results

	E2 Stack	
	g/sec	**lb/hr**
R1	1.11E-05	8.80E-05
R2	1.34E-06	1.06E-05
R3	2.00E-06	1.59E-05
Average	4.81E-06	3.82E-05

3. PROCESS DESCRIPTIONS

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

3.1 E-2

Freon E-2® is a compound used in Nafion™ polymerization processes to promote heat dissipation.

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
E2 Stack	E-2	Batch

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

- IXM Process
  - E2 Reactor
  - Decanting
  - Drying

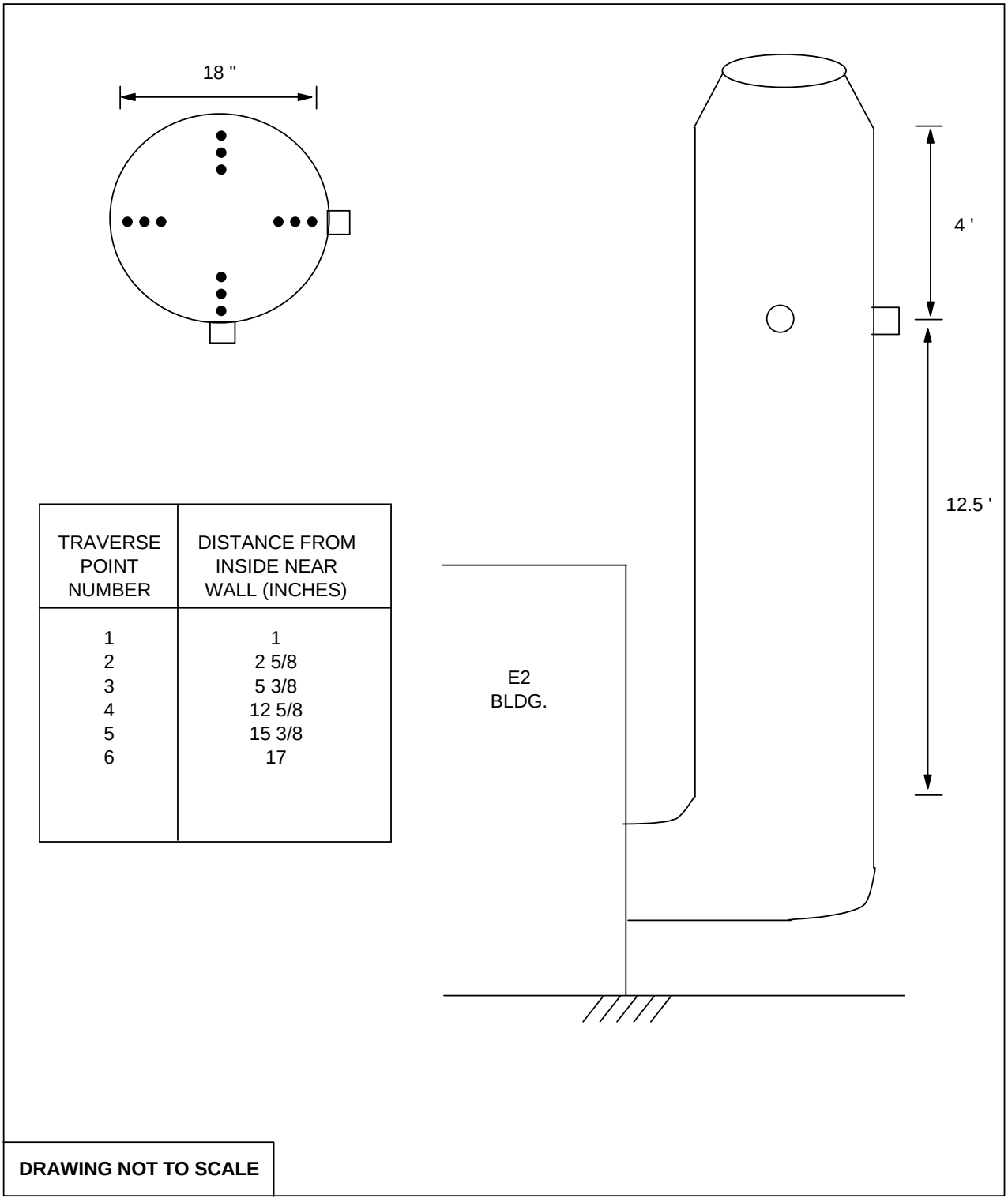
4. DESCRIPTION OF TEST LOCATIONS

4.1 E2 STACK

Two 3-inch ID test ports were installed on the 18-inch ID steel stack as shown below.

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

Location	Distance from Flow Disturbance	
	Downstream (B)	Upstream (A)
E2 Stack	12.5 feet > 8 duct diameters	4 feet > 2.6 diameters



TRAVERSE POINT NUMBER	DISTANCE FROM INSIDE NEAR WALL (INCHES)
1	1
2	2 5/8
3	5 3/8
4	12 5/8
5	15 3/8
6	17

FIGURE 4-1
E2 STACK
TEST PORT AND TRAVERSE POINT LOCATION

IASDATA\CHEMOURS\15418.002.018\FIGURE 4-1 E2 STACK

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

A check for the presence or absence of cyclonic flow was conducted at the test location. The cyclonic flow check was negative (< 20°) verifying that the test location was 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 the location was an EPA Method 0010 train (see Figure 5-1). The Method 0010 consisted of a borosilicate nozzle that attached directly to a heated borosilicate probe. In order to minimize possible thermal degradation of the HFPO Dimer Acid, the probe and particulate filter were heated above stack temperature to minimize water vapor condensation before the filter. The probe was connected directly to a heated borosilicate filter holder containing a solvent extracted glass fiber filter.

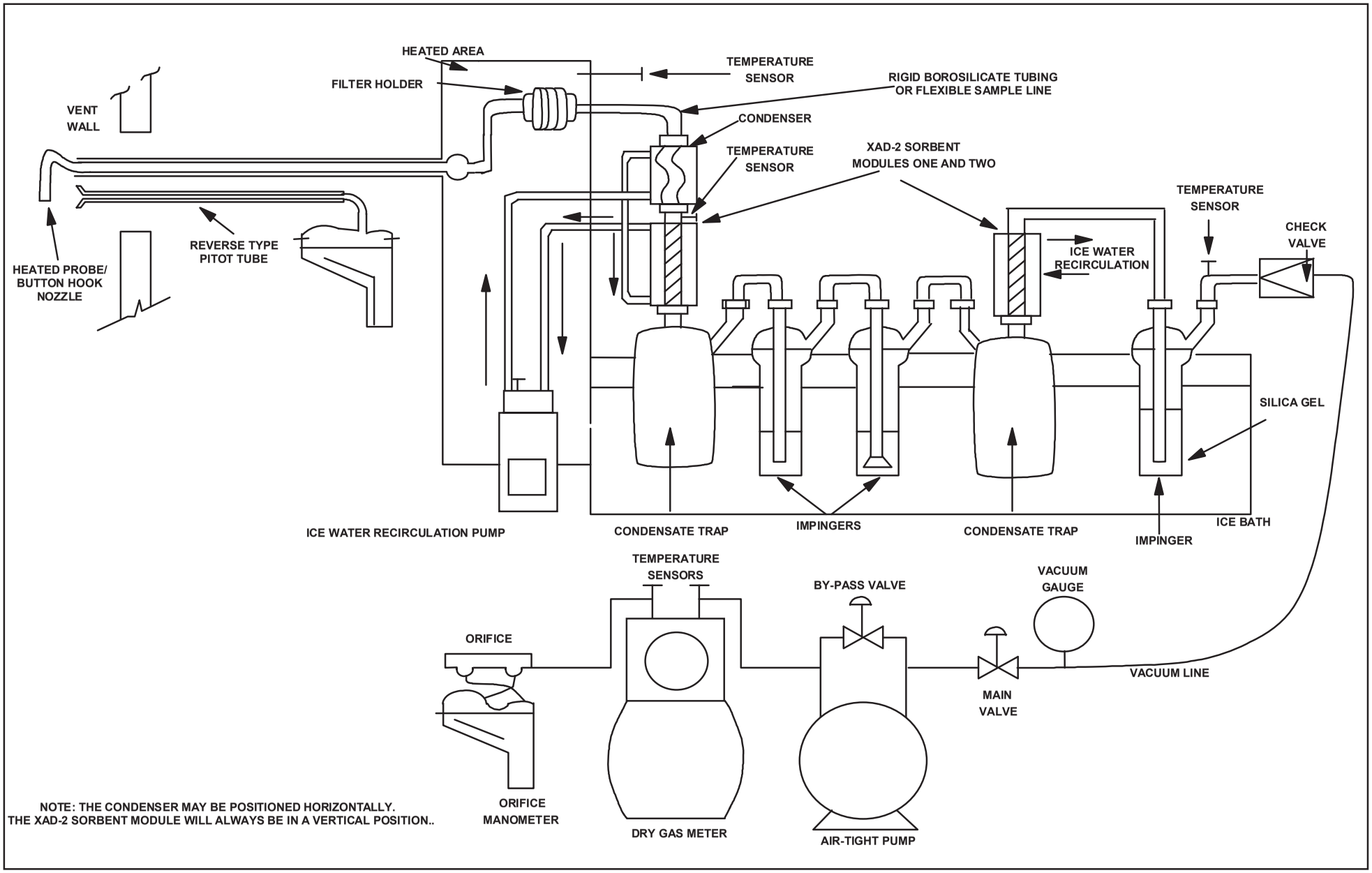


FIGURE 5-1
EPA METHOD 0010 SAMPLING TRAIN

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

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

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

5.2.2 EPA Method 0010 Sample Recovery

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

A consistent procedure was employed for sample recovery:

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

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

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

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

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

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

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

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

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

Each container was labeled to clearly identify its contents. All samples were maintained cool. 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.

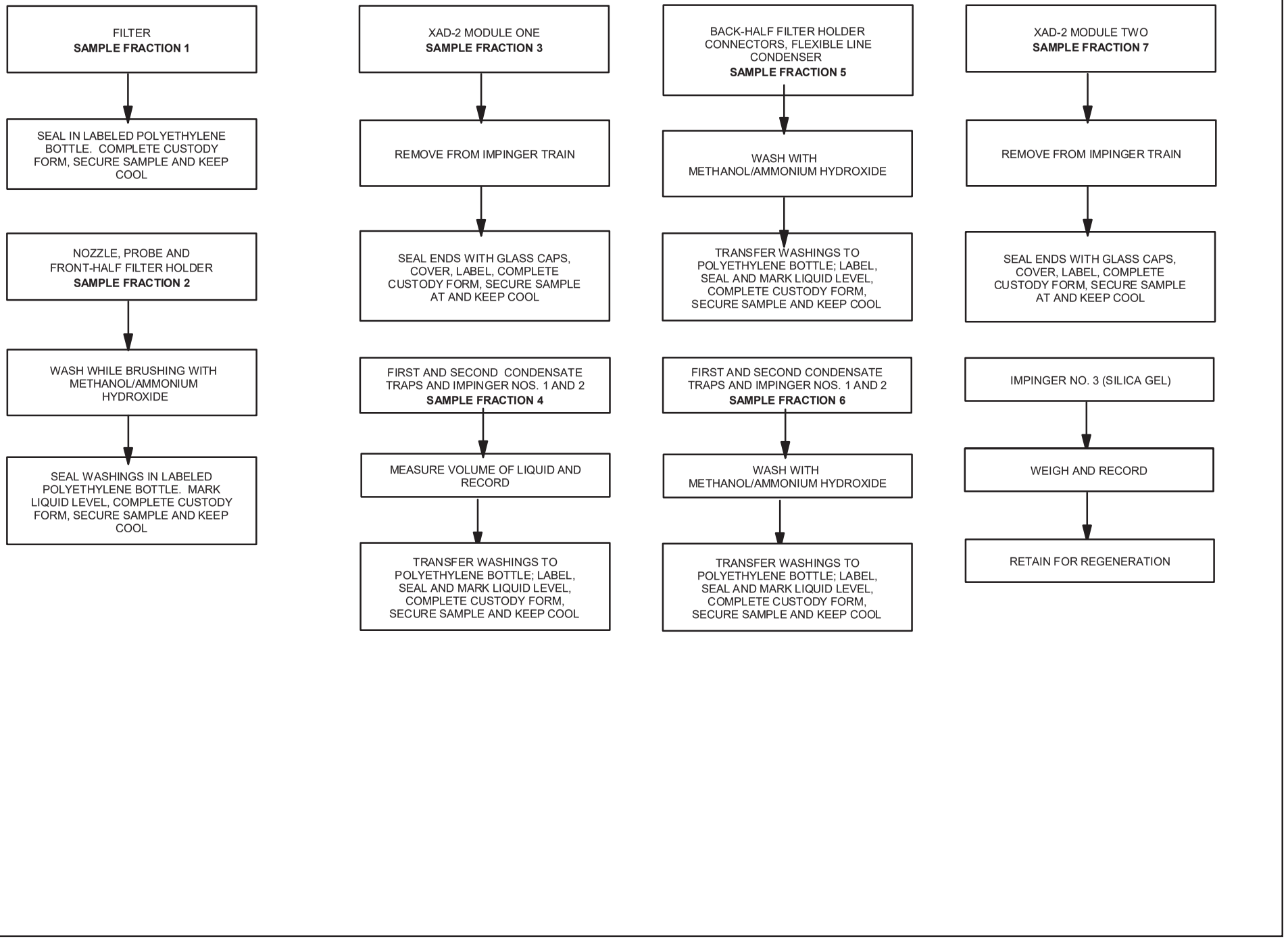


FIGURE 5-2
HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010

IASDATA\CHEMOURS\15418.002.018\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.

For the E2 stack test campaign, the sample bag was collected at the exhaust of the Method 0010 sampling system.

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 oxygen and carbon dioxide content of the 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.

6. DETAILED TEST RESULTS AND DISCUSSION

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

Table 6-1 provides detailed test data and test results for E2 stack.

The Method 3/3A sampling 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
E2 STACK

Test Data			
Run number	1	2	3
Location	E2 Stack	E2 Stack	E2 Stack
Date	12/04/19	12/05/19	12/05/19
Time period	1416-1556	0817-0959	1025-1207
SAMPLING DATA:			
Sampling duration, min.	96.0	96.0	96.0
Nozzle diameter, in.	0.280	0.280	0.280
Cross sectional nozzle area, sq.ft.	0.000428	0.000428	0.000428
Barometric pressure, in. Hg	29.70	30.07	30.07
Avg. orifice press. diff., in H_2O	1.66	1.47	1.83
Avg. dry gas meter temp., deg F	61.6	51.6	65.8
Avg. abs. dry gas meter temp., deg. R	522	512	526
Total liquid collected by train, ml	20.3	33.6	23.6
Std. vol. of H_2O vapor coll., cu.ft.	1.0	1.6	1.11
Dry gas meter calibration factor	0.9972	0.9972	0.9972
Sample vol. at meter cond., dcf	68.630	63.724	71.248
Sample vol. at std. cond., dscf [(1)]	69.025	66.123	71.992
Percent of isokinetic sampling	101.5	102.4	99.5
GAS STREAM COMPOSITION DATA:			
CO_2, % by volume, dry basis	0.2	0.2	0.2
O_2, % by volume, dry basis	20.9	20.8	20.8
N_2, % by volume, dry basis	78.9	79.0	79.0
Molecular wt. of dry gas, lb/lb mole	28.87	28.86	28.86
H_20 vapor in gas stream, prop. by vol.	0.014	0.023	0.015
Mole fraction of dry gas	0.986	0.977	0.985
Molecular wt. of wet gas, lb/lb mole	28.72	28.61	28.70
GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:			
Static pressure, in. H_2O	0.10	0.30	0.36
Absolute pressure, in. Hg	29.71	30.09	30.10
Avg. temperature, deg. F	66	51	59
Avg. absolute temperature, deg.R	526	511	519
Pitot tube coefficient	0.84	0.84	0.84
Total number of traverse points	12	12	12
Avg. gas stream velocity, ft./sec.	28.1	25.9	29.2
Stack/duct cross sectional area, sq.ft.	1.76	1.76	1.76
Avg. gas stream volumetric flow, wacf/min.	2969	2731	3079
Avg. gas stream volumetric flow, dscf/min.	2916	2770	3101

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

TABLE 6-1 (cont.)
CHEMOURS - FAYETTEVILLE, NC
SUMMARY OF HFPO DIMER ACID TEST DATA AND TEST RESULTS
E2 STACK

TEST DATA			
Run number	1	2	3
Location	E2 Stack	E2 Stack	E2 Stack
Date	12/04/19	12/05/19	12/05/19
Time period	1416-1556	0817-0959	1025-1207
LABORATORY REPORT DATA, ug.			
HFPO Dimer Acid	15.75	1.92	2.79
EMISSION RESULTS, ug/dscm.			
HFPO Dimer Acid	8.05	1.02	1.37
EMISSION RESULTS, lb/dscf.			
HFPO Dimer Acid	5.03E-10	6.39E-11	8.53E-11
EMISSION RESULTS, lb/hr.			
HFPO Dimer Acid	8.80E-05	1.06E-05	1.59E-05
EMISSION RESULTS, g/sec.			
HFPO Dimer Acid	1.11E-05	1.34E-06	2.00E-06

APPENDIX A
PROCESS OPERATIONS DATA

E2 Stack

Date: 12/4/19

Time	1400		1500		1600			
Stack Testing		RUN 1 - 1416-1556						
		E2 Reactor Cook Step						

Date: 12/5/19

Time	800		900		1000		1100		1200			
Stack Testing		RUN 2 - 0817-0959				RUN 3 - 1025-1207						
		Decanting	Drying			eeding Trim	Drying					

APPENDIX B
RAW AND REDUCED TEST DATA

Sample and Velocity Traverse Point Data Sheet - Method 1

Client Chemours
Loaction/Plant Fayetteville, NC
Source EZ

Operator KS
Date 12/3/19
W.O. Number 15418.002.018.0001

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	20
Port Depth (in.) = D	2
Depth of Duct, diameter (in.) = C-D	18
Area of Duct (ft^2)	1.76
Total Traverse Points	12
Total Traverse Points per Port	6
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)	

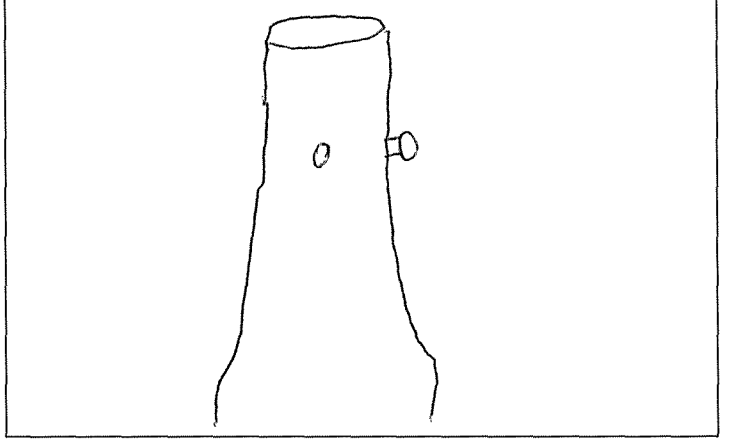
Traverse Point Locations

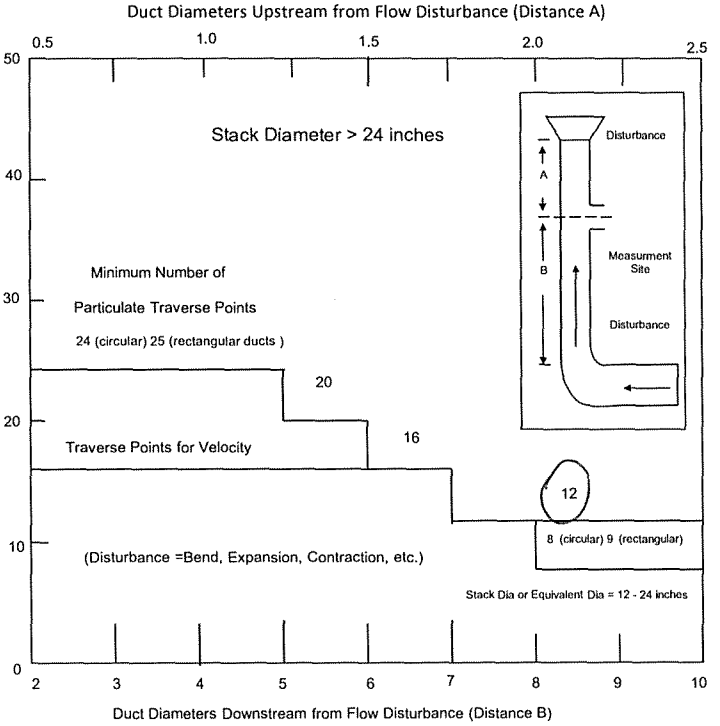
Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	4.4	1	3
2	14.6	2 5/8	4 5/8
3	29.6	5 3/8	7 3/8
4	70.4	12 5/8	14 5/8
5	85.4	15 3/8	17 5/8
6	95.6	17	19
7			
8			
9			
10			
11			
12			
CEM 3 Point(Long Measurment Line) Stratificaton Point Locations			
1	0.167		
2	0.50		
3	0.833		

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

Flow Disturbances	
Upstream - A (ft)	4
Downstream - B (ft)	12.5
Upstream - A (duct diameters)	2.6
Downstream - B (duct diameters)	8.3

Diagram of Stack





Traverse Point Location Percent of Stack -Circular

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

Traverse Point Location Percent of Stack -Rectangular

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

CHEMOURS - FAYETTEVILLE, NC
INPUTS FOR HFPO DIMER ACID CALCULATIONS
E2 STACK

Test Data			
Run number	1	2	3
Location	E2 Stack	E2 Stack	E2 Stack
Date	12/04/19	12/05/19	12/05/19
Time period	1416-1556	0817-0959	1025-1207
Operator	JV/BB/KS	JV/KS	JV/BB
Inputs For Calcs.			
Sq. rt. delta P	0.49854	0.46742	0.52373
Delta H	1.6579	1.4658	1.8342
Stack temp. (deg.F)	66.3	51.2	59.0
Meter temp. (deg.F)	61.6	51.6	65.8
Sample volume (act.)	68.630	63.724	71.248
Barometric press. (in.Hg)	29.70	30.07	30.07
Volume H_2O imp. (ml)	7.0	22.0	8.0
Weight change sil. gel (g)	13.3	11.6	15.6
% CO_2	0.2	0.2	0.2
% O_2	20.9	20.8	20.8
% N_2	78.9	79.0	79.0
Area of stack (sq.ft.)	1.760	1.760	1.760
Sample time (min.)	96.0	96.0	96.0
Static pressure (in.H_2O)	0.10	0.30	0.36
Nozzle dia. (in.)	0.280	0.280	0.280
Meter box cal.	0.9972	0.9972	0.9972
Cp of pitot tube	0.84	0.84	0.84
Traverse points	12	12	12

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

			Stack Conditions							
Client	Chemours		Assumed	Actual	Meter Box ID	30			K Factor JV 1.66667	
W.O.#	15418.002.018				Meter Box Y	0.9972 ✓			Initial	Mid-Point / Final
Project ID	Chemours	% Moisture	2		Meter Box Del H	1.6715				
Mode/Source ID	E2	Impinger Vol (ml)		7	Probe ID / Length	P108	4'	Sample Train (ft^3)	.001	.001
Samp. Loc. ID	STK	Silica gel (g)		13.3	Probe Material	Boro		Leak Check @ (in Hg)	15	8
Run No.ID	1	CO2, % by Vol	0.2	0.2	Pitot / Thermocouple ID	P108		Pitot leak check good	(yes) / no	yes / no (yes) / no
Test Method ID	M0010	O2, % by Vol	20.8	20.9	Pitot Coefficient	0.84 ✓		Pitot Inspection good	(yes) / no	yes / no (yes) / no
Date ID	NOV2019	Temperature (°F)	65		Nozzle ID	.280		Method 3 System good	yes / no	yes / no yes / no
Source/Location	E2 Stack	Meter Temp (°F)	65		Nozzle Measurements	.280	0.280	0.280	**Temp Check**	Pre-Test Set / Post-Test Set
Sample Date	12-4-19 ✓	Static Press (in H_2O)	0.1 ✓		Avg Nozzle Dia (in)	.280 ✓			Meter Box Temp	58 / 57
Baro. Press (in Hg)	29.70 ✓				Area of Stack (ft^2)	1.76 ✓			Reference Temp	59.2 / 58.6
Operator	JV/BB/KS ✓	Ambient Temp (°F)	59		Sample Time	96 ✓			Pass/Fail (+/- 2°)	(Pass) / Fail
					Total Traverse Pts	12 ✓			Temp Change Response ?	(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	1416 ✓			008.883									
B	4		.27	JV 1.80	012.1	66	60	109	111	53	6.5	60		34.424
	x 8		.27	1.80	015.1	66	60	109	112	51	6.5	59		
	12		.27	1.80	018.1	66	60	109	112	50	6.5	58		
	x 16		.28	1.86	021.0	66	60	109	113	50	6.5	58		
	20		.29	1.93	024.0	66	61	109	112	50	6.5	58		
	x 24		.27	1.80	027.0	66	61	109	113	49	6.5	57		
	28		.22	1.46	029.8	66	62	110	112	49	5.0	57		
	x 32		.24	1.60	032.5	66	62	109	111	49	5.5	57		
	36		.22	1.46	035.2	66	62	109	112	49	5.5	57		
	x 40		.22	1.46	037.9	66	62	110	112	49	5.5	57		
	44		.23	1.53	040.6	66	62	109	111	49	5.5	57		
	48	1505	.21	1.40	043.307	66	62	109	112	49	5.0	57		
		1508												
A	4		.26	1.73	46.1	67	62	110	112	52	6.0	60		
	x 8		0.26	1.73	49.0	67	62	109	110	48	6.0	57		
	12		.27	1.80	51.9	67	62	109	109	48	6.0	57		
	x 16		.28	1.86	054.9	67	62	109	113	48	6.5	57		
	20		.27	1.80	057.809	67	62	109	111	49	6.5	57		
	x 24		.28	1.86	060.9	67	62	109	115	48	6.5	56		
	28		.24	1.60	063.8	66	62	109	111	48	6.0	57		
	x 32		.23	1.53	066.5	66	62	110	113	49	5.5	58		
	36		.23	1.53	069.3	66	62	110	111	49	5.5	58		
	x 40		.22	1.46	072.0	66	62	110	114	49	5.5	58		
	44		.23	1.53	074.8	66	62	109	111	48	5.5	58		
	48	1556 ✓	.22	1.46	077.513	66	62	109	113	48	5.5	58		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			.2491 ✓	1.6579 ✓	68.63 ✓	66.25 ✓	61.58 ✓	109/110	109/115	53	6.5	56/60		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			.4985 ✓	1.2859 ✓										

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

OMM

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

Page 1 of ___

		Stack Conditions						
Client	Chemours		Assumed	Actual	Meter Box ID	30		
W.O.#	15418.002.018				Meter Box Y	0.9972 ✓		
Project ID	Chemours	% Moisture	2		Meter Box Del H	1.8715		
Mode/Source ID	E2	Impinger Vol (ml)		22	Probe ID / Length	P708	4'	Sample Train (ft³)
Samp. Loc. ID	STK	Silica gel (g)		11.6	Probe Material	Boro		Leak Check @ (in Hg)
Run No.ID	2	CO2, % by Vol	.2	.2	Pitot / Thermocouple ID	P708		Pitot leak check good
Test Method ID	M0010	O2, % by Vol	20.8	20.7	Pitot Coefficient	0.84		Pitot Inspection good
Date ID	NOV2019	Temperature (°F)	65		Nozzle ID	0.280		Method 3 System good
Source/Location	E2 Stack	Meter Temp (°F)	65		Nozzle Measurements	.280 / .280 / .280		**Temp Check**
Sample Date	12-5-19 ✓	Static Press (in H_2O)	0.1	0.30 ✓	Avg Nozzle Dia (in)	0.280 ✓		Meter Box Temp
Baro. Press (in Hg)	30.07 ✓				Area of Stack (ft²)	1.76 ✓		Reference Temp
Operator	JV / KS ✓	Ambient Temp (°F)	40		Sample Time	96 ✓		Pass/Fail (+/- 2°)
					Total Traverse Pts	12 ✓		Temp Change Response ?

K Factor 6.67

	Initial	Mid-Point	Final
Sample Train (ft³)	.001	.001	.001
Leak Check @ (in Hg)	15	9	7
Pitot leak check good	(yes) / no	(yes) / no	(yes) / no
Pitot Inspection good	(yes) / no	(yes) / no	(yes) / no
Method 3 System good	yes / no	yes / no	yes / no
Temp Check	Pre-Test Set		Post-Test Set
Meter Box Temp	44		46
Reference Temp	44.3		45.9
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	0817 ✓			077.939									
B	4		.27	1.80	80.9	47	40	109	118	43	7.0	58		31.938
	x 8		.27	1.80	83.9	48	40	109	114	47	6.5	59		
	12		.28	1.86	86.8	48	42	109	111	50	6.5	60		
	x 16		.27	1.80	89.8	48	42	109	111	52	6.5	60		
	20		.26	1.73	92.6	49	43	110	111	52	6.0	60		
	x 24		.26	1.73	95.5	49	45	110	113	50	6.0	59		
	28		.19	1.26	98.0	49	46	109	111	46	4.5	57		
	x 32		.18	1.20	100.5	50	47	110	111	44	4.5	56		
	36		.17	1.13	102.9	50	49	109	113	43	4.5	56		
	x 40		.16	1.06	105.2	51	50	108	112	43	4.5	56		
	44		.17	1.13	107.6	51	51	108	109	42	4.5	55		
	48	0905	.16	1.06	109.877	51	53	108	111	43	4.0	56		
		0911			110.002									
A	4		.26	1.73	112.6	52	55	107	111	46	5.5	56		31.786
	x 8		.25	1.66	115.4	52	55	107	109	44	5.5	55		
	12		.26	1.73	118.3	52	55	107	110	43	5.5	56		
	x 16		.26	1.73	121.1	52	56	107	111	43	5.5	56		
	20		.24	1.60	124.0	53	57	107	110	45	5.5	58		
	x 24		.23	1.53	126.7	53	57	109	110	44	5.5	58		
	28		.20	1.33	129.3	53	58	108	111	44	5.0	58		
	x 32		.20	1.33	131.8	53	58	108	112	44	5.0	58		
	36		.19	1.26	134.4	54	57	108	110	44	4.5	56		
	x 40		.19	1.26	136.8	54	60	107	110	45	4.5	58		
	44		.19	1.26	139.3	54	60	108	110	45	4.5	58		
	48	0959 ✓	.18	1.20	141.788	55 ✓	60 ✓	108	111	45	4.5	58		
			Avg Delta P .2204 ✓	Avg Delta H 1.4658 ✓	Total Volume 63.724 ✓	Avg Ts 51.16 ✓	Avg Tm 51.58 ✓	Min/Max 107 / 110	Min/Max 109 / 118	Max 52	Max Vac 70	Min/Max 55 / 60		
			Avg Sqrt Delta P .4674 ✓	Avg Sqrt Del H 1.2053 ✓	Comments:									

EPA Method 0010 from EPA SW-846

ISOKINETIC FIELD DATA SHEET

EPA Method 0010 - HFPO Dimer Acid

			Stack Conditions	
Client	Chemours		Assumed	Actual
W.O.#	15418.002.018	% Moisture	2	
Project ID	Chemours	Impinger Vol (ml)		8
Mode/Source ID	E2	Silica gel (g)		15.6
Samp. Loc. ID	STK	CO2, % by Vol	.2	
Run No.ID	3	O2, % by Vol	20.8	
Test Method ID	M0010	Temperature (°F)	65	
Date ID	NOV2019	Meter Temp (°F)	65	
Source/Location	E2 Stack	Static Press (in H_2O)	+.36	+.36 ✓
Sample Date	12·5·19 ✓			
Baro. Press (in Hg)	30.07 ✓			
Operator	JV / BB ✓	Ambient Temp (°F)		

Meter Box ID	30			
Meter Box Y	0.9972 ✓			
Meter Box Del H	1.8715			
Probe ID / Length	P708	4'	Sample Train (ft³)	
Probe Material	Boro		Leak Check @ (in Hg)	
Pitot / Thermocouple ID	P708		Pitot leak check good	
Pitot Coefficient	0.84 ✓		Pitot Inspection good	
Nozzle ID	.280		Method 3 System good	
Nozzle Measurements	.280	.280 / .280	**Temp Check**	
Avg Nozzle Dia (in)	.280 ✓		Meter Box Temp	
Area of Stack (ft²)	1.76 ✓		Reference Temp	
Sample Time	96 ✓		Pass/Fail (+/- 2°)	
Total Traverse Pts	12 ✓		Temp Change Response ?	

K Factor 6.67

	Initial	Mid-Point	Final
	.001	.001	.001
	15	9	6
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	yes / no	yes / no	yes / no
	Pre-Test Set		Post-Test Set
	Pass / Fail		Pass / Fail
	yes / no		yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM OUTLET TEMP (oF)	PROBE TEMP (oF)	FILTER BOX TEMP (F)	IMPINGER EXIT TEMP (oF)	SAMPLE TRAIN VAC (in Hg)	XAD EXIT TEMP (F)		COMMENTS
	0	1025 ✓			142.072									
A	4		.27	1.80	145.0	57	62	112	126	58	6.0	65		35.247
	8		.26	1.73	147.9	57	63	107	118	57	6.0	64		
	12		.29	1.93	150.9	57	63	108	113	60	6.0	64		
	16		.30	2.00	154.0	57	63	109	111	60	6.0	64		
	20		.32	2.13	157.1	57	63	109	112	58	6.5	64		
	24		.31	2.06	160.3	57	63	107	114	53	6.5	61		
	28		.25	1.66	163.1	58	64	105	111	51	5.5	60		
	32		.24	1.60	165.9	58	64	106	109	49	5.0	59		
	36		.24	1.60	168.8	58	64	109	111	48	5.0	58		
	40		.24	1.60	171.6	58	65	111	112	48	5.0	58		
	44		.22	1.47	174.4	58	65	112	110	48	5.0	58		
	48	1113	.25	1.66	177.239	58	66	108	109	49	5.0	58		
		1119			177.319									
B	4		.31	2.06	180.3	60	66	106	113	55	6.0	59		36.081
	8		.30	2.00	183.5	60	66	107	112	50	6.0	59		
	12		.30	2.00	186.6	60	66	110	117	49	6.0	58		
	16		.30	2.00	189.7	60	67	110	113	50	6.0	58		
	20		.32	2.13	192.8	61	68	108	106	51	6.0	59		
	24		.31	2.06	195.9	60	68	106	114	51	6.0	59		
	28		.31	2.06	199.1	60	68	107	116	50	6.0	59		
	32		.32	2.13	202.2	61	68	107	110	49	6.0	58		
	36		.27	1.80	205.2	61	69	109	112	49	5.5	58		
	40		.24	1.60	208.0	60	69	111	110	49	5.0	58		
	44		.22	1.47	210.7	61	70	108	106	49	5.0	58		
	48	1207 ✓	.22	1.47	213.400	61	70	107	112	48	5.0	59		
			Avg Delta P	Avg Delta H	Total Volume	Avg Ts ✓	Avg Tm ✓	Min/Max	Min/Max	Max	Max Vac	Min/Max		
			.2454 ✓	1.8341 ✓	~~71.328~~	58.95	65.83	105/112	106/126	60	6.5	58/65		
			Avg Sqrt Delta P	Avg Sqrt Del H	Comments:									
			.5237 ✓	1.3515 ✓	71.248									

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

Client	Chemours	W.O. #	15418.002.018
Location/Plant	Fayetteville, NC	Source & Location	E2 Stack

Run No. 1 — Sample Date 12/4/19 — Recovery Date 12/5/19

Sample I.D. Chemours - E2 - STK - 1 - M0010 - — Analyst PM — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	1	101	103	2				207	313.3	
Initial	0	100	100	0				200	300	
Gain	1	1	3	2				7 ✓	13.3 ✓	

Impinger Color: clear — Labeled? ✓

Silica Gel Condition: Good — Sealed?

Run No. 2 — Sample Date 12/5/19 — Recovery Date 12/5/19

Sample I.D. Chemours - E2 - STK - 2 - M0010 - — Analyst KS/CH — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	1	116	104	1				122	311.6	
Initial	0	100	100	0				100	300	
Gain	1	16	4	1				22 ✓	11.6 ✓	

Impinger Color: clear — Labeled? ✓

Silica Gel Condition: good — Sealed? ✓

Run No. 3 — Sample Date 12/5/19 — Recovery Date 12/5/19

Sample I.D. Chemours - E2 - STK - 3 - M0010 - — Analyst KS/CH — Filter Number NA

	Impinger									
	1	2	3	4	5	6	7	Imp.Total	8	Total
Contents	Empty	HPLC H20	HPLC H20						Silica Gel	
Final	1	103	102	2				208	315.6	
Initial	0	100	100	0				200	300	
Gain	1	3	2	2				8 ✓	15.6 ✓	

Impinger Color: clear — Labeled? ✓

Silica Gel Condition: good — Sealed? ✓

Check COC for Sample IDs of Media Blanks

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

Client Chemours
Location/Plant Fayetteville
Source F2
W.O. Number

Analyst GI
Date 12-4-19
Analyzer Make & Model Servo 1440

Calibration

Analysis Number	Span	Calibration Gas Value O_2 (%)	Calibration Gas Value CO_2 (%)	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1	Zero	0	0	0	0
2	Mid	11.97	8.976	12.0	9.0
3	High	20.98	17.05	21.0	17.0
	Average				

Run Number	Analysis Time	Analyzer Response O_2 (%)	Analyzer Response CO_2 (%)
1	1630	20.9 ✓	0.2 ✓
2	1010	20.8 ✓	0.2 ✓
3	1230	20.8 ✓	0.2 ✓
	Average		

(4) 12-5-19
12-5-19

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

Span	Cylinder ID
Mid	ALM009044
High	CC112489

**Report all values to the nearest 0.1 percent

Determination of Stack Gas Velocity - Method 2

Client: The Chemours Company | Operator: JV | Pitot Coeff (Cp): .84
Location/Plant: Fayetteville | Date: 12-4-19 | Stack Area, ft² (As):
Source: 15418.002.018 | W.O. Number: | Pitot Tube/Thermo ID:

Run Number	1350-1405 (Prelim 1 & 2)		
Time			
Barometric Press, in Hg (Pb)	29.70		
Static Press, in H_2O (Pstatic)	+.35		
Source Moisture, % (BWS)	1		
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
0	0	A	1	.23	65				
0	0		2	.26	65				
0	0		3	.27	65				
0	0		4	.25	65				
0	0		5	.22	65				
0	0		6	.22	65				
0	0	B	1	.26	66				
0	0		2	.27	66				
0	0		3	.28	66				
0	0		4	.24	66				
0	0		5	.25	65				
0	0		6	.24	65				
Avg Angle		Avg Delta P & Temp		.2491	65				
		avg $\sqrt{\text{DeltaP}}$		.4986					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

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

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

$Tsa = Ts + 460$

$Ps = Pb + (Pstatic/13.6)$

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

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

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

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.

APPENDIX C
LABORATORY ANALYTICAL REPORT

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Job Number: 140-17552-1

Job Description: E2 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 II
12/17/2019 1:42 PM

Courtney M Adkins, Project Manager II
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
12/17/2019

Table of Contents

Table of Contents

Definitions/Glossary

Client: Chemours Company FC, LLC The
Project/Site: E2 Stack - M0010

Job ID: 140-17552-1

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: E2 Stack - M0010

Job ID: 140-17552-1

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: E2 Stack - M0010

Job ID: 140-17552-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-17552-1	GF-2501,2502 R1 M0010 E2 STACK FH	Air	12/04/19 00:00	12/07/19 08:00	
140-17552-2	GF-2503,2504,2506 R1 M0010 E2 STACK BH	Air	12/04/19 00:00	12/07/19 08:00	
140-17552-3	GF-2505 R1 M0010 E2 STACK IMPINGER 1,2&3 COND	Air	12/04/19 00:00	12/07/19 08:00	
140-17552-4	GF-2507 R1 M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE	Air	12/04/19 00:00	12/07/19 08:00	
140-17552-5	GF-2508,2509 R2 M0010 E2 STACK FH	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-6	GF-2510,2511,2513 R2 M0010 E2 STACK BH	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-7	GF-2512 R2 M0010 E2 STACK IMPINGER 1,2&3 COND	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-8	GF-2514 R2 M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-9	GF-2515,2516 R3 M0010 E2 STACK FH	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-10	GF-2517,2518,2520 R3 M0010 E2 STACK BH	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-11	GF-2519 R3 M0010 E2 STACK IMPINGER 1,2&3 COND	Air	12/05/19 00:00	12/07/19 08:00	
140-17552-12	GF-2521 R3 M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE	Air	12/05/19 00:00	12/07/19 08:00	

Job Narrative
140-17552-1

Sample Receipt

The samples were received on December 7, 2019 at 8:00 AM in good condition and properly preserved. The temperatures of the 2 coolers at receipt time were 0.9º C and 1.4º 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.

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: 479940

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17552-2	GF-2503,2504,2506 R1 M0010 E2 STACK BH	Total/NA	Air	None	
140-17552-4	GF-2507 R1 M0010 E2 STACK BREAKTHROUG	Total/NA	Air	None	
140-17552-6	GF-2510,2511,2513 R2 M0010 E2 STACK BH	Total/NA	Air	None	
140-17552-8	GF-2514 R2 M0010 E2 STACK BREAKTHROUG	Total/NA	Air	None	
140-17552-10	GF-2517,2518,2520 R3 M0010 E2 STACK BH	Total/NA	Air	None	
140-17552-12	GF-2521 R3 M0010 E2 STACK BREAKTHROUG	Total/NA	Air	None	
MB 280-479940/1-A	Method Blank	Total/NA	Air	None	
LCS 280-479940/2-A	Lab Control Sample	Total/NA	Air	None	
LCSD 280-479940/3-A	Lab Control Sample Dup	Total/NA	Air	None	

Prep Batch: 480027

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17552-1	GF-2501,2502 R1 M0010 E2 STACK FH	Total/NA	Air	None	
140-17552-5	GF-2508,2509 R2 M0010 E2 STACK FH	Total/NA	Air	None	
140-17552-9	GF-2515,2516 R3 M0010 E2 STACK FH	Total/NA	Air	None	
MB 280-480027/1-A	Method Blank	Total/NA	Air	None	
LCS 280-480027/2-A	Lab Control Sample	Total/NA	Air	None	
LCSD 280-480027/3-A	Lab Control Sample Dup	Total/NA	Air	None	

Prep Batch: 480114

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17552-3	GF-2505 R1 M0010 E2 STACK IMPINGER 1,2&3	Total/NA	Air	None	
140-17552-7	GF-2512 R2 M0010 E2 STACK IMPINGER 1,2&3	Total/NA	Air	None	
140-17552-11	GF-2519 R3 M0010 E2 STACK IMPINGER 1,2&3	Total/NA	Air	None	
MB 280-480114/1-A	Method Blank	Total/NA	Air	None	
LCS 280-480114/2-A	Lab Control Sample	Total/NA	Air	None	
LCSD 280-480114/3-A	Lab Control Sample Dup	Total/NA	Air	None	

Analysis Batch: 480357

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17552-1	GF-2501,2502 R1 M0010 E2 STACK FH	Total/NA	Air	8321A	480027
140-17552-5	GF-2508,2509 R2 M0010 E2 STACK FH	Total/NA	Air	8321A	480027
140-17552-9	GF-2515,2516 R3 M0010 E2 STACK FH	Total/NA	Air	8321A	480027
MB 280-480027/1-A	Method Blank	Total/NA	Air	8321A	480027
LCS 280-480027/2-A	Lab Control Sample	Total/NA	Air	8321A	480027
LCSD 280-480027/3-A	Lab Control Sample Dup	Total/NA	Air	8321A	480027

Analysis Batch: 480373

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17552-3	GF-2505 R1 M0010 E2 STACK IMPINGER 1,2&3	Total/NA	Air	8321A	480114
140-17552-7	GF-2512 R2 M0010 E2 STACK IMPINGER 1,2&3	Total/NA	Air	8321A	480114
140-17552-11	GF-2519 R3 M0010 E2 STACK IMPINGER 1,2&3	Total/NA	Air	8321A	480114
MB 280-480114/1-A	Method Blank	Total/NA	Air	8321A	480114
LCS 280-480114/2-A	Lab Control Sample	Total/NA	Air	8321A	480114
LCSD 280-480114/3-A	Lab Control Sample Dup	Total/NA	Air	8321A	480114

QC Association Summary

Client: Chemours Company FC, LLC The
Project/Site: E2 Stack - M0010

Job ID: 140-17552-1

LCMS

Analysis Batch: 480693

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17552-2	GF-2503,2504,2506 R1 M0010 E2 STACK BH	Total/NA	Air	8321A	479940
140-17552-4	GF-2507 R1 M0010 E2 STACK BREAKTHROUG	Total/NA	Air	8321A	479940
140-17552-6	GF-2510,2511,2513 R2 M0010 E2 STACK BH	Total/NA	Air	8321A	479940
140-17552-8	GF-2514 R2 M0010 E2 STACK BREAKTHROUG	Total/NA	Air	8321A	479940
140-17552-10	GF-2517,2518,2520 R3 M0010 E2 STACK BH	Total/NA	Air	8321A	479940
140-17552-12	GF-2521 R3 M0010 E2 STACK BREAKTHROUG	Total/NA	Air	8321A	479940
MB 280-479940/1-A	Method Blank	Total/NA	Air	8321A	479940
LCS 280-479940/2-A	Lab Control Sample	Total/NA	Air	8321A	479940
LCSD 280-479940/3-A	Lab Control Sample Dup	Total/NA	Air	8321A	479940

Client Sample ID: GF-2501,2502 R1 M0010 E2 STACK FH — Lab Sample ID: 140-17552-1

Date Collected: 12/04/19 00:00 — **Matrix: Air**
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	7.93		0.100	0.0108	ug/Sample		12/09/19 14:20	12/12/19 10:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*120*		*50 - 200*	*12/09/19 14:20*	*12/12/19 10:18*	*1*

Client Sample ID: GF-2503,2504,2506 R1 M0010 E2 STACK BH — Lab Sample ID: 140-17552-2

Date Collected: 12/04/19 00:00 — **Matrix: Air**
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	7.55		0.200	0.0400	ug/Sample		12/09/19 14:20	12/16/19 10:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*84*		*50 - 200*	*12/09/19 14:20*	*12/16/19 10:39*	*1*

Client Sample ID: GF-2505 R1 M0010 E2 STACK IMPINGER 1,2&3 COND — Lab Sample ID: 140-17552-3

Date Collected: 12/04/19 00:00 — **Matrix: Air**
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.201	0.0102	ug/Sample		12/10/19 11:15	12/12/19 10:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*108*		*50 - 200*	*12/10/19 11:15*	*12/12/19 10:44*	*1*

Client Sample ID: GF-2507 R1 M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE — Lab Sample ID: 140-17552-4

Date Collected: 12/04/19 00:00 — **Matrix: Air**
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.267		0.200	0.0400	ug/Sample		12/09/19 14:20	12/16/19 10:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*100*		*50 - 200*	*12/09/19 14:20*	*12/16/19 10:42*	*1*

Client Sample ID: GF-2508,2509 R2 M0010 E2 STACK FH — Lab Sample ID: 140-17552-5

Date Collected: 12/05/19 00:00 — **Matrix: Air**
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.556		0.150	0.0162	ug/Sample		12/09/19 14:20	12/12/19 10:21	1

Client Sample ID: GF-2508,2509 R2 M0010 E2 STACK FH
Lab Sample ID: 140-17552-5

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	133		50 - 200	12/09/19 14:20	12/12/19 10:21	1

Client Sample ID: GF-2510,2511,2513 R2 M0010 E2 STACK BH
Lab Sample ID: 140-17552-6

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	1.36		0.325	0.0650	ug/Sample		12/09/19 14:20	12/16/19 10:46	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	128		50 - 200	12/09/19 14:20	12/16/19 10:46	1

Client Sample ID: GF-2512 R2 M0010 E2 STACK IMPINGER 1,2&3 COND
Lab Sample ID: 140-17552-7

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.216	0.0110	ug/Sample		12/10/19 11:15	12/12/19 10:47	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	110		50 - 200	12/10/19 11:15	12/12/19 10:47	1

Client Sample ID: GF-2514 R2 M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE
Lab Sample ID: 140-17552-8

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
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		12/09/19 14:20	12/16/19 10:49	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	102		50 - 200	12/09/19 14:20	12/16/19 10:49	1

Client Sample ID: GF-2515,2516 R3 M0010 E2 STACK FH
Lab Sample ID: 140-17552-9

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	2.02		0.150	0.0162	ug/Sample		12/09/19 14:20	12/12/19 10:24	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 HFPO-DA	127		50 - 200	12/09/19 14:20	12/12/19 10:24	1

Client Sample ID: GF-2517,2518,2520 R3 M0010 E2 STACK BH
Lab Sample ID: 140-17552-10

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.664		0.325	0.0650	ug/Sample		12/09/19 14:20	12/16/19 10:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*131*		*50 - 200*	*12/09/19 14:20*	*12/16/19 10:52*	*1*

Client Sample ID: GF-2519 R3 M0010 E2 STACK IMPINGER 1,2&3 COND
Lab Sample ID: 140-17552-11

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.194	0.00989	ug/Sample		12/10/19 11:15	12/12/19 10:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*116*		*50 - 200*	*12/10/19 11:15*	*12/12/19 10:50*	*1*

Client Sample ID: GF-2521 R3 M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE
Lab Sample ID: 140-17552-12

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.103	J	0.200	0.0400	ug/Sample		12/09/19 14:20	12/16/19 10:59	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*101*		*50 - 200*	*12/09/19 14:20*	*12/16/19 10:59*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: E2 Stack - M0010

Job ID: 140-17552-1

Method: 8321A - HFPO-DA

Prep: None

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

Method: 8321A - PFOA and PFOS

Prep: None

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

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ANALYTICAL REPORT

Job Number: 140-17554-1

Job Description: E2 Field QC - 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 II
12/17/2019 1:43 PM

Courtney M Adkins, Project Manager II
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
12/17/2019

Table of Contents

Table of Contents

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: E2 Field QC - M0010

Job ID: 140-17554-1

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: E2 Field QC - M0010

Job ID: 140-17554-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
140-17554-1	A-6622,6623 QC M0010 E2 STACK FH BT	Air	12/05/19 00:00	12/07/19 08:00	
140-17554-2	A-6624,6625,6627 QC M0010 E2 STACK BH BT	Air	12/05/19 00:00	12/07/19 08:00	
140-17554-3	A-6626 QC M0010 E2 STACK IMPINGERS 1,2& COND BT	Air	12/05/19 00:00	12/07/19 08:00	
140-17554-4	A-6628 QC M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE BT	Air	12/05/19 00:00	12/07/19 08:00	
140-17554-5	A-6629 QC M0010 E2 STACK DI WATER RB	Air	12/05/19 00:00	12/07/19 08:00	
140-17554-6	A-6630 QC M0010 E2 STACK MEOH WITH 5% NH4OH RB	Air	12/05/19 00:00	12/07/19 08:00	
140-17554-7	A-6631 QC M0010 E2 STACK COMBINED GLASSWARE RINSES (MEOH/5% NH4OH) PB	Air	12/05/19 00:00	12/07/19 08:00	

Job Narrative
140-17554-1

Sample Receipt

The samples were received on December 7, 2019 at 8:00 AM in good condition and properly preserved. The temperatures of the 2 coolers at receipt time were 0.9º C and 1.4º 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.

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: 479940

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17554-2	A-6624,6625,6627 QC M0010 E2 STACK BH BT	Total/NA	Air	None	
140-17554-4	A-6628 QC M0010 E2 STACK BREAKTHROUGH	Total/NA	Air	None	
140-17554-6	A-6630 QC M0010 E2 STACK MEOH WITH 5% I	Total/NA	Air	None	
140-17554-7	A-6631 QC M0010 E2 STACK COMBINED GLAS	Total/NA	Air	None	
MB 280-479940/1-A	Method Blank	Total/NA	Air	None	
LCS 280-479940/2-A	Lab Control Sample	Total/NA	Air	None	
LCSD 280-479940/3-A	Lab Control Sample Dup	Total/NA	Air	None	

Prep Batch: 480027

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17554-1	A-6622,6623 QC M0010 E2 STACK FH BT	Total/NA	Air	None	
MB 280-480027/1-A	Method Blank	Total/NA	Air	None	
LCS 280-480027/2-A	Lab Control Sample	Total/NA	Air	None	
LCSD 280-480027/3-A	Lab Control Sample Dup	Total/NA	Air	None	

Prep Batch: 480114

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17554-3	A-6626 QC M0010 E2 STACK IMPINGERS 1,2&	Total/NA	Air	None	
140-17554-5	A-6629 QC M0010 E2 STACK DI WATER RB	Total/NA	Air	None	
MB 280-480114/1-A	Method Blank	Total/NA	Air	None	
LCS 280-480114/2-A	Lab Control Sample	Total/NA	Air	None	
LCSD 280-480114/3-A	Lab Control Sample Dup	Total/NA	Air	None	

Analysis Batch: 480357

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17554-1	A-6622,6623 QC M0010 E2 STACK FH BT	Total/NA	Air	8321A	480027
MB 280-480027/1-A	Method Blank	Total/NA	Air	8321A	480027
LCS 280-480027/2-A	Lab Control Sample	Total/NA	Air	8321A	480027
LCSD 280-480027/3-A	Lab Control Sample Dup	Total/NA	Air	8321A	480027

Analysis Batch: 480373

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17554-3	A-6626 QC M0010 E2 STACK IMPINGERS 1,2&	Total/NA	Air	8321A	480114
140-17554-5	A-6629 QC M0010 E2 STACK DI WATER RB	Total/NA	Air	8321A	480114
MB 280-480114/1-A	Method Blank	Total/NA	Air	8321A	480114
LCS 280-480114/2-A	Lab Control Sample	Total/NA	Air	8321A	480114
LCSD 280-480114/3-A	Lab Control Sample Dup	Total/NA	Air	8321A	480114

Analysis Batch: 480693

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-17554-2	A-6624,6625,6627 QC M0010 E2 STACK BH BT	Total/NA	Air	8321A	479940
140-17554-4	A-6628 QC M0010 E2 STACK BREAKTHROUGH	Total/NA	Air	8321A	479940
140-17554-6	A-6630 QC M0010 E2 STACK MEOH WITH 5% I	Total/NA	Air	8321A	479940
140-17554-7	A-6631 QC M0010 E2 STACK COMBINED GLAS	Total/NA	Air	8321A	479940
MB 280-479940/1-A	Method Blank	Total/NA	Air	8321A	479940
LCS 280-479940/2-A	Lab Control Sample	Total/NA	Air	8321A	479940
LCSD 280-479940/3-A	Lab Control Sample Dup	Total/NA	Air	8321A	479940

Client Sample ID: A-6622,6623 QC M0010 E2 STACK FH BT

Lab Sample ID: 140-17554-1

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.0437		0.0250	0.00270	ug/Sample		12/09/19 14:20	12/12/19 10:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*128*		*50 - 200*	*12/09/19 14:20*	*12/12/19 10:27*	*1*

Client Sample ID: A-6624,6625,6627 QC M0010 E2 STACK BH BT

Lab Sample ID: 140-17554-2

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	0.264		0.200	0.0400	ug/Sample		12/09/19 14:20	12/16/19 11:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*98*		*50 - 200*	*12/09/19 14:20*	*12/16/19 11:02*	*1*

Client Sample ID: A-6626 QC M0010 E2 STACK IMPINGERS 1,2&3 COND BT

Lab Sample ID: 140-17554-3

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.00250	0.000128	ug/Sample		12/10/19 11:15	12/12/19 10:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*124*		*50 - 200*	*12/10/19 11:15*	*12/12/19 10:53*	*1*

Client Sample ID: A-6628 QC M0010 E2 STACK BREAKTHROUGH XAD-2 RESIN TUBE BT

Lab Sample ID: 140-17554-4

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
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		12/09/19 14:20	12/16/19 11:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*111*		*50 - 200*	*12/09/19 14:20*	*12/16/19 11:05*	*1*

Client Sample ID: A-6629 QC M0010 E2 STACK DI WATER RB

Lab Sample ID: 140-17554-5

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - HFPO-DA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.00250	0.000128	ug/Sample		12/10/19 11:15	12/12/19 10:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*139*		*50 - 200*	*12/10/19 11:15*	*12/12/19 10:57*	*1*

Client Sample ID: A-6630 QC M0010 E2 STACK MEOH WITH 5% NH4OH RB

Lab Sample ID: 140-17554-6

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	ND		0.0250	0.00500	ug/Sample		12/09/19 14:20	12/16/19 11:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*147*		*50 - 200*	*12/09/19 14:20*	*12/16/19 11:08*	*1*

Client Sample ID: A-6631 QC M0010 E2 STACK COMBINED GLASSWARE RINSES (MEOH/5% NH4OH) PB

Lab Sample ID: 140-17554-7

Date Collected: 12/05/19 00:00
Matrix: Air
Date Received: 12/07/19 08:00
Sample Container: Air Train

Method: 8321A - PFOA and PFOS

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
HFPO-DA	**0.0112**	**J**	0.0250	0.00500	ug/Sample		12/09/19 14:20	12/16/19 11:12	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
13C3 HFPO-DA	*143*		*50 - 200*	*12/09/19 14:20*	*12/16/19 11:12*	*1*

Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: E2 Field QC - M0010

Job ID: 140-17554-1

Method: 8321A - HFPO-DA

Prep: None

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

Method: 8321A - PFOA and PFOS

Prep: None

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

APPENDIX D
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS FOR
HFPO DIMER ACID (METHOD 0010)

Client: Chemours | **Plant: Fayetteville, NC**
Test Number: Run 3 | **Test Date: 12/05/19**
Test Location: E2 Stack | **Test Period: 1025-1207**

1. HFPO Dimer Acid concentration, lbs/dscf.

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

$$Conc1 = \frac{2.8 \times 2.2046 \times 10\text{-}9}{71.992}$$

Conc1 = 8.53E-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 = 2.8 / (71.992 x 0.02832)

Conc2 = 1.37

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

$MR1_{(Outlet)}$ = 8.53E-11 x 3101 x 60

$MR1_{(Outlet)}$ = 1.59E-05

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

$MR2_{(Outlet)}$ = 1.59E-05 x 453.59 /3600

$MR2_{(Outlet)}$ = 2.00E-06

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: 12/05/19
Test Location: E2 Stack	Test Period: 1025-1207

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

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

$$Vm(std) = \frac{17.64 \times 0.9972 \times 71.248 \times \left(30.07 + \frac{1.834}{13.6} \right)}{65.83 + 460} = 71.992$$

Where:

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

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

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

$$Vw(std) = (0.04707 \times 8.0) + (0.04715 \times 15.6) = 1.11$$

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

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

$$bws = \frac{1.11}{1.11 + 71.992} = 0.015$$

Where:

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

4. Mole fraction of dry gas.

$$Md = 1 - bws$$

$$Md = 1 - 0.015 = 0.985$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

$$MWd = (0.440 \times 0.2) + (0.320 \times 20.8) + (0.280 \times (79.0 + 0.00))$$

$$MWd = 28.86$$

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.

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

$$MWs = (28.86 \times 0.985) +(18 (1 - 0.985)) = 28.70$$

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.

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

$$Vs = 85.49 \times 0.84 \times 0.52373 \times \left(\frac{519}{30.10 \times 28.70} \right)^{\wedge}1/2 = 29.2$$

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.

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

$$Qs(act) = 60 \times 29.2 \times 1.76 = 3079$$

Where:

Qs(act) = Volumetric flow rate of wet stack gas at actual conditions, wacf/min.

As = Cross-sectional area of stack, ft^2.

60 = Conversion factor from seconds to minutes.

9. Average gas stream dry volumetric flow rate at standard conditions, dscf/min.

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

$$Qs(std) = 17.64 \times 0.985 \times \frac{30.10}{519.0} \times 3079$$

$$Qs(std) = 3101$$

Where:

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

10. Isokinetic variation calculated from intermediate values, percent.

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

$$I = \frac{17.327 \times 519 \times 71.992}{29.2 \times 96 \times 30.10 \times 0.985 \times (0.280)^{\wedge}2} = 99.5$$

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

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

Calibrator MDW | **Meter Box Number** 30 | **Ambient Temp** 72

Date 21-Feb-19 | **Wet Test Meter Number** P-2952 | **Temp Reference Source** Thermocouple Simulator (Accuracy +/- 1°F)

Dry Gas Meter Number 17485131

Baro Press, in Hg (Pb)	29.87

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	905.750	70.0	70.00	70.00	68.0	12.8	1.0002	1.8501
		910.724		70.00	70.00				
		4.974		70.00	70.00				
1.0	5.0	911.701	70.0	71.00	71.00	70.0	9.0	1.0007	1.8224
		916.685		71.00	71.00				
		4.984		71.00	71.00				
1.5	10.0	917.680	70.0	72.00	72.00	72.5	15.0	0.9995	1.8894
		927.695		74.00	74.00				
		10.015		73.00	73.00				
2.0	10.0	928.690	70.0	74.00	74.00	74.5	13.0	0.9946	1.8851
		938.780		75.00	75.00				
		10.090		74.50	74.50				
3.0	10.0	939.800	70.0	76.00	76.00	76.0	10.7	0.9910	1.9103
		949.930		77.00	77.00				
		10.130		76.50	76.50				
							Average	**0.9972**	**1.8715**

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	1832	1832	1832	1832		1832.0	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

E2 STACK

METER BOX NO. 30

12/4/2019 + 12/5/2019

	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.	0.2	0.2	0.2
% O_2 = Percent oxygen by volume, dry basis.	20.9	20.8	20.8

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

$$MWd = (0.32 * 20.9) + (0.44 * 0.2) + (0.28 * (100 - (0.2 + 20.9)))$$

$$MWd = (6.69) + (0.09) + (22.09)$$

MWd =	28.87	28.86	28.86

Tma = Source Temperature, absolute(^oR)			
Tm = Average dry gas meter temperature , deg F.	61.6	51.6	65.8

$$Tma = Ts + 460$$

$$Tma = 61.58 + 460$$

Tma =	521.58	511.58	525.83

Ps = Absolute meter pressure, inches Hg.			
13.60 = Specific gravity of mercury.			
delta H = Avg pressure drop across the orifice meter during sampling, in H2O	1.66	1.47	1.83
Pb = Barometric Pressure, in Hg.	29.70	30.07	30.07

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

$$Pm = 29.7 + (1.65791666666667 / 13.6)$$

Pm =	29.82	30.18	30.20

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.	68.630	63.724	71.248
Y = Dry gas meter calibration factor (based on full calibration)	0.9972	0.9972	0.9972
Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O.	1.8715	1.8715	1.8715
avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. H_2O	1.2860	1.2053	1.3516
O = Total sampling time, minutes.	96	96	96

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

$$Yqa = (96.00 / 68.63) * SQRT (0.0319 * 521.58 * 29) / (1.87 * 29.82 * 28.87) * 1.29$$

$$Yqa = 1.399 * SQRT 482.517 / 1,611.069 * 1.29$$

Yqa =	0.9844	0.9783	0.9944

Diff = Absolute difference between Yqa and Y	1.28	1.90	0.28

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

$$Diff = ((0.9972 - 0.984) / 0.9972) * 100$$

Average Diff = 1.15

Allowable = 5.0

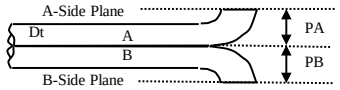
Type S Pitot Tube Inspection Data Form

Pitot Tube Identification Number: **P-708**

Inspection Date 6/15/18 Individual Conducting Inspection KS

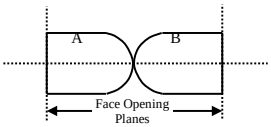
If all Criteria PASS
Cp is equal to 0.84

		PASS/FAIL
Distance to A Plane (PA) - inches	0.436	PASS
Distance to B Plane (PB) - inches	0.436	PASS
Pitot OD (D_t) - inches	0.375	

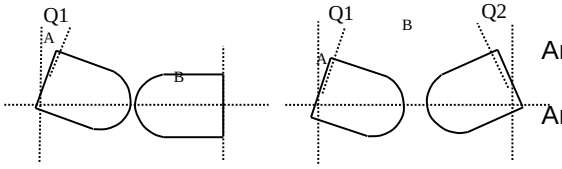


$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

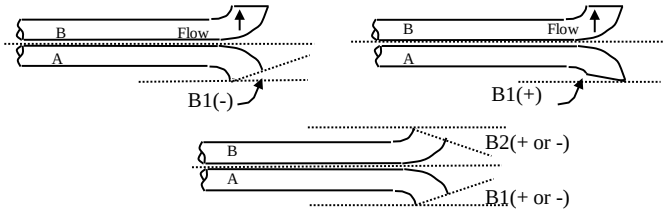


Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS



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 $\leq 10^o$

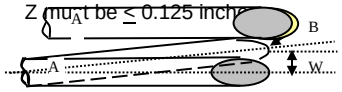


Angle of B1 from vertical A Tube- degrees (absolute)	0	PASS
Angle of B1 from vertical B Tube- degrees (absolute)	0	PASS

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

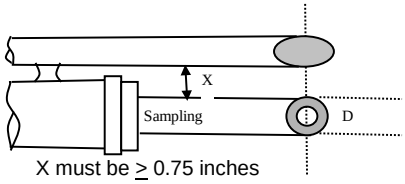
Horizontal offset between A and B Tubes (Z) - inches	0.01	PASS

Z must be $\leq$ 0.125 inches



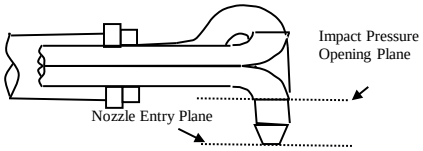
Vertical offset between A and B Tubes (W) - inches	0.014	PASS

W must be $\leq$ 0.03125 inches

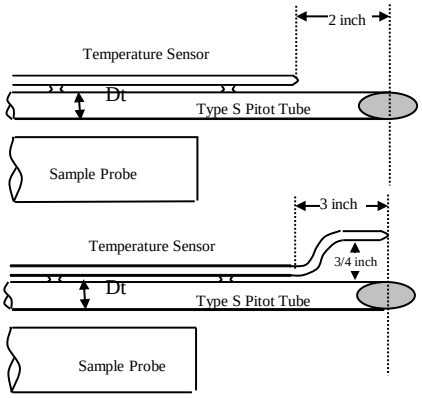


Distance between Sample Nozzle and Pitot (X) - inches	0.9	PASS

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

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

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI79E15A00E4	Reference Number:	82-401356855-1
Cylinder Number:	ALM009044	Cylinder Volume:	150.5 CF
Laboratory:	124 - Riverton (SAP) - NJ	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Nov 26, 2018

Expiration Date: Nov 26, 2026

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	9.000 %	8.976 %	G1	+/- 0.7% NIST Traceable	11/26/2018
OXYGEN	12.00 %	11.97 %	G1	+/- 0.5% NIST Traceable	11/26/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09060236	CC263114	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 05, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA 510-CO2-19GYCXEG	NDIR	Nov 06, 2018
Horiba MPA 510-O2-7TWMJ041	Paramagnetic	Nov 07, 2018

Triad Data Available Upon Request

Signature on file
Approved for Release

APPENDIX F
LIST OF PROJECT PARTICIPANTS

The following WESTON employees participated in this project.

Paul Meeter	Senior Project Manager
Johnnie Vitello	Team Member
Brandon Berger	Team Member
Kyle Schweitzer	Team Member
Chris Hartsky	Team Member