# FLUOROMONOMERS
# MANUFACTURING PROCESS
# VE SOUTH CARBON BED
# REMOVAL EFFICIENCY AND
# VE SOUTH STACK EMISSIONS TEST REPORT
# TEST DATES: 20-21 NOVEMBER 2019

## THE CHEMOURS COMPANY
## FAYETTEVILLE, NORTH CAROLINA

Prepared for:


**THE CHEMOURS COMPANY**
22828 NC Hwy 87 W
Fayetteville, North Carolina 28306

Prepared by:


**WESTON SOLUTIONS, INC.**
1400 Weston Way
P.O. Box 2653
West Chester, Pennsylvania 19380

December 2019

W.O. No. 15418.002.018

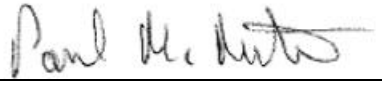
**THE CHEMOURS COMPANY**

**FLOROMONOMERS MANUFACTURING PROCESS**
**VE SOUTH CARBON BED REMOVAL EFFICIENCY AND**
**VE SOUTH STACK EMISSIONS TEST REPORT**

**TEST DATES: 20-21 November 2019**

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 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 20-21 November 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 | Water Content |
| Sampling or Monitoring Method | EPA M-0010 | EPA M1 and M2 in conjunction with M-0010 tests | EPA M4 in conjunction with M-0010 tests |
| Sample Extraction/ Analysis Method(s): | LC/MS/MS | NA[6] | NA |
| Sample Size | $\geq 1.5m^3$ | NA | NA |
| Total Number of Samples Collected[1] | 6 | 6 | 6 |
| Reagent Blanks (Solvents, Resins)[1] | 1 set | 0 | 0 |
| Field Blank Trains[1] | 1 per source | 0 | 0 |
| Proof Blanks[1] | 1 per train | 0 | 0 |
| Trip Blanks[1,2] | 1 set | 0 | |
| Lab Blanks | 1 per fraction[3] | 0 | 0 |
| Laboratory or Batch Control Spike Samples (LCS) | 1 per fraction[3] | 0 | 0 |
| Laboratory or Batch Control Spike Sample Duplicate (LCSD) | 1 per fraction[3] | 0 | 0 |
| Media Blanks | 1 set[4] | 0 | 0 |
| Isotope Dilution Internal Standard Spikes | Each sample | 0 | 0 |
| Total No. of Samples | 10[5] | 6 | 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 | 1.73E-02 | 1.38E-01 | 8.24E-03 | 6.54E-02 | 52.4 | 6.08E-03 | 4.83E-02 |
| R2 | 2.59E-02 | 2.06E-01 | 5.99E-03 | 4.76E-02 | 76.9 | 3.98E-03 | 3.16E-02 |
| R3 | 1.19E-02 | 9.45E-02 | 5.56E-03 | 4.42E-02 | 53.2 | 1.10E-03 | 8.75E-03 |
| Average | 1.84E-02 | 1.46E-01 | 6.60E-03 | 5.24E-02 | 63.7 | 3.72E-03 | 2.96E-02 |

# 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.

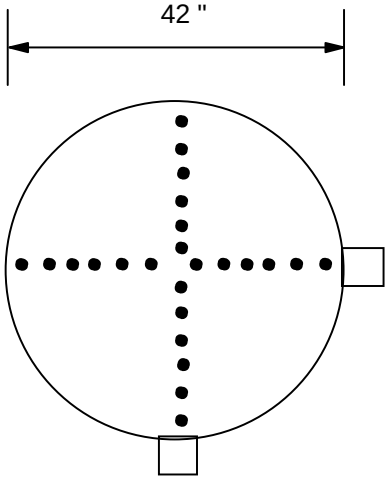
See Figure 4-1 for a schematic of the test port and traverse point locations.

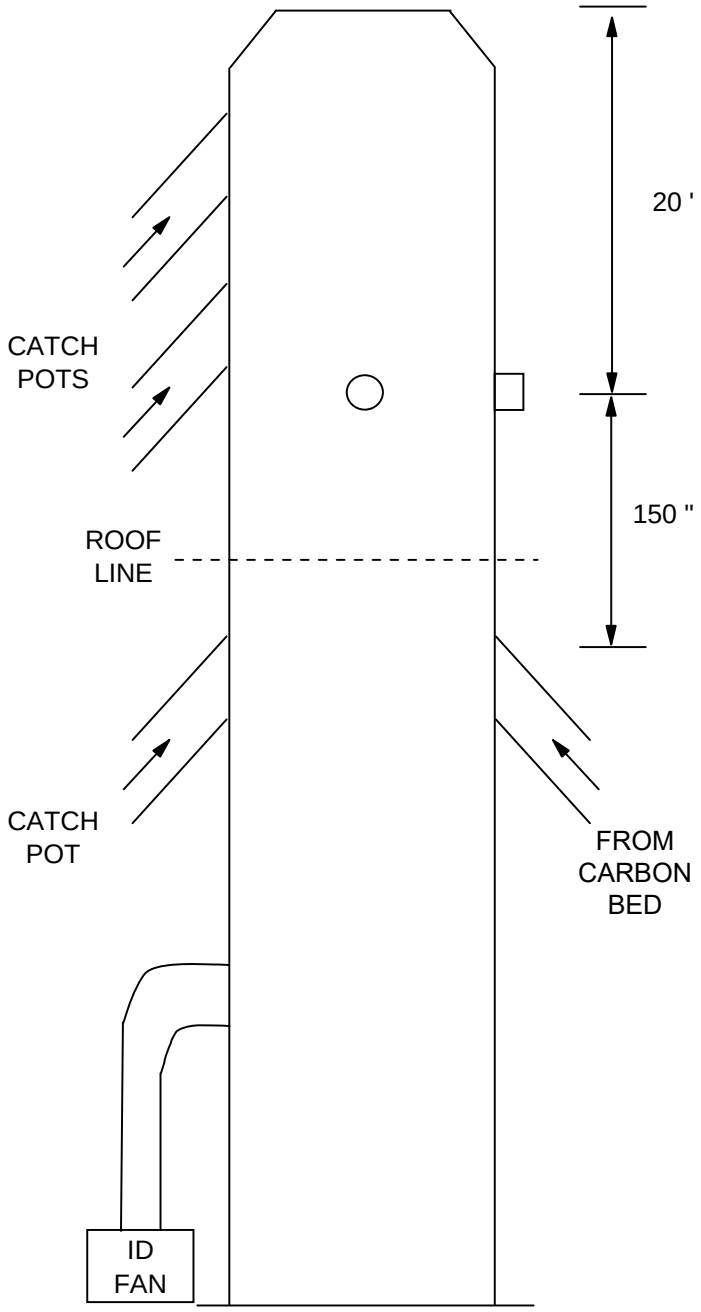
Note: All measurements at the test location were confirmed prior to sampling.

## 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<br>> 0.97 duct diameters | 41 inches<br>> 1.1 duct diameters |
| Carbon Bed Outlet | 12.5 feet<br>> 4.2 duct diameters | 31 feet<br>> 10.3 duct diameters |
| VE South Stack | 150 inches<br>3.6 duct diameters | 20 feet<br>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

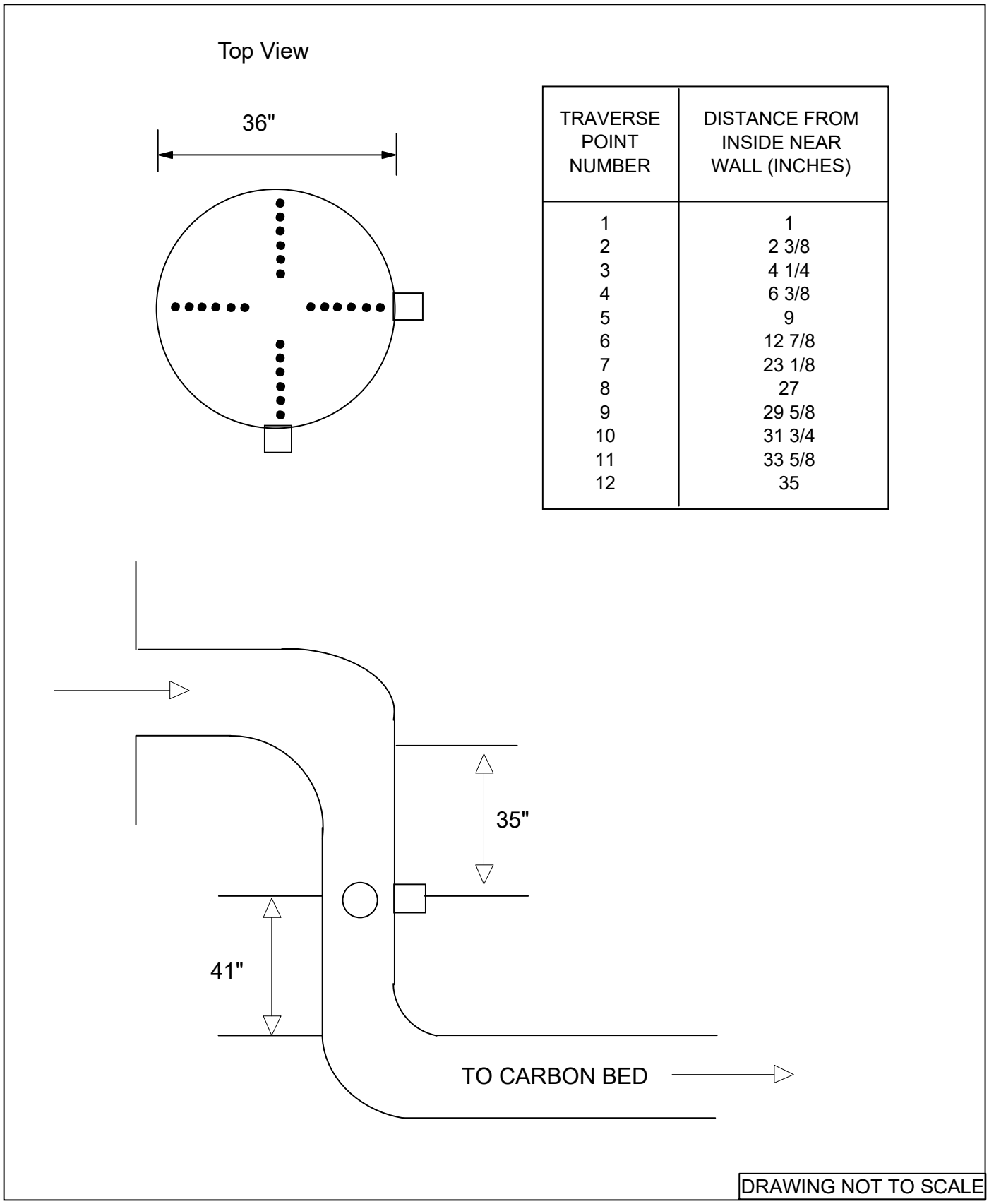



**FIGURE 4-2**
**VE SOUTH CARBON BED INLET SCHEMATIC**



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

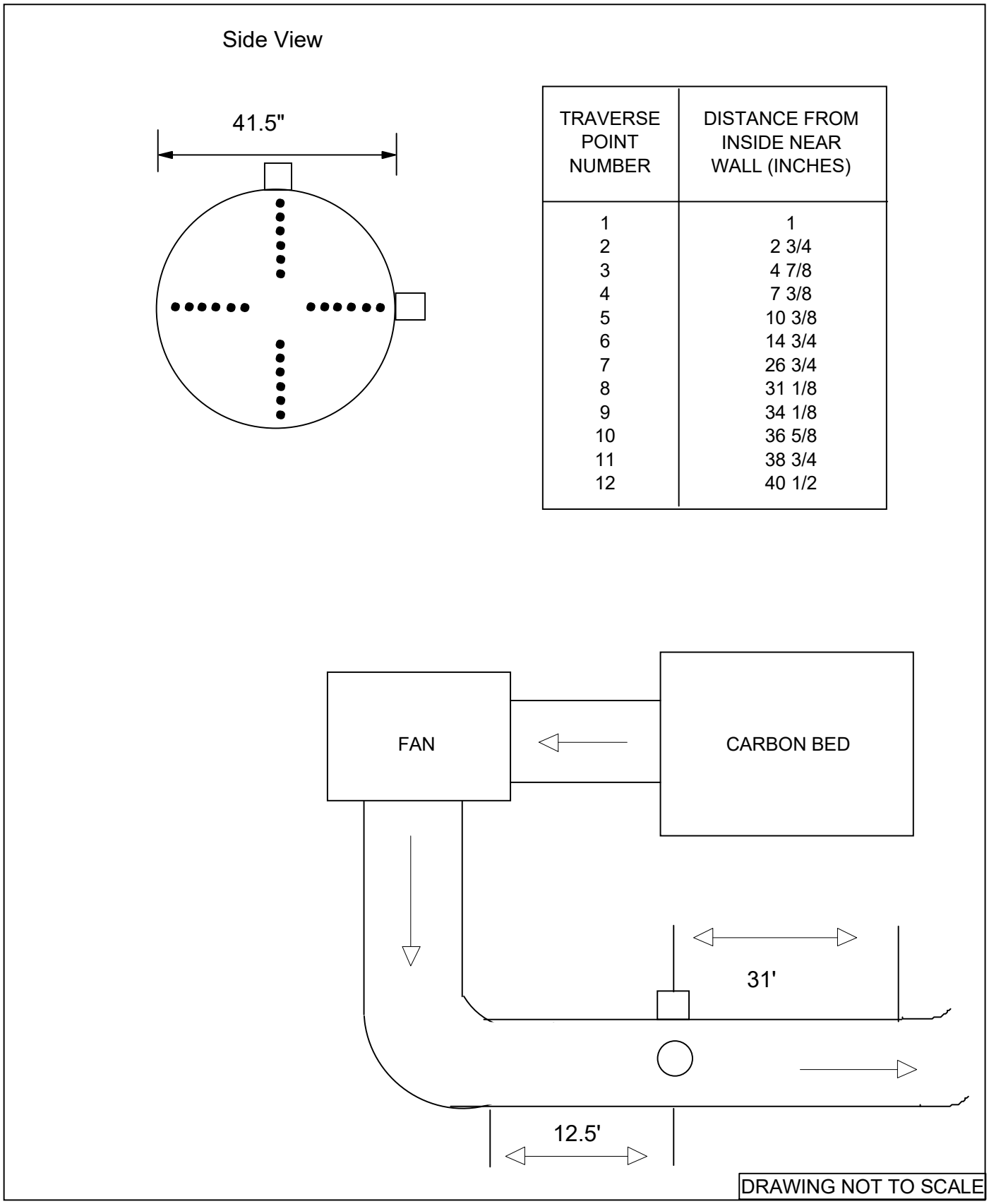



**FIGURE 4-3**
**VE SOUTH CARBON BED OUTLET SCHEMATIC**

# 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.

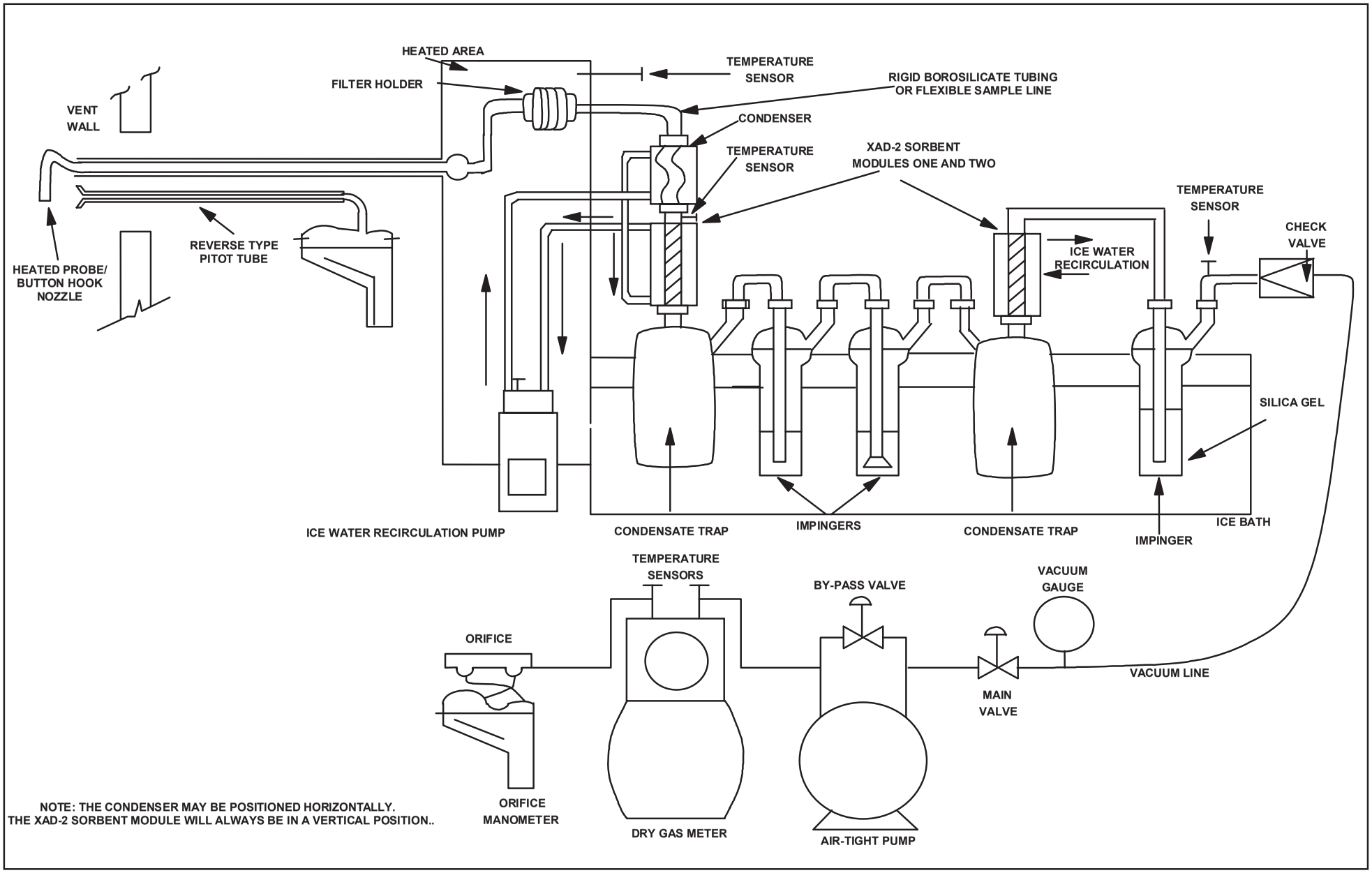



**FIGURE 5-1**
**EPA METHOD 0010 SAMPLING TRAIN**

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.

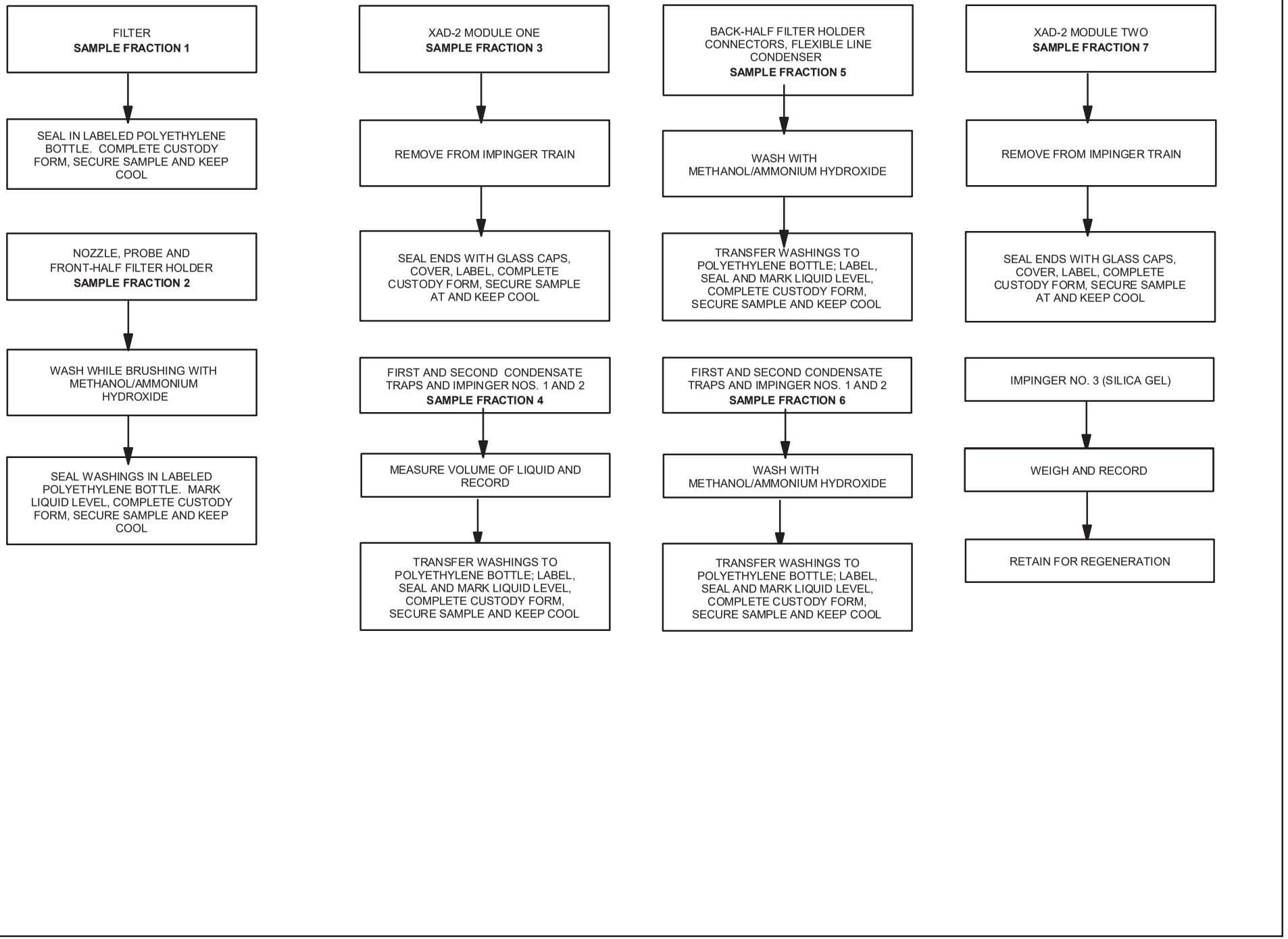





**FIGURE 5-2**
**HFPO DIMER ACID SAMPLE RECOVERY PROCEDURES FOR METHOD 0010**

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.

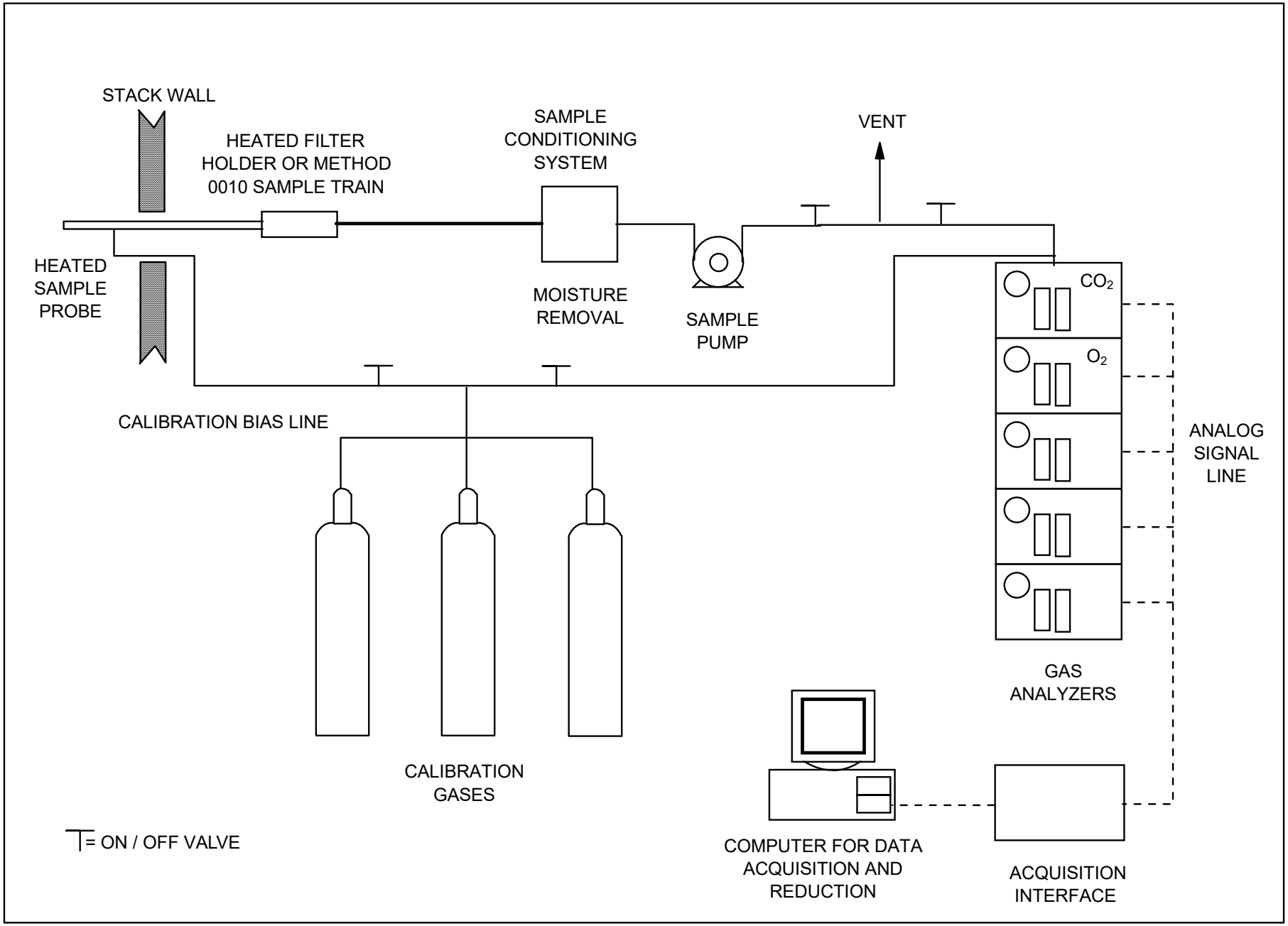



**FIGURE 5-5**
**WESTON SAMPLING SYSTEM**

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

# 6. DETAILED TEST RESULTS AND DISCUSSION

Chemours tested specific conditions for this test, including venting of the DAF ISO during filling operations. The results are being evaluated and will be supplemented with additional information as appropriate.

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

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.

The full CEMS file was not available for inclusion in this report, but will be available at a later date upon request.

**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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| **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 | 30.05 | 30.10 | 30.30 |
| Avg. orifice press. diff., in $H_2O$ | 1.03 | 1.05 | 0.98 |
| Avg. dry gas meter temp., deg F | 61.0 | 66.4 | 60.0 |
| Avg. abs. dry gas meter temp., deg. R | 521 | 526 | 520 |
| Total liquid collected by train, ml | 19.0 | 18.8 | 16.3 |
| Std. vol. of $H_2O$ vapor coll., cu.ft. | 0.90 | 0.89 | 0.77 |
| Dry gas meter calibration factor | 1.0066 | 1.0066 | 1.0066 |
| Sample vol. at meter cond., dcf | 50.118 | 51.536 | 49.722 |
| Sample vol. at std. cond., dscf [(1)] | 51.453 | 52.462 | 51.564 |
| Percent of isokinetic sampling | 99.0 | 102.2 | 100.7 |
| **GAS STREAM COMPOSITION DATA:** | | | |
| $CO_2$, % by volume, dry basis | 0.0 | 0.0 | 0.0 |
| $O_2$, % by volume, dry basis | 20.9 | 20.9 | 20.9 |
| $N_2$, % by volume, dry basis | 79.1 | 79.1 | 79.1 |
| Molecular wt. of dry gas, lb/lb mole | 28.84 | 28.84 | 28.84 |
| $H_20$ vapor in gas stream, prop. by vol. | 0.017 | 0.017 | 0.015 |
| Mole fraction of dry gas | 0.983 | 0.983 | 0.985 |
| Molecular wt. of wet gas, lb/lb mole | 28.65 | 28.66 | 28.68 |
| **GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:** | | | |
| Static pressure, in. $H_2O$ | -5.00 | -5.00 | -5.00 |
| Absolute pressure, in. Hg | 29.68 | 29.73 | 29.93 |
| Avg. temperature, deg. F | 74 | 74 | 73 |
| Avg. absolute temperature, deg.R | 534 | 534 | 533 |
| Pitot tube coefficient | 0.84 | 0.84 | 0.84 |
| Total number of traverse points | 24 | 24 | 24 |
| Avg. gas stream velocity, ft./sec. | 67.0 | 66.1 | 65.2 |
| Stack/duct cross sectional area, sq.ft. | 7.07 | 7.07 | 7.07 |
| Avg. gas stream volumetric flow, wacf/min. | 28418 | 28020 | 27669 |
| Avg. gas stream volumetric flow, dscf/min. | 27407 | 27080 | 27014 |

[(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**
**VES CARBON BED INLET**

| | | | |
|---|---|---|---|
| **TEST DATA** | | | |
| Run number | 1 | 2 | 3 |
| Location | VES CBed Inlet | VES CBed Inlet | VES CBed Inlet |
| Date | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| **LABORATORY REPORT DATA, ug.** | | | |
| HFPO Dimer Acid | 1952.68 | 3015.56 | 1363.16 |
| **EMISSION RESULTS, ug/dscm.** | | | |
| HFPO Dimer Acid | 1339.93 | 2029.47 | 933.39 |
| **EMISSION RESULTS, lb/dscf.** | | | |
| HFPO Dimer Acid | 8.37E-08 | 1.27E-07 | 5.83E-08 |
| **EMISSION RESULTS, lb/hr.** | | | |
| HFPO Dimer Acid | 1.38E-01 | 2.06E-01 | 9.45E-02 |
| **EMISSION RESULTS, g/sec.** | | | |
| HFPO Dimer Acid | 1.73E-02 | 2.59E-02 | 1.19E-02 |

**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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| **SAMPLING DATA:** | | | |
| Sampling duration, min. | 96.0 | 96.0 | 96.0 |
| Nozzle diameter, in. | 0.200 | 0.200 | 0.200 |
| Cross sectional nozzle area, sq.ft. | 0.000218 | 0.000218 | 0.000218 |
| Barometric pressure, in. Hg | 30.05 | 30.10 | 30.30 |
| Avg. orifice press. diff., in $H_2O$ | 1.46 | 1.53 | 1.55 |
| Avg. dry gas meter temp., deg F | 63.5 | 62.0 | 67.1 |
| Avg. abs. dry gas meter temp., deg. R | 523 | 522 | 527 |
| Total liquid collected by train, ml | 19.0 | 26.6 | 18.1 |
| Std. vol. of $H_2O$ vapor coll., cu.ft. | 0.90 | 1.25 | 0.85 |
| Dry gas meter calibration factor | 1.0005 | 1.0005 | 1.0005 |
| Sample vol. at meter cond., dcf | 57.729 | 58.798 | 59.342 |
| Sample vol. at std. cond., dscf [(1)] | 58.698 | 60.061 | 60.427 |
| Percent of isokinetic sampling | 100.6 | 100.9 | 100.4 |
| **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. | 0.015 | 0.020 | 0.014 |
| Mole fraction of dry gas | 0.985 | 0.980 | 0.986 |
| Molecular wt. of wet gas, lb/lb mole | 28.67 | 28.61 | 28.69 |
| **GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:** | | | |
| Static pressure, in. $H_2O$ | 2.70 | 2.60 | 2.60 |
| Absolute pressure, in. Hg | 30.25 | 30.29 | 30.49 |
| Avg. temperature, deg. F | 73 | 71 | 74 |
| Avg. absolute temperature, deg.R | 533 | 531 | 534 |
| Pitot tube coefficient | 0.84 | 0.84 | 0.84 |
| Total number of traverse points | 24 | 24 | 24 |
| Avg. gas stream velocity, ft./sec. | 47.1 | 48.1 | 48.3 |
| Stack/duct cross sectional area, sq.ft. | 9.39 | 9.39 | 9.39 |
| Avg. gas stream volumetric flow, wacf/min. | 26547 | 27112 | 27190 |
| Avg. gas stream volumetric flow, dscf/min. | 26156 | 26706 | 27001 |

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

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

| | | | |
|---|---|---|---|
| **TEST DATA** | | | |
| Run number | 1 | 2 | 3 |
| Location | VES CBed Outlet | VES CBed Outlet | VES CBed Outlet |
| Date | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| **LABORATORY REPORT DATA, ug.** | | | |
| HFPO Dimer Acid | 1110.14 | 808.58 | 747.38 |
| **EMISSION RESULTS, ug/dscm.** | | | |
| HFPO Dimer Acid | 667.75 | 475.32 | 436.69 |
| **EMISSION RESULTS, lb/dscf.** | | | |
| HFPO Dimer Acid | 4.17E-08 | 2.97E-08 | 2.73E-08 |
| **EMISSION RESULTS, lb/hr.** | | | |
| HFPO Dimer Acid | 6.54E-02 | 4.76E-02 | 4.42E-02 |
| HFPO Dimer Acid (From Inlet Data) | 1.38E-01 | 2.06E-01 | 9.45E-02 |
| **EMISSION RESULTS, g/sec.** | | | |
| HFPO Dimer Acid | 8.24E-03 | 5.99E-03 | 5.56E-03 |
| Carbon Bed Removal Efficiency, % | 52.4 | 76.9 | 53.2 |

**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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| **SAMPLING DATA:** | | | |
| Sampling duration, min. | 96.0 | 96.0 | 96.0 |
| Nozzle diameter, in. | 0.190 | 0.200 | 0.200 |
| Cross sectional nozzle area, sq.ft. | 0.000197 | 0.000218 | 0.000218 |
| Barometric pressure, in. Hg | 30.05 | 30.10 | 30.30 |
| Avg. orifice press. diff., in $H_2O$ | 0.70 | 1.03 | 1.00 |
| Avg. dry gas meter temp., deg F | 59.2 | 64.6 | 71.3 |
| Avg. abs. dry gas meter temp., deg. R | 519 | 525 | 531 |
| Total liquid collected by train, ml | 19.8 | 20.5 | 24.6 |
| Std. vol. of $H_2O$ vapor coll., cu.ft. | 0.9 | 1.0 | 1.2 |
| Dry gas meter calibration factor | 0.9972 | 0.9972 | 1.0008 |
| Sample vol. at meter cond., dcf | 44.030 | 53.635 | 52.901 |
| Sample vol. at std. cond., dscf [(1)] | 44.906 | 54.268 | 53.203 |
| Percent of isokinetic sampling | 97.9 | 101.3 | 101.3 |
| **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. | 0.020 | 0.017 | 0.021 |
| Mole fraction of dry gas | 0.980 | 0.983 | 0.979 |
| Molecular wt. of wet gas, lb/lb mole | 28.62 | 28.65 | 28.60 |
| **GAS STREAM VELOCITY AND VOLUMETRIC FLOW DATA:** | | | |
| Static pressure, in. $H_2O$ | 2.10 | 2.10 | 2.00 |
| Absolute pressure, in. Hg | 30.20 | 30.25 | 30.45 |
| Avg. temperature, deg. F | 72 | 71 | 73 |
| Avg. absolute temperature, deg.R | 532 | 531 | 533 |
| Pitot tube coefficient | 0.84 | 0.84 | 0.84 |
| Total number of traverse points | 24 | 24 | 24 |
| Avg. gas stream velocity, ft./sec. | 41.2 | 43.1 | 42.3 |
| Stack/duct cross sectional area, sq.ft. | 9.62 | 9.62 | 9.62 |
| Avg. gas stream volumetric flow, wacf/min. | 23774 | 24901 | 24436 |
| Avg. gas stream volumetric flow, dscf/min. | 23347 | 24611 | 24121 |

[(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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| **LABORATORY REPORT DATA, ug.** | | | |
| HFPO Dimer Acid | 702.4886 | 527.5496 | 145.8367 |
| **EMISSION RESULTS, ug/dscm.** | | | |
| HFPO Dimer Acid | 552.32 | 343.23 | 96.78 |
| **EMISSION RESULTS, lb/dscf.** | | | |
| HFPO Dimer Acid | 3.45E-08 | 2.14E-08 | 6.04E-09 |
| **EMISSION RESULTS, lb/hr.** | | | |
| HFPO Dimer Acid | 4.83E-02 | 3.16E-02 | 8.75E-03 |
| **EMISSION RESULTS, g/sec.** | | | |
| HFPO Dimer Acid | 6.08E-03 | 3.98E-03 | 1.10E-03 |

# APPENDIX A
# PROCESS OPERATIONS DATA

VES Process Data

Date: 11/20/2019

| Time | 800 | | | | 900 | | | 1000 | | | | 1100 | | | 1200 | | | | 1300 | | 1400 | | | | 1500 | | | | 1600 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stack Testing | | | | | | | | RUN 1: 0953 - 1157 | | | | | | | | | | | | | RUN 2: 1342 - 1548 | | | | | | | | | | | |
| VES Product | PM/PE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VES Precursor | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VES Condensation (HFPO) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VES ABR (East) | | | | | | | | | | | | | | | | | | | | | | | | | | | | Burnout | | | | |
| VES ABR (West) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VES Refining | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VES WGS Recirculation Flow | 18500 kg/h | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dimer ISO Venting | | | | | | | | | | | Venting | | | Venting | | | Venting | | | Venting | | | Venting | | | Venting | | | Venting | | | |

Date: 11/21/2019

| Time | 1000 | | | | 1100 | | | 1200 | | | | 1300 | | | 1400 | | | | 1500 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stack Testing | | | | | | | RUN 3: 1143 - 1340 | | | | | | | | | | | | | | | |
| VES Product | PM/PE | | | | | | | | | | | | | | | | | | | | | |
| VES Precursor | | | | | | | | | | | | | | | | | | | | | | |
| VES Condensation (HFPO) | | | | | | | | | | | | | | | | | | | | | | |
| VES ABR (East) | | | | | | | | | | | | | | | | Burnout | | | | | | |
| VES ABR (West) | | | | | | | | | | | | | | | | | | | | | | |
| VES Refining | | | | | | | | | | | | | | | | | | | | | | |
| VES WGS Recirculation Flow | 18500 kg/h | | | | | | | | | | | | | | | | | | | | | |
| Dimer ISO Venting | | | | | | | | | | | | | | Venting | | | Venting | | | | Venting | |

# APPENDIX B
# RAW AND REDUCED TEST DATA

# Sample and Velocity Traverse Point Data Sheet - Method 1

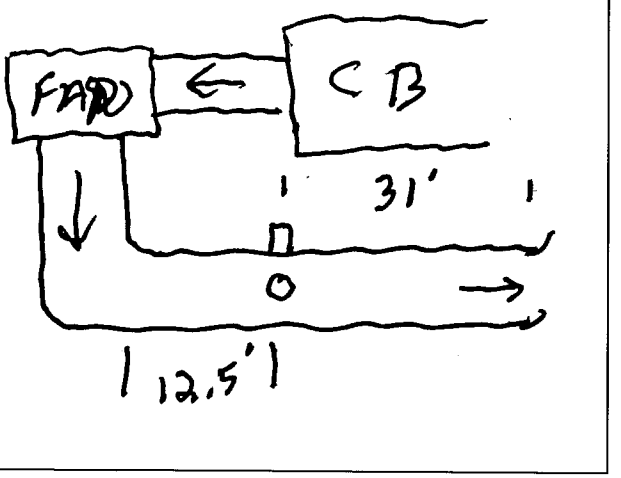
Client: Chemours
Loaction/Plant: Fayetteville
Source: UES CB Out
Operator: DMD/SMA/PG
Date: 7-16-19
W.O. Number:

| | | | | |
|---|---|---|---|---|
| **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 |

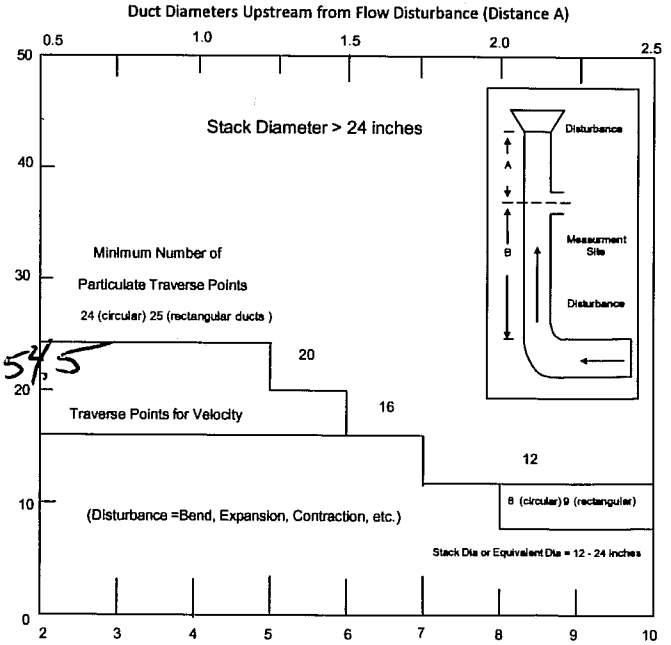
52.72

**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

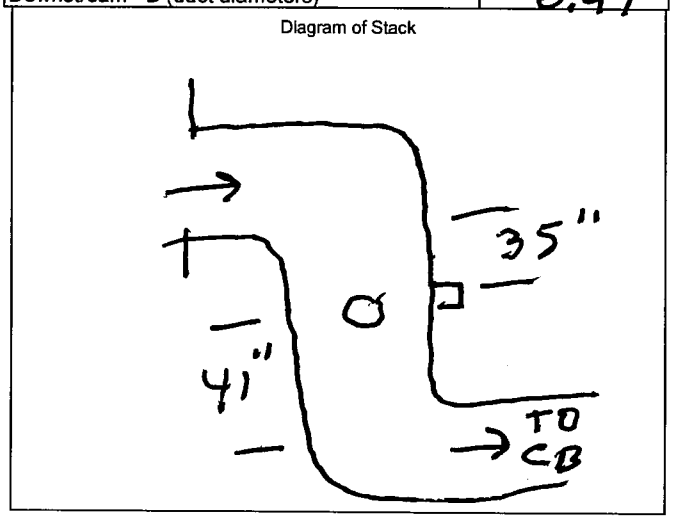
Client: Chemours
Loaction/Plant: Fayetteville
Source: VES CB Inlet
Operator:
Date: 7-16-19
W.O. Number:

| | | | | | |
|---|---|---|---|---|---|
| **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

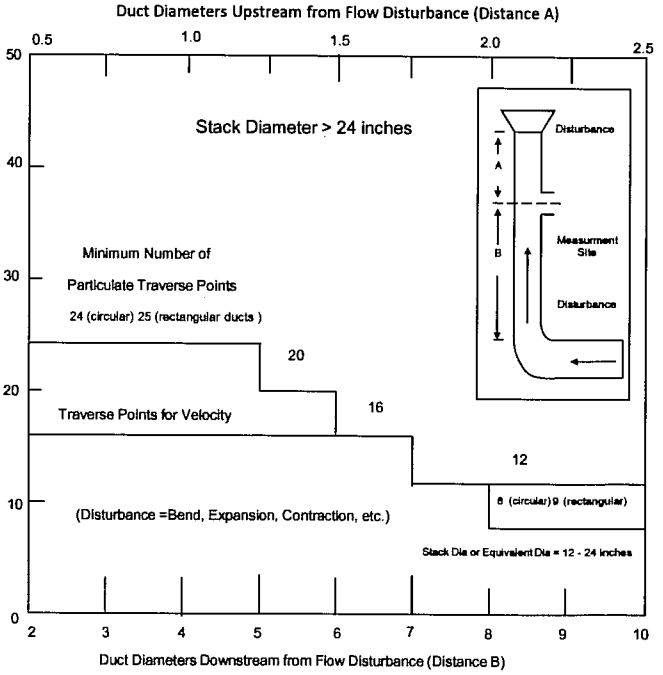



**Traverse Point Locations**

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

**Traverse Point Location Percent of Stack -Rectangular**

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

# Sample and Velocity Traverse Point Data Sheet - Method 1

Client: Chemours
Location/Plant: Fayetteville, NC
Source: VE South

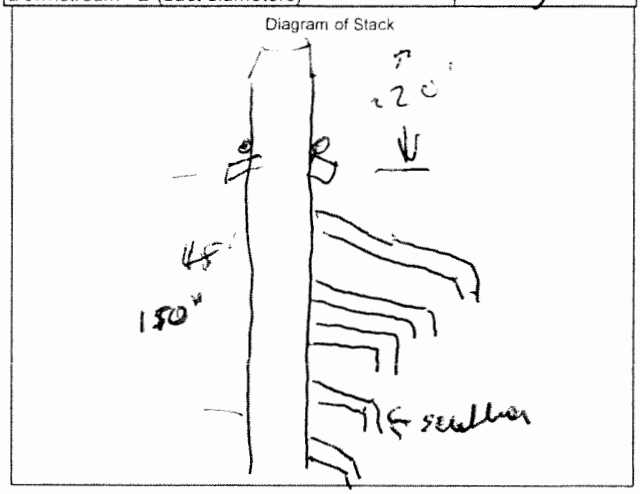
Operator: Ann
Date: 1/10/18
W.O. Number: 15413.002.001.0001

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

| | |
|---|---|
| Distance from far wall to outside of port (in.) = C | 6" |
| Port Depth (in.) = D | 4" |
| Depth of Duct, diameter (in.) = C-D | 49.2 |
| Area of Duct (ft²) | 9.62 |
| Total Traverse Points | 24 |
| Total Traverse Points per Port | 12 |
| Port Diameter (in.) ---(Flange-Threaded-Hole) | 4" |
| Monorail Length | |
| **Rectangular Ducts Only** | |
| Width of Duct, rectangular duct only (in.) | |
| Total Ports (rectangular duct only) | |
| Equivalent Diameter = (2*L*W)/(L+W) | |

| **Flow Disturbances** | |
|---|---|
| Upstream - A (ft) | >20' |
| Downstream - B (ft) | 12.5' |
| Upstream - A (duct diameters) | >5 |
| Downstream - B (duct diameters) | ~3.6 |

Diagram of Stack




**Traverse Point Locations**

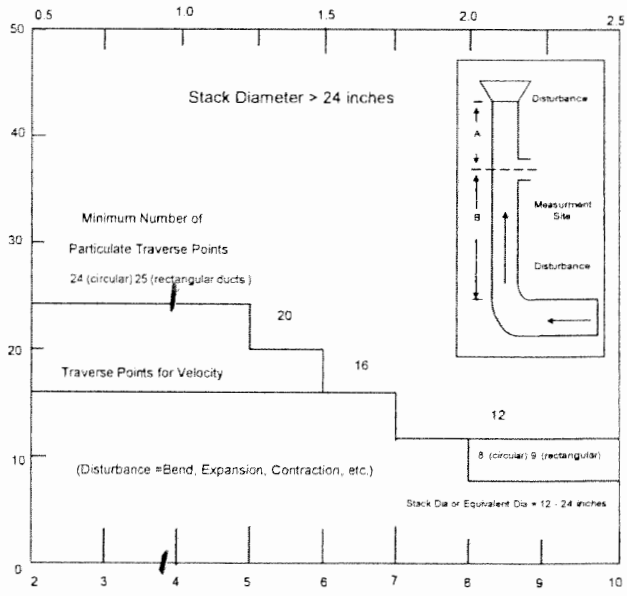
| Traverse Point | % of Duct | Distance from Inside Duct Wall (in) | Distance from Outside of Port (in) |
|---|---|---|---|
| 1 | 2.1 | 0.88 | 19.9 20.0 |
| 2 | 6.7 | 2.81 | 21.0 |
| 3 | 11.8 | 4.96 | 23.9 3/8 |
| 4 | 17.7 | 7.4 | 26.1 |
| 5 | 25.0 | 10.5 | 29.1/2 |
| 6 | 35.6 | 14.95 | 33.3/4 34 |
| 7 | 64.4 | 27.0 | 46.0 |
| 8 | 75 | 31.5 | 50.5 |
| 9 | 82.3 | 34.57 | 53 5/8 |
| 10 | 88.2 | 37.0 | 56.0 |
| 11 | 93.3 | 39.2 | 58.1/8 |
| 12 | 97.9 | 41.1 | 60.0 |

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

**Traverse Point Location Percent of Stack -Rectangular**

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

WESTON MANAGERS DESIGNERS/CONSULTANTS

**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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| Operator | WF/AS | WF/JV/AS | AS/JV/WF |
| | | | |
| **Inputs For Calcs.** | | | |
| Sq. rt. delta P | 1.17800 | 1.16254 | 1.15314 |
| Delta H | 1.0254 | 1.0458 | 0.9842 |
| Stack temp. (deg.F) | 73.6 | 73.7 | 72.9 |
| Meter temp. (deg.F) | 61.0 | 66.4 | 60.0 |
| Sample volume (act.) | 50.118 | 51.536 | 49.722 |
| Barometric press. (in.Hg) | 30.05 | 30.10 | 30.30 |
| Volume $H_2O$ imp. (ml) | 3.0 | 4.0 | 4.0 |
| Weight change sil. gel (g) | 16.0 | 14.8 | 12.3 |
| % $CO_2$ | 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.$H_2O$) | -5.00 | -5.00 | -5.00 |
| 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 |

VES CB INLET

# ISOKINETIC FIELD DATA SHEET

# EPA Method 0010 - HFPO Dimer Acid



| | |
|---|---|
| Client | Chemours |
| W.O.# | 15418.002.018 |
| Project ID | Chemours |
| Mode/Source ID | VES |
| Samp. Loc. ID | CB IN |
| Run No.ID | 1 |
| Test Method ID | M0010 |
| Date ID | NOV2019 |
| Source/Location | VE South CB Inlet |
| Sample Date | 11/19/19 |
| Baro. Press (in Hg) | 30.07 |
| Operator | WF/RS |

| Stack Conditions | Assumed | Actual |
|---|---|---|
| % Moisture | 3% | |
| Impinger Vol (ml) | | |
| Silica gel (g) | | |
| CO2, % by Vol | 0.0 | |
| O2, % by Vol | 20.9 | |
| Temperature (°F) | 90 | |
| Meter Temp (°F) | 55 | |
| Static Press (in $H_2O$) | -5.0 | |
| Ambient Temp (°F) | 62 | |

| | | | |
|---|---|---|---|
| Meter Box ID | 31 | | |
| Meter Box Y | 1.0066 | | |
| Meter Box Del H | 1.9526 | | |
| Probe ID / Length | P697 | | |
| Probe Material | Boro | | |
| Pitot / Thermocouple ID | P697 | | |
| Pitot Coefficient | 0.84 | | |
| Nozzle ID | | | |
| Nozzle Measurements | 0.160 | 0.160 | 0.160 |
| Avg Nozzle Dia (in) | 0.160 | | |
| Area of Stack ($ft^2$) | 7.068 | | |
| Sample Time | 96 | | |
| Total Traverse Pts | 24 | | |

K Factor ~~0.68~~ 0.70

| | Initial | Mid-Point | Final |
|---|---|---|---|
| Sample Train ($ft^3$) | 0.007 | 0.003 | 0.005 |
| Leak Check @ (in Hg) | 14 | 5 | 8 |
| Pitot leak check good | yes / no | yes / no | yes / no |
| Pitot Inspection good | yes / no | yes / no | yes / no |
| Method 3 System good | yes / no | yes / no | yes / no |
| **Temp Check** | Pre-Test Set | | Post-Test Set |
| Meter Box Temp | 55 | | 58 |
| Reference Temp | 56 | | 59 |
| 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 | 0953 | | | 232.975 | | | | | | | | | |
| X 1 | 4 | | WF ~~1.3~~ 1.7 | 1.19 | 236.1 | 76 | 57 | 119 | 120 | 53 | 4.0 | 39 | | 26.177 |
| 2 | 8 | | 1.8 | 1.26 | 237.5 | 75 | 57 | 124 | 122 | 50 | 4.0 | 39 | | |
| 3 | 12 | | 1.6 | 1.12 | 239.7 | 74 | 58 | 118 | 121 | 48 | 4.0 | 37 | | |
| 4 | 16 | | 1.8 | 1.26 | 241.9 | 74 | 58 | 120 | 121 | 49 | 4.0 | 38 | | |
| 5 | 20 | | 1.7 | 1.19 | 244.3 | 74 | 59 | 124 | 121 | 49 | 4.0 | 38 | | |
| 6 | 24 | | 1.7 | 1.19 | 246.6 | 73 | 59 | 124 | 121 | 51 | 4.0 | 38 | | |
| 7 | 28 | | 1.6 | 1.12 | 248.8 | 72 | 59 | 123 | 123 | 51 | 4.0 | 38 | | |
| 8 | 32 | | 1.5 | 1.05 | 251.0 | 72 | 60 | 117 | 120 | 51 | 4.0 | 38 | | |
| 9 | 36 | | 1.4 | .98 | 253.1 | 71 | 60 | 124 | 120 | 52 | 4.0 | 38 | | |
| 10 | 40 | | 1.4 | .98 | 255.2 | 71 | 60 | 117 | 121 | 52 | 4.0 | 38 | | |
| 11 | 44 | | 1.3 | 91.91 | 257.2 | 72 | 61 | 117 | 121 | 51 | 3.5 | 38 | | |
| 12 | 48 | 1041 | 1.1 | .77 | 259.152 | 75 | 61 | 123 | 122 | 52 | 3.5 | 37 | | |
| | 0 | 1109 | | | 159.264 | | | | | | | | | |
| Y 1 | 4 | | 2.4 | 1.68 | 261.8 | 73 | 61 | 123 | 120 | 54 | 5.0 | 39 | | 33.741 |
| 2 | 8 | | 2.3 | 1.61 | 264.5 | 73 | 62 | 117 | 122 | 50 | 5.5 | 39 | | |
| 3 | 12 | | 2.1 | 1.47 | 267.0 | 73 | 62 | 120 | 122 | 49 | 5.0 | 39 | | |
| 4 | 16 | | 2.0 | 1.40 | 269.6 | 73 | 62 | 125 | 122 | 51 | 5.0 | 39 | | |
| 5 | 20 | | 2.0 | 1.40 | 272.2 | 73 | 63 | 118 | 122 | 52 | 5.0 | 37 | | |
| 6 | 24 | | 1.8 | 1.26 | 274.6 | 73 | 63 | 115 | 121 | 53 | 4.5 | 40 | | |
| 7 | 28 | | 1.3 | 91.91 | 276.7 | 73 | 63 | 120 | 122 | 54 | 4.0 | 42 | | |
| 8 | 32 | | .98 | .68 | 278.4 | 74 | 64 | 123 | 120 | 54 | 3.0 | 42 | | |
| 9 | 36 | | .67 | .47 | 280.0 | 74 | 64 | 119 | 121 | 55 | 2.5 | 43 | | |
| 10 | 40 | | .45 | .32 | 281.2 | 75 | 64 | 118 | 121 | 55 | 2.0 | 43 | | |
| 11 | 44 | | .34 | .23 | 282.3 | 76 | 64 | 121 | 120 | 55 | 2.0 | 44 | | |
| 12 | 48 | 1157 | .23 | .16 | 283.205 | 78 | 64 | 121 | 122 | 55 | 1.5 | 44 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 1.46541667 | 1.02541667 | ~~250.73~~ | 73.625 | 61.041 | 115/125 | 120/123 | 55 | 5.5 | 37/44 | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 1.17799631 | .98525016711 | 50.118 | | | | | | | | | |


Point 1 all the way in

EPA Method 0010 from EPA SW-846

99,017 1.71 %Iso

3740 usct

VES CB INLET

# ISOKINETIC FIELD DATA SHEET

## EPA Method 0010 - HFPO Dimer Acid



| | | Stack Conditions | Assumed | Actual |
|---|---|---|---|---|
| Client | Chemours | | | |
| W.O.# | 15418.002.018 | | | |
| Project ID | Chemours | % Moisture | 1.7 | |
| Mode/Source ID | VES | Impinger Vol (ml) | | 3 |
| Samp. Loc. ID | CB IN | Silica gel (g) | | 14.6 |
| Run No.ID | 2 | CO2, % by Vol | 0 | 0 |
| Test Method ID | M0010 | O2, % by Vol | 20.9 | 20.9 |
| Date ID | NOV2019 | Temperature (°F) | 75 | |
| Source/Location | VE South CB Inlet | Meter Temp (°F) | 65 | |
| Sample Date | 11/20/19 | Static Press (in $H_2O$) | -5.0 | -5.0 |
| Baro. Press (in Hg) | 30.10 | | | |
| Operator | WF/JV/AS | Ambient Temp (°F) | 62 | |

| | | | |
|---|---|---|---|
| Meter Box ID | 31 | | |
| Meter Box Y | 1.0066 | | |
| Meter Box Del H | 1.9526 | | |
| Probe ID / Length | P697 | | Sample Train (ft³) |
| Probe Material | | Boro | Leak Check @ (in Hg) |
| Pitot / Thermocouple ID | P697 | | Pitot leak check good |
| Pitot Coefficient | | 0.84 | Pitot Inspection good |
| Nozzle ID | | | Method 3 System good |
| Nozzle Measurements | .160 | .160 .160 | **Temp Check** |
| Avg Nozzle Dia (in) | .160 | | Meter Box Temp |
| Area of Stack (ft²) | 7.068 | | Reference Temp |
| Sample Time | 96 | | Pass/Fail (+/- 2°) |
| Total Traverse Pts | 24 | | Temp Change Response ? |

K Factor .73

| | Initial | Mid-Point | Final |
|---|---|---|---|
| | .014 | 0.015 | 0.013 |
| | 14 in | 8 | 8 |
| | yes / no | yes / no | yes / no |
| | yes / no | yes / no | yes / no |
| | yes / no | yes / no | yes / no |
| | yes / no | yes / no | yes / no |
| **Temp Check** | Pre-Test Set | | Post-Test Set |
| Meter Box Temp | 61 | | 62 |
| Reference Temp | 618 | | 62 |
| 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 | 1342 | | | 283.372 | | | | | | | | | |
| Y 1 | 4 | | 2.3 | 1.68 | 286.0 | 72 | 65 | 124 | 120 | 58 | 6.0 | 54 | | 24.745 |
| 2 | 8 | | 2.3 | 1.68 | 288.8 | 72 | 65 | 119 | 122 | 56 | 6.0 | 55 | | |
| 3 | 12 | | 2.3 | 1.68 | 291.5 | 72 | 65 | 116 | 122 | 58 | 6.0 | 55 | | |
| 4 | 16 | | 2.1 | 1.53 | 294.1 | 73 | 65 | 119 | 122 | 65 | 5.5 | 55 | | |
| 5 | 20 | | 2.0 | 1.46 | 296.8 | 73 | 66 | 123 | 122 | 62 | 5.5 | 39 | | |
| 6 | 24 | | 1.8 | 1.31 | 299.3 | 73 | 66 | 119 | 122 | 56 | 5.0 | 36 | | |
| 7 | 28 | | 1.3 | .95 | 301.4 | 73 | 66 | 115 | 121 | 51 | 4.0 | 36 | | |
| 8 | 32 | | 1.0 | .73 | 303.3 | 73 | 66 | 120 | 120 | 48 | 3.0 | 37 | | |
| 9 | 36 | | .69 | .50 | 304.8 | 74 | 66 | 125 | 121 | 47 | 2.5 | 37 | | |
| 10 | 40 | | .46 | .34 | 306.1 | 74 | 66 | 119 | 120 | 47 | 2.0 | 37 | | |
| 11 | 44 | | .31 | .23 | 307.2 | 75 | 66 | 118 | 121 | 48 | 2.0 | 36 | | |
| 12 | 48 | 1430 | .22 | .16 | 308.115 | 77 | 66 | 122 | 120 | 48 | 1.5 | 36 | | |
| | | 1599 | | | 308.294 | | | | | | | | | 308.294 |
| X 1 | 4 | ~~1500~~ | 1.7 | 1.24 | 310.7 | 75 | 66 | 119 | 120 | 55 | 4.5 | 37 | | 26.793 |
| 2 | 8 | | 1.8 | 1.31 | 313.1 | 74 | 66 | 118 | 121 | 45 | 5.0 | 36 | | |
| 3 | 12 | | 1.7 | 1.24 | 315.5 | 74 | 66 | 120 | 122 | 44 | 4.5 | 36 | | |
| 4 | 16 | | 1.7 | 1.24 | 318.0 | 74 | 67 | 123 | 121 | 44 | 4.5 | 36 | | |
| 5 | 20 | | 1.6 | 1.17 | 320.3 | 73 | 67 | 121 | 121 | 45 | 4.5 | 36 | | |
| 6 | 24 | | 1.6 | 1.17 | 322.7 | 73 | 67 | 115 | 121 | 45 | 4.5 | 37 | | |
| 7 | 28 | | 1.5 | 1.10 | 325.0 | 73 | 67 | 120 | 121 | 43 | 4.5 | 36 | | |
| 8 | 32 | | 1.4 | 1.02 | 327.2 | 73 | 67 | 123 | 120 | 46 | 4.0 | 37 | | |
| 9 | 36 | | 1.3 | .95 | 329.3 | 72 | 68 | 120 | 120 | 46 | 3.5 | 37 | | |
| 10 | 40 | | 1.3 | .95 | 331.4 | 73 | 68 | 116 | 121 | 46 | 3.5 | 36 | | |
| 11 | 44 | | 1.0 | .73 | 333.2 | 76 | 68 | 121 | 121 | 46 | 3.0 | 37 | | |
| 12 | 48 | 1548 | 1.0 | .73 | 335.087 | 77 | 68 | 122 | 121 | 47 | 3.0 | 36 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 1.4325 | 1.0456 | 51.536 | 73.6 | 66.37 | 115/125 | 120/122 | 65 | 6.0 | 36/55 | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 1.1625 | .9934 | | | | | | | | | | |

EPA Method 0010 from EPA SW-846

ISO = 102.1
Bws = 1.56
Flow = 27103
Vstd = 52.46

VES CB INLET

# ISOKINETIC FIELD DATA SHEET

## EPA Method 0010 - HFPO Dimer Acid



| | |
|---|---|
| Client | Chemours |
| W.O.# | 15418.002.018 |
| Project ID | Chemours |
| Mode/Source ID | VES |
| Samp. Loc. ID | CB IN |
| Run No.ID | 3 |
| Test Method ID | M0010 |
| Date ID | NOV2019 |
| Source/Location | VE South CB Inlet |
| Sample Date | 11-21-19 |
| Baro. Press (in Hg) | 30.30 |
| Operator | AS/JV/W |

| Stack Conditions | Assumed | Actual |
|---|---|---|
| % Moisture | 2 | |
| Impinger Vol (ml) | | |
| Silica gel (g) | | |
| CO2, % by Vol | 0 | |
| O2, % by Vol | 20.9 | |
| Temperature (°F) | 70 | |
| Meter Temp (°F) | 56 | |
| Static Press (in $H_2O$) | -5 | -5 |
| Ambient Temp (°F) | 60 | |

| | | | |
|---|---|---|---|
| Meter Box ID | 31 | | |
| Meter Box Y | 1.0066 | | |
| Meter Box Del H | 1.9526 | | |
| Probe ID / Length | P697 | 6ft | |
| Probe Material | Boro | | |
| Pitot / Thermocouple ID | P697 | | |
| Pitot Coefficient | 0.84 | | |
| Nozzle ID | .160 | | |
| Nozzle Measurements | 0.160 | 0.160 | 0.160 |
| Avg Nozzle Dia (in) | 0.160 | | |
| Area of Stack ($ft^2$) | 7.068 | | |
| Sample Time | 96 | | |
| Total Traverse Pts | 24 | | |

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

K Factor .71

| Initial | Mid-Point | Final |
|---|---|---|
| .014 | .005 | .005 |
| 15.0 | 6 in | 6 in |
| yes / no | yes / no | yes / no |
| yes / no | yes / no | yes / no |
| yes / no | yes / no | yes / no |
| Pre-Test Set | | Post-Test Set |
| 54 | | |
| ~~53~~ 54 | | 54.1 |
| Pass / Fail | | Pass / Fail |
| yes / no | | yes / no |

| TRAVERSE POINT NO. | SAMPLE TIME (min) | CLOCK TIME (plant time) | VELOCITY PRESSURE Delta P (in H2O) | ORIFICE PRESSURE Delta H (in H2O) | DRY GAS METER READING ($ft^3$) | STACK TEMP (°F) | DGM OUTLET TEMP (oF) | PROBE TEMP (oF) | FILTER BOX TEMP (F) | IMPINGER EXIT TEMP (oF) | SAMPLE TRAIN VAC (in Hg) | XAD EXIT TEMP (F) | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1143 | | | 335.322 | | | | | | | | | |
| Y 1 | 4 | | 2.3 | 1.6 | 337.9 | 73 | 55 | 123 | 122 | 51 | 4.5 | 40 | | 23.975 |
| 2 | 8 | | 2.2 | 1.5 | 340.5 | 73 | 55 | 126 | 122 | 44 | 4.5 | 37 | | |
| 3 | 12 | | 2.2 | 1.5 | 343.2 | 73 | 56 | 117 | 122 | 42 | 4.5 | 38 | | |
| 4 | 16 | | 2.0 | 1.4 | 345.7 | 73 | 56 | 118 | 122 | 43 | 4.5 | 37 | | |
| 5 | 20 | | 2.0 | 1.4 | 348.3 | 73 | 57 | 123 | 122 | 45 | 4.5 | 38 | | |
| 6 | 24 | | 1.8 | 1.2 | 350.7 | 73 | 58 | 122 | 122 | 46 | 4.0 | 38 | | |
| 7 | 28 | | 1.3 | .92 | 352.8 | 73 | 58 | 116 | 121 | 46 | 3.5 | 38 | | |
| 8 | 32 | | 1.0 | .71 | 354.6 | 73 | 59 | 118 | 122 | 46 | 3.0 | 38 | | |
| 9 | 36 | | .69 | .49 | 356.1 | 73 | 59 | 124 | 122 | 46 | 2.5 | 39 | | |
| 10 | 40 | | .41 | .29 | 357.3 | 73 | 60 | 122 | 122 | 47 | 2.0 | 40 | | |
| 11 | 44 | | .32 | .23 | 358.4 | 74 | 60 | 116 | 121 | 47 | 2.0 | 40 | | |
| 12 | 48 | 1231 | .18 | .13 | 359.297 | 76 | 60 | 120 | 122 | 48 | 1.5 | 41 | | |
| | | 1252 | | | 359.402 | | | | | | | | | |
| X 1 | 4 | | 1.8 | 1.27 | 361.6 | 74 | 61 | 118 | 121 | 53 | 4.0 | 41 | | 25.747 |
| 2 | 8 | | 1.8 | 1.27 | 364.0 | 73 | 61 | 119 | 121 | 45 | 4.0 | 38 | | |
| 3 | 12 | | 1.7 | 1.20 | 366.3 | 72 | 62 | 122 | 122 | 43 | 4.0 | 39 | | |
| 4 | 16 | | 1.6 | 1.1 | 368.6 | 72 | 62 | 124 | 122 | 44 | 3.5 | 38 | | |
| 5 | 20 | | 1.6 | 1.1 | 370.9 | 72 | 62 | 117 | 121 | 44 | 3.5 | 38 | | |
| 6 | 24 | | 1.6 | 1.1 | 373.2 | 72 | 62 | 119 | 121 | 45 | 3.5 | 38 | | |
| 7 | 28 | | 1.4 | .99 | 375.3 | 72 | 63 | 122 | 122 | 45 | 3.5 | 39 | | |
| 8 | 32 | | 1.3 | .92 | 377.3 | 72 | 63 | 123 | 121 | 46 | 3.0 | 40 | | |
| 9 | 36 | | 1.3 | .92 | 379.4 | 72 | 63 | 117 | 122 | 46 | 3.0 | 39 | | |
| 10 | 40 | | 1.2 | .85 | 381.3 | 72 | 63 | 118 | 122 | 46 | 3.0 | 40 | | |
| 11 | 44 | | 1.2 | .85 | 383.3 | 72 | 63 | 124 | 121 | 46 | 3.0 | 40 | | |
| 12 | 48 | 1340 | .97 | .68 | 385.149 | 74 | 63 | 124 | 122 | 47 | 3.0 | 39 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 1.4112 | .9641 | 49.122 | 72.87 | 60.0416 | 116/126 | 121/122 | 53 | 4.5 | 37/41 | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 1.1531 | .9639 | | | | | | | | | | |

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

VES CB INLET

# SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

| | | | |
|---|---|---|---|
| Client | Chemours | W.O. # | 15418.002.018 |
| Location/Plant | Fayetteville, NC | Source & Location | VE South CB Inlet |

**Run No.** 1 — Sample Date 11/20/19 — Recovery Date 11/20/19

Sample I.D. Chemours - VES - CB IN - 1 - M0010 - — Analyst JMO/LWF/AS — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 3 | 100 | 100 | 0 | | | | | 316 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 3 | 0 | 0 | 0 | | | | 3 J | 16 J | 19 |

Impinger Color all clear — Labeled? ✓

Silica Gel Condition 4% 30% — Sealed? ✓

**Run No.** 2 — Sample Date 11/20/19 — Recovery Date 11/20/19

Sample I.D. Chemours - VES - CB IN - 2 - M0010 - — Analyst JMO/LWF/AS — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 4 | 100 | 100 | 0 | | | | | 314.8 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 4 | 0 | 0 | 0 | | | | 4.3 J | 14.8 | 17.8 |

Impinger Color all clear — Labeled? ✓ — 18.8

Silica Gel Condition 4% 90% — Sealed? ✓

**Run No.** 3 — Sample Date 11-21-19 — Recovery Date 11-21-19

Sample I.D. Chemours - VES - CB IN - 3 - M0010 - — Analyst JMO/AS/LWF — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 4 | 100 | 100 | 0 | | | | | 312.3 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 4 | 0 | 0 | 0 | | | | 4 J | 12.3 | 16.3 |

Impinger Color all clear — Labeled? ✓

Silica Gel Condition 4% 90% — Sealed? ✓

Check COC for Sample IDs of Media Blanks

| Balance Check | Known | Actual | |
|---|---|---|---|
| 11-14-19 | 500 | 499.8 | JMO |
| 20 JMO | | | |
| 11-21-19 | 500 | 500 | JMO |

# 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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| Operator | JM | JM | JM |

**Inputs For Calcs.**

| | | | |
|---|---|---|---|
| Sq. rt. delta P | 0.83668 | 0.85586 | 0.86002 |
| Delta H | 1.4608 | 1.5300 | 1.5458 |
| Stack temp. (deg.F) | 73.4 | 71.4 | 74.1 |
| Meter temp. (deg.F) | 63.5 | 62.0 | 67.1 |
| Sample volume (act.) | 57.729 | 58.798 | 59.342 |
| Barometric press. (in.Hg) | 30.05 | 30.10 | 30.30 |
| Volume $H_2O$ imp. (ml) | 4.0 | 7.0 | 4.0 |
| Weight change sil. gel (g) | 15.0 | 19.6 | 14.1 |
| % $CO_2$ | 0.0 | 0.0 | 0.0 |
| % $O_2$ | 20.9 | 20.9 | 20.9 |
| % $N_2$ | 79.1 | 79.1 | 79.1 |
| Area of stack (sq.ft.) | 9.390 | 9.390 | 9.390 |
| Sample time (min.) | 96.0 | 96.0 | 96.0 |
| Static pressure (in.$H_2O$) | 2.70 | 2.60 | 2.60 |
| Nozzle dia. (in.) | 0.200 | 0.200 | 0.200 |
| Meter box cal. | 1.0005 | 1.0005 | 1.0005 |
| Cp of pitot tube | 0.84 | 0.84 | 0.84 |
| Traverse points | 24 | 24 | 24 |

VES CB OUTLET

# ISOKINETIC FIELD DATA SHEET

## EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

| | |
|---|---|
| Client | Chemours |
| W.O.# | 15418.002.018 |
| Project ID | Chemours |
| Mode/Source ID | VES |
| Samp. Loc. ID | CB OUT |
| Run No.ID | 1 |
| Test Method ID | M0010 |
| Date ID | NOV2019 |
| Source/Location | VE South Outlet |
| Sample Date | 11/20/19 |
| Baro. Press (in Hg) | 30.05 |
| Operator | MILLS |

**Stack Conditions**

| | Assumed | Actual |
|---|---|---|
| % Moisture | 2 | |
| Impinger Vol (ml) | | |
| Silica gel (g) | | |
| CO2, % by Vol | 0 | |
| O2, % by Vol | 20.9 | |
| Temperature (°F) | 74 | |
| Meter Temp (°F) | 55 | |
| Static Press (in $H_2O$) | +2.4 | +2.7 |
| Ambient Temp (°F) | 60 | |

| | |
|---|---|
| Meter Box ID | VNC 23 |
| Meter Box Y | 1.0005 |
| Meter Box Del H | 2.2926 |
| Probe ID / Length | SS (Boro) |
| Probe Material | |
| Pitot / Thermocouple ID | D375 |
| Pitot Coefficient | (0.84) |
| Nozzle ID | 0.200 / 0.201 / 0.200 |
| Nozzle Measurements | 0.200 |
| Avg Nozzle Dia (in) | 4.34 |
| Area of Stack ($ft^2$) | 96 |
| Sample Time | 24 |
| Total Traverse Pts | |

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

K Factor 2.04

| | Initial | Mid-Point | Final |
|---|---|---|---|
| | 0.008 | 0.006 | 0.008 |
| | 15 | 12 | 8 |
| | yes / no | yes / no | yes / no |
| | yes / no | yes / no | yes / no |
| | yes / no | yes / no | yes / no |
| **Temp Check** | Pre-Test Set | | Post-Test Set |
| | 49 | | 61 |
| | 49 | | 60 |
| | Pass / Fail | | Pass / Fail |
| | yes / no | | yes / no |

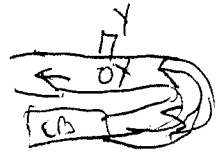
| TRAVERSE POINT NO. | SAMPLE TIME (min) | CLOCK TIME (plant time) | VELOCITY PRESSURE Delta P (in H2O) | ORIFICE PRESSURE Delta H (in H2O) | DRY GAS METER READING ($ft^3$) | STACK TEMP (°F) | DGM OUTLET TEMP (°F) | PROBE TEMP (°F) | FILTER BOX TEMP (F) | IMPINGER EXIT TEMP (oF) | SAMPLE TRAIN VAC (in Hg) | XAD EXIT TEMP (F) | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 0453 | | | 697.415 | | | | | | | | | |
| 1 | 4 | | 0.47 | 0.96 | 699.4 | 73 | 60 | 130 | 129 | 55 | 2 | 54 | | |
| 2 | 8 | | 0.50 | 1.02 | 701.4 | 74 | 60 | 130 | 130 | 50 | 2 | 45 | | |
| 3 | 12 | | 0.54 | 1.10 | 703.5 | 74 | 60 | 129 | 125 | 48 | 2 | 45 | | |
| 4 | 16 | | 0.58 | 1.18 | 705.6 | 74 | 61 | 122 | 121 | 48 | 2 | 45 | | |
| 5 | 20 | | 0.61 | 1.24 | 707.9 | 74 | 61 | 123 | 124 | 48 | 2 | 46 | | |
| 6 | 24 | | 0.68 | 1.39 | 710.3 | 74 | 62 | 123 | 123 | 48 | 2 | 46 | | |
| 7 | 28 | | 0.80 | 1.63 | 712.8 | 74 | 62 | 124 | 126 | 49 | 3 | 45 | | |
| 8 | 32 | | 0.85 | 1.73 | 715.5 | 74 | 62 | 123 | 122 | 50 | 3 | 46 | | |
| 9 | 36 | | 0.92 | 1.88 | 718.2 | 74 | 62 | 122 | 122 | 51 | 4 | 46 | | |
| 10 | 40 | | 0.95 | 1.94 | 721.0 | 73 | 62 | 123 | 124 | 51 | 4 | 46 | | |
| 11 | 44 | | 1.0 | 2.04 | 723.8 | 74 | 62 | 123 | 123 | 52 | 4 | 46 | | 29,475 |
| 12 | 48 | 1041 | 1.05 | 2.14 | 726.838 | 73 | 63 | 123 | 123 | 52 | 4 | 47 | | |
| | | 1109 | — | — | 727.100 | — | — | — | — | — | — | — | | |
| 1 | 4 | | 0.96 | 1.96 | 729.8 | 72 | 64 | 123 | 126 | 61 | 4 | 57 | | |
| 2 | 8 | | 0.95 | 1.94 | 732.7 | 73 | 64 | 123 | 124 | 49 | 4 | 48 | | |
| 3 | 12 | | 0.90 | 1.84 | 735.4 | 73 | 64 | 123 | 122 | 47 | 4 | 47 | | |
| 4 | 16 | | 0.89 | 1.82 | 738.1 | 73 | 65 | 122 | 123 | 47 | 4 | 47 | | |
| 5 | 20 | | 0.85 | 1.73 | 740.7 | 73 | 66 | 123 | 122 | 47 | 3 | 47 | | |
| 6 | 24 | | 0.78 | 1.60 | 743.3 | 73 | 66 | 123 | 122 | 47 | 3 | 48 | | |
| 7 | 28 | | 0.62 | 1.26 | 745.6 | 73 | 66 | 123 | 122 | 48 | 3 | 48 | | |
| 8 | 32 | | 0.54 | 1.10 | 747.6 | 74 | 67 | 123 | 122 | 47 | 2 | 48 | | |
| 9 | 36 | | 0.44 | 0.90 | 749.8 | 74 | 66 | 123 | 122 | 47 | 2 | 49 | | |
| 10 | 40 | | 0.41 | 0.84 | 751.7 | 73 | 66 | 124 | 122 | 47 | 2 | 49 | | |
| 11 | 44 | | 0.42 | 0.86 | 753.6 | 73 | 66 | 123 | 122 | 46 | 2 | 48 | | 28,306 |
| 12 | 48 | 1151 | 0.40 | 0.82 | 755.408 | 73 | 66 | 123 | 121 | 46 | 2 | 48 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 0.715833 | 1.4608 | 57.779 | 73.42 | 63.45 | | | | | | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 0.836678 | 1.19584 | | | | | | | | | | |

EPA Method 0010 from EPA SW-846

1.5% m

26200

100.6



VLV CD OMPA

# ISOKINETIC FIELD DATA SHEET

# EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

| | | Stack Conditions | Assumed | Actual |
|---|---|---|---|---|
| Client | Chemours | | | |
| W.O.# | 15418.002.018 | | | |
| Project ID | Chemours | % Moisture | 1.5 | |
| Mode/Source ID | VES | Impinger Vol (ml) | | |
| Samp. Loc. ID | CB OUT | Silica gel (g) | | |
| Run No.ID | 2 | CO2, % by Vol | 0 | |
| Test Method ID | M0010 | O2, % by Vol | 20.9 | |
| Date ID | NOV2019 | Temperature (°F) | 74 | |
| Source/Location | VE South / Outlet | Meter Temp (°F) | | |
| Sample Date | 11/20/19 | Static Press (in $H_2O$) | 2.7 | 2.6 |
| Baro. Press (in Hg) | 30.01 30.10 | | | |
| Operator | Mills | Ambient Temp (°F) | | |

| | | | | |
|---|---|---|---|---|
| Meter Box ID | MC23 | | | |
| Meter Box Y | 1.0005 | | | |
| Meter Box Del H | 2.2926 | | | |
| Probe ID / Length | 5FT | | Sample Train ($ft^3$) | |
| Probe Material | Boro | | Leak Check @ (in Hg) | |
| Pitot / Thermocouple ID | P35 | | Pitot leak check good | yes / no |
| Pitot Coefficient | 0.84 | | Pitot Inspection good | yes / no |
| Nozzle ID | | | Method 3 System good | N/A yes / no |
| Nozzle Measurements | 0.200 | 0.201 | 0.202 | **Temp Check** |
| Avg Nozzle Dia (in) | 0.200 | | | 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 2.04

| | Initial | Mid-Point | Final |
|---|---|---|---|
| Sample Train ($ft^3$) | 0.005 | 0.004 | 0.008 |
| Leak Check @ (in Hg) | 15 | 8 | 8 |
| Pitot leak check good | yes / no | yes / no | yes / no |
| Pitot Inspection good | yes / no | yes / no | yes / no |
| Method 3 System good | ~~yes / no~~ | yes / no | yes / no |
| **Temp Check** | Pre-Test Set | | Post-Test Set |
| Meter Box Temp | 61 | | 58 |
| Reference Temp | 61 | | 59 |
| 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 | 1342 | | | 755.663 | | | | | | | | | |
| Y Pt 1 | 4 | | 0.46 | 0.94 | 757.6 | 71 | 63 | 121 | 120 | 51 | 2 | 44 | | |
| 2 | 8 | | 0.50 | 1.02 | 759.6 | 71 | 63 | 122 | 122 | 48 | 2 | 41 | | |
| 3 | 12 | | 0.53 | 1.12 | 761.8 | 71 | 62 | 123 | 122 | 44 | 2 | 40 | | |
| 4 | 16 | | 0.58 | 1.18 | 764.0 | 71 | 62 | 123 | 121 | 43 | 2 | 42 | | |
| 5 | 20 | | 0.67 | 1.37 | 766.2 | 71 | 61 | 123 | 124 | 44 | 2 | 43 | | |
| 6 | 24 | | 0.71 | 1.45 | 768.7 | 71 | 62 | 123 | 122 | 45 | 3 | 44 | | |
| 7 | 28 | | 0.85 | 1.73 | 771.4 | 71 | 61 | 123 | 123 | 45 | 3 | 41 | | |
| 8 | 32 | | 0.89 | 1.82 | 774.0 | 71 | 62 | 123 | 125 | 47 | 3 | 41 | | |
| 9 | 36 | | 0.98 | 2.00 | 776.7 | 71 | 62 | 123 | 123 | 49 | 4 | 42 | | |
| 10 | 40 | | 1.00 | 2.04 | 779.7 | 72 | 62 | 124 | 122 | 49 | 4 | 42 | | 39.967 |
| 11 | 44 | | 1.05 | 2.14 | 782.6 | 71 | 62 | 123 | 122 | 50 | 4 | 41 | | |
| Pt Pt 12 | 48 | 1430 | 1.10 | 2.24 | 785.630 | 71 | 62 | 123 | 124 | 51 | 4 | 41 | | |
| | 0 | 1500 | — | — | 786.235 | — | — | — | — | — | — | — | | |
| X IN 1 | 4 | | 1.00 | 2.04 | 789.0 | 71 | 62 | 124 | 123 | 51 | 4 | 46 | | |
| SINK 2 | 8 | | 1.00 | 2.04 | 792.0 | 72 | 62 | 122 | 120 | 48 | 4 | 43 | | |
| 3 | 12 | | 0.97 | 1.98 | 794.7 | 72 | 62 | 123 | 123 | 48 | 4 | 44 | | |
| 4 | 16 | | 0.94 | 1.92 | 797.4 | 72 | 62 | 123 | 122 | 52 | 4 | 45 | | |
| 5 | 20 | | 0.88 | 1.80 | 800.2 | 72 | 62 | 124 | 123 | 55 | 3 | 45 | | |
| 6 | 24 | | 0.83 | 1.69 | 802.7 | 72 | 62 | 123 | 124 | 56 | 3 | 46 | | |
| 7 | 28 | | 0.65 | 1.32 | 805.1 | 72 | 62 | 123 | 123 | 57 | 3 | 46 | | |
| 8 | 32 | | 0.55 | 1.12 | 807.3 | 72 | 62 | 124 | 123 | 57 | 2 | 47 | | |
| 9 | 36 | | 0.52 | 1.06 | 809.4 | 72 | 62 | 124 | 124 | 59 | 2 | 48 | | |
| 10 | 40 | | 0.46 | 0.94 | 811.3 | 71 | 62 | 123 | 123 | 59 | 2 | 48 | | 28.831 |
| 11 | 44 | | 0.44 | 0.90 | 813.1 | 71 | 62 | 122 | 121 | 59 | 2 | 48 | | |
| OUT Pt 12 | 48 | 1516 | 0.42 | 0.86 | 815.066 | 71 | 62 | 121 | 122 | 59 | 2 | 48 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 0.7500 | 1.5300 | 58.798 | 71.37 | 62.00 | | | | | | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 0.854859 | 1.22243 | | | | | | | | | | |

EPA Method 0010 from EPA SW-846

WESTON SOLUTIONS

IN Y

OUT X

I = 100.7 M = 20 40 Qs 26664 Vm 59.882

VES CB OUTLET

# ISOKINETIC FIELD DATA SHEET

## EPA Method 0010 - HFPO Dimer Acid

Page 1 of 1

| | | Stack Conditions | Assumed | Actual |
|---|---|---|---|---|
| Client | Chemours | | | |
| W.O.# | 15418.002.018 | | | |
| Project ID | Chemours | % Moisture | 1.5 | |
| Mode/Source ID | VES | Impinger Vol (ml) | | |
| Samp. Loc. ID | CB OUT | Silica gel (g) | | |
| Run No.ID | 3 | CO2, % by Vol | 0 | |
| Test Method ID | M0010 | O2, % by Vol | 20.9 | |
| Date ID | NOV2019 | Temperature (°F) | 74 | |
| Source/Location | VE South Outlet | Meter Temp (°F) | 65 | |
| Sample Date | 11/21/19 | Static Press (in $H_2O$) | 2.6 | |
| Baro. Press (in Hg) | 30.30 | | | |
| Operator | MH/LS | Ambient Temp (°F) | 65 | |

| | | | |
|---|---|---|---|
| Meter Box ID | WC 23 | | |
| Meter Box Y | 1.00025 | | |
| Meter Box Del H | 2.2926 | | |
| Probe ID / Length | 5FT | | Sample Train ($ft^3$) |
| Probe Material | Boro | | Leak Check @ (in Hg) |
| Pitot / Thermocouple ID | P375 | | Pitot leak check good |
| Pitot Coefficient | 0.84 | | Pitot Inspection good |
| Nozzle ID | | | Method 3 System good |
| Nozzle Measurements | 0.200 | 0.201 / 0.200 | **Temp Check** |
| Avg Nozzle Dia (in) | 0.200 | | Meter Box Temp |
| Area of Stack ($ft^2$) | 9.34 | | Reference Temp |
| Sample Time | 96 | | Pass/Fail (+/- 2°) |
| Total Traverse Pts | 24 | | Temp Change Response ? |

K Factor 2.04

| | Initial | Mid-Point | Final |
|---|---|---|---|
| Sample Train ($ft^3$) | 0.012 | 0.008 | 0.005 |
| Leak Check @ (in Hg) | 14 | 9 | 8 |
| Pitot leak check good | ~~yes~~ / no | yes / no | yes / no |
| Pitot Inspection good | ~~yes~~ / no | yes / no | yes / no |
| Method 3 System good | ~~yes~~ / no | yes / no | yes / no |
| | Pre-Test Set | | Post-Test Set |
| Meter Box Temp | 65 | | 54 |
| Reference Temp | 65 | | 54 |
| 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 | 1143 | | | 815.663 | | | | | | | | | |
| 1 | 4 | | 0.46 | 0.94 | 817.6 | 75 | 65 | 130 | 128 | 64 | 2 | 57 | | |
| 2 | 8 | | 0.49 | 1.00 | 819.7 | 76 | 65 | 125 | 127 | 59 | 2 | 55 | | |
| 3 | 12 | | 0.53 | 1.08 | 821.8 | 76 | 65 | 124 | 126 | 54 | 2 | 53 | | |
| 4 | 16 | | 0.59 | 1.20 | 824.0 | 76 | 65 | 124 | 125 | 56 | 2 | 54 | | |
| 5 | 20 | | 0.64 | 1.31 | 826.3 | 76 | 66 | 125 | 123 | 51 | 2 | 56 | | |
| 6 | 24 | | 0.71 | 1.45 | 828.7 | 75 | 66 | 125 | 125 | 50 | 2 | 51 | | |
| 7 | 28 | | 0.85 | 1.73 | 831.3 | 75 | 67 | 125 | 125 | 50 | 3 | 52 | | |
| 8 | 32 | | 0.93 | 1.90 | 834.1 | 74 | 67 | 124 | 123 | 51 | 3 | 51 | | |
| 9 | 36 | | 1.00 | 2.04 | 836.9 | 74 | 68 | 124 | 124 | 50 | 3 | 50 | | |
| 10 | 40 | | 1.05 | 2.14 | 839.9 | 74 | 68 | 124 | 123 | 50 | 3 | 46 | | 30.292 |
| 11 | 44 | | 1.10 | 2.24 | 842.9 | 74 | 69 | 123 | 123 | 50 | 3 | 45 | | |
| 12 | 48 | 1231 | 1.10 | 2.24 | 845.955 | 73 | 70 | 123 | 123 | 50 | 3 | 45 | | |
| | 0 | | — | — | 846.194 | — | — | — | — | — | — | — | | 846.194 |
| 1 | 4 | 1257 1.00 | ~~0.42~~ 1.00 | ~~0.86~~ 2.04 | 849.1 | 74 | 70 | 124 | 127 | 50 | 3 | 46 | | |
| 2 | 8 | | 1.00 | 2.04 | 852.0 | 74 | 70 | 124 | 125 | 48 | 3 | 43 | | |
| 3 | 12 | | 1.00 | 2.04 | 854.7 | 74 | 70 | 123 | 121 | 47 | 3 | 42 | | |
| 4 | 16 | | 0.94 | 1.92 | 857.5 | 74 | 70 | 123 | 122 | 45 | 3 | 45 | | |
| 5 | 20 | | 0.87 | 1.77 | 860.3 | 73 | 69 | 123 | 122 | 47 | 3 | 45 | | |
| 6 | 24 | | 0.82 | 1.67 | 863.0 | 73 | 68 | 123 | 121 | 49 | 2 | 44 | | |
| 7 | 28 | | 0.66 | 1.35 | 865.2 | 73 | 67 | 123 | 120 | 44 | 2 | 42 | | |
| 8 | 32 | | 0.57 | 1.16 | 867.4 | 74 | 67 | 123 | 124 | 44 | 2 | 43 | | |
| 9 | 36 | | 0.53 | 1.08 | 869.4 | 73 | 66 | 123 | 126 | 44 | 2 | 41 | | |
| 10 | 40 | | 0.48 | 0.98 | 871.5 | 73 | 65 | 121 | 124 | 48 | 2 | 42 | | |
| 11 | 44 | | 0.45 | 0.92 | 873.4 | 73 | 64 | 122 | 126 | 48 | 2 | 39 | | 29.050 |
| 12 | 48 | 1340 | 0.42 | 0.86 | 875.244 | 72 | 64 | 123 | 127 | 48 | 2 | 40 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 0.75717 | 1.54583 | 59.342 | 74.04 | 67.12 | | | | | | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 0.860027 | 1.22829 | | | | | | | | | | |

EPA Method 0010 from EPA SW-846

VES CB OUTLET

# SAMPLE RECOVERY FIELD DATA

EPA Method 0010 - HFPO Dimer Acid

| | | | |
|---|---|---|---|
| Client | Chemours | W.O. # | 15418.002.018 |
| Location/Plant | Fayetteville, NC | Source & Location | VE South Outlet |

**Run No.** 1 — Sample Date 11/20/19 — Recovery Date 11/20/19

Sample I.D. Chemours - VES - CB OUT - 1 - M0010 - — Analyst JMO/JWF/AJS — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 4 | 100 | 100 | 0 | | | | | 315 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 4 | 0 | 0 | 0 | | | | 4 | 15 | 19 |

Impinger Color all clear — Labeled? ✓

Silica Gel Condition blue 90% — Sealed? ✓

**Run No.** 2 — Sample Date 11/20/19 — Recovery Date 11/20/19

Sample I.D. Chemours - VES - CB OUT - 2 - M0010 - — Analyst JMO/JWF/AJS — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 7 | 100 | 100 | 0 | | | | | 319.6 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 7 | 0 | 0 | 0 | | | | 7 | 19.6 | 26.6 |

Impinger Color all clear — Labeled? ✓

Silica Gel Condition blue 90% — Sealed? ✓

**Run No.** 3 — Sample Date 11/21/19 — Recovery Date 11/21/19

Sample I.D. Chemours - VES - CB OUT - 3 - M0010 - — Analyst JMO/JWF/AJS — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 4 | 100 | 100 | 0 | | | | | 314.1 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 4 | 0 | 0 | 0 | | | | 4 | 14.1 | |

Impinger Color all clear — Labeled? ✓

Silica Gel Condition blue — Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON SOLUTIONS

| Balance Acc# | Known | Actual | |
|---|---|---|---|
| 11-19-19 | 500.0 | 499.8 | JMO |
| JO JMO | | | |
| 11-21-19 | 500 | 500 | JMO |

UES BT

# SAMPLE RECOVERY FIELD DATA

Client: Chemours | W.O. #: 15418.002.018
Location/Plant: Fayetteville, NC | Source & Location: Blank Train

**Run No.** 2 | Sample Date 11/20/14 | Recovery Date 11/20/14
Sample I.D. _____ | Analyst JMZ | Filter Number N/A

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | | | | | | | | | Silica Gel | |
| **Final** | 0 | 100 | 100 | | | | | 200 | | |
| **Initial** | 0 | 100 | 100 | | | | | 200 0 | 300 | |
| **Gain** | 0 | 0 | 0 | | | | | | | |

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

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

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

Impinger Color _____ | Labeled? _____
Silica Gel Condition _____ | Sealed? _____

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

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

Impinger Color _____ | Labeled? _____
Silica Gel Condition _____ | 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 | 11/20/19 | 11/20/19 | 11/21/19 |
| Time period | 0953-1157 | 1342-1548 | 1143-1340 |
| Operator | SR | SR | SR |
| | | | |
| **Inputs For Calcs.** | | | |
| Sq. rt. delta P | 0.73141 | 0.76784 | 0.75394 |
| Delta H | 0.6979 | 1.0342 | 0.9983 |
| Stack temp. (deg.F) | 71.5 | 70.5 | 72.5 |
| Meter temp. (deg.F) | 59.2 | 64.6 | 71.3 |
| Sample volume (act.) | 44.030 | 53.635 | 52.901 |
| Barometric press. (in.Hg) | 30.05 | 30.10 | 30.30 |
| Volume $H_2O$ imp. (ml) | 10.0 | 6.0 | 12.0 |
| Weight change sil. gel (g) | 9.8 | 14.5 | 12.6 |
| % $CO_2$ | 0.0 | 0.0 | 0.0 |
| % $O_2$ | 20.9 | 20.9 | 20.9 |
| % $N_2$ | 79.1 | 79.1 | 79.1 |
| Area of stack (sq.ft.) | 9.620 | 9.620 | 9.620 |
| Sample time (min.) | 96.0 | 96.0 | 96.0 |
| Static pressure (in.$H_2O$) | 2.10 | 2.10 | 2.00 |
| Nozzle dia. (in.) | 0.190 | 0.200 | 0.200 |
| Meter box cal. | 0.9972 | 0.9972 | 0.9972 |
| Cp of pitot tube | 0.84 | 0.84 | 0.84 |
| Traverse points | 24 | 24 | 24 |

# ISOKINETIC FIELD DATA SHEET

# EPA Method 0010 - HFPO Dimer Acid

Page ____ of ____

| | | | Assumed | Actual | | | | |
|---|---|---|---|---|---|---|---|---|
| Client | Chemours | **Stack Conditions** | | | Meter Box ID | 30 | | |
| W.O.# | 15418.002.018 | | | | Meter Box Y | 0.9972 | | |
| Project ID | Chemours | % Moisture | | | Meter Box Del H | 1.3715 | | |
| Mode/Source ID | VE South | Impinger Vol (ml) | | | Probe ID / Length | P700 | | Sample Train ($ft^3$) |
| Samp. Loc. ID | STK | Silica gel (g) | | | Probe Material | Boro | | Leak Check @ (in Hg) |
| Run No.ID | 1 | CO2, % by Vol | | | Pitot / Thermocouple ID | | | Pitot leak check good |
| Test Method ID | M0010 | O2, % by Vol | | | Pitot Coefficient | 0.84 | | Pitot Inspection good |
| Date ID | 20NOV2019 | Temperature (°F) | | | Nozzle ID | 6490 | | Method 3 System good |
| Source/Location | VE South Stack | Meter Temp (°F) | | | Nozzle Measurements | .191 / .190 / .190 | | **Temp Check** |
| Sample Date | 11/20/19 | Static Press (in $H_2O$) | | 2.1 | Avg Nozzle Dia (in) | 0.190 | | Meter Box Temp |
| Baro. Press (in Hg) | 30.05 | | | | Area of Stack ($ft^2$) | 9.62 | | Reference Temp |
| Operator | SR | Ambient Temp (°F) | | | Sample Time | 96 | | Pass/Fail (+/- 2°) |
| | | | | | Total Traverse Pts | 24 | | Temp Change Response ? |

K Factor | 30

| | Initial | Mid-Point | Final |
|---|---|---|---|
| Sample Train ($ft^3$) | 0.610 | .008 | .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 | 51 | | 63 |
| Reference Temp | 51.6 | | 63.9 |
| 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 ($ft^3$) | 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 | 0953 | | | 745.330 | | | | | | | | | |
| A 1 | 4 | | 0.58 | 0.75 | 747.6 | 70 | 52 | 110 | 111 | 53 | 3.0 | 53 | | |
| 2 | 8 | | 0.55 | 0.72 | 749.1 | 71 | 55 | 110 | 110 | 51 | 3.0 | 45 | | |
| 3 | 12 | | 0.52 | 0.63 | 750.9 | 72 | 56 | 110 | 109 | 50 | 3.0 | 46 | | |
| 4 | 16 | | 0.53 | 0.69 | 752.8 | 72 | 56 | 110 | 109 | 50 | 3.0 | 46 | | |
| 5 | 20 | | 0.53 | 0.64 | 754.7 | 72 | 56 | 110 | 109 | 50 | 3.0 | 45 | | $H_1$ = |
| 6 | 24 | | 0.52 | 0.68 | 756.6 | 72 | 57 | 110 | 109 | 50 | 3.0 | 45 | | 2.182 |
| 7 | 28 | | 0.51 | 0.66 | 758.4 | 72 | 57 | 110 | 112 | 50 | 3.0 | 45 | | |
| 8 | 32 | | 0.47 | 0.61 | 759.8 | 72 | 57 | 110 | 111 | 51 | 3.0 | 46 | | |
| 9 | 36 | | 0.45 | 0.59 | 761.4 | 72 | 57 | 112 | 111 | 52 | 2.5 | 47 | | |
| 10 | 40 | | 0.51 | 0.66 | 763.6 | 71 | 58 | 110 | 110 | 53 | 3.0 | 47 | | |
| 11 | 44 | | 0.50 | 0.65 | 765.3 | 70 | 58 | 110 | 112 | 54 | 3.0 | 50 | | |
| 12 | 48 | 1041 | 0.54 | 0.70 | 767.150 | 69 | 58 | 110 | 111 | 55 | 3.0 | 52 | | |
| | 0 | 1109 | - | - | 767.850 | - | - | - | - | - | - | - | | |
| B 1 | 4 | | 0.63 | 0.82 | 769.4 | 71 | 59 | 110 | 112 | 63 | 3.5 | 62 | | |
| 2 | 8 | | 0.65 | 0.85 | 771.3 | 71 | 59 | 109 | 110 | 60 | 3.5 | 60 | | |
| 3 | 12 | | 0.59 | 0.77 | 773.2 | 71 | 58 | 111 | 112 | 56 | 3.0 | 53 | | $H_2$ = |
| 4 | 16 | | 0.57 | 0.74 | 775.2 | 72 | 61 | 113 | 110 | 57 | 3.0 | 52 | | 22.21 |
| 5 | 20 | | 0.55 | 0.72 | 776.8 | 72 | 61 | 110 | 110 | 57 | 3.0 | 53 | | |
| 6 | 24 | | 0.55 | 0.72 | 779.0 | 72 | 62 | 110 | 111 | 57 | 3.0 | 54 | | |
| 7 | 28 | | 0.53 | 0.69 | 780.4 | 72 | 63 | 110 | 109 | 57 | 3.0 | 54 | | |
| 8 | 32 | | 0.53 | 0.69 | 782.6 | 72 | 64 | 111 | 110 | 58 | 3.0 | 54 | | |
| 9 | 36 | | 0.51 | 0.66 | 784.4 | 72 | 64 | 110 | 111 | 58 | 3.0 | 54 | | |
| 10 | 40 | | 0.50 | 0.65 | 786.3 | 72 | 64 | 111 | 110 | 59 | 3.0 | 55 | | |
| 11 | 44 | | 0.52 | 0.68 | 788.1 | 72 | 64 | 110 | 109 | 59 | 3.0 | 55 | | |
| 12 | 48 | 1157 | 0.52 | 0.68 | 790.060 | 72 | 64 | 110 | 110 | 60 | 3.0 | 55 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 0.53583 | 0.69792 | 44.03 | 71.5 | 59.2 | | | | | | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 0.73141 | 0.83473 | | | | | | | | | | |

EPA Method 0010 from EPA SW-846

I.D 97.4

# ISOKINETIC FIELD DATA SHEET

# EPA Method 0010 - HFPO Dimer Acid



| | |
|---|---|
| Client | Chemours |
| W.O.# | 15418.002.018 |
| Project ID | Chemours |
| Mode/Source ID | VE South |
| Samp. Loc. ID | STK |
| Run No.ID | 2 |
| Test Method ID | M0010 |
| Date ID | 20NOV2019 |
| Source/Location | VE South Stack |
| Sample Date | 11/20/19 |
| Baro. Press (in Hg) | 30.1 |
| Operator | SB |

**Stack Conditions**

| | Assumed | Actual |
|---|---|---|
| % Moisture | | |
| Impinger Vol (ml) | 8 | |
| Silica gel (g) | 14 | |
| CO2, % by Vol | | |
| O2, % by Vol | | |
| Temperature (°F) | | |
| Meter Temp (°F) | | |
| Static Press (in $H_2O$) | | 2.1 |
| Ambient Temp (°F) | | |

| | |
|---|---|
| Meter Box ID | 30 |
| Meter Box Y | 0.9972 |
| Meter Box Del H | 1.5715 |
| Probe ID / Length | P700 |
| Probe Material | Boro |
| Pitot / Thermocouple ID | P700 |
| Pitot Coefficient | 0.84 |
| Nozzle ID | 6 200 |
| Nozzle Measurements | .200 / .200 / .200 |
| Avg Nozzle Dia (in) | 0.200 |
| Area of Stack ($ft^2$) | 9.62 |
| Sample Time | 96 |
| Total Traverse Pts | 24 |

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

K Factor 1.75

| | Initial | Mid-Point | Final |
|---|---|---|---|
| Sample Train ($ft^3$) | .010 | 0.006 | .006 |
| Leak Check @ (in Hg) | 15 | 8 | 8 |
| Pitot leak check good | yes / no | yes / no | yes / no |
| Pitot Inspection good | yes / no | yes / no | yes / no |
| Method 3 System good | yes / no | yes / no | yes / no |
| | Pre-Test Set | | Post-Test Set |
| Meter Box Temp | 65 | | 69 |
| Reference Temp | 65.5 | | 64.7 |
| 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 | 1342 | | | 790.110 | | | | | | | | | |
| A 1 | 4 | | 0.63 | 1.10 | 792.5 | 70 | 65 | 110 | 109 | 65 | 4.0 | 62 | | |
| 2 | 8 | | 0.65 | 1.14 | 795.1 | 70 | 65 | 110 | 112 | 57 | 4.5 | 52 | | |
| 3 | 12 | | 0.60 | 1.05 | 797.3 | 71 | 65 | 109 | 110 | 54 | 4.0 | 52 | | $V_1$= |
| 4 | 16 | | 0.63 | 1.10 | 799.5 | 70 | 64 | 111 | 110 | 54 | 4.0 | 52 | | 27.4 |
| 5 | 20 | | 0.72 | 1.26 | 802.0 | 70 | 64 | 111 | 111 | 54 | 4.5 | 51 | | |
| 6 | 24 | | 0.68 | 1.19 | 804.3 | 70 | 63 | 111 | 111 | 55 | 4.5 | 50 | | |
| 7 | 28 | | 0.58 | 1.02 | 806.5 | 70 | 63 | 111 | 110 | 55 | 4.0 | 52 | | |
| 8 | 32 | | 0.58 | 1.02 | 808.7 | 70 | 63 | 110 | 110 | 56 | 4.0 | 53 | | |
| 9 | 36 | | 0.60 | 1.05 | 811.0 | 70 | 65 | 110 | 110 | 57 | 4.0 | 53 | | |
| 10 | 40 | | 0.56 | 0.98 | 813.2 | 70 | 65 | 110 | 109 | 58 | 4.0 | 53 | | |
| 11 | 44 | | 0.58 | 1.02 | 815.2 | 70 | 64 | 112 | 112 | 58 | 4.0 | 54 | | |
| 12 | 48 | 1430 | 0.52 | 0.91 | 817.510 | 70 | 65 | 110 | 112 | 58 | 4.0 | 55 | | |
| | 0 | 1500 | - | - | 817.565 | - | - | - | - | - | - | - | | |
| B 1 | 4 | | 0.58 | 1.02 | 819.7 | 71 | 65 | 110 | 113 | 66 | 3.5 | 65 | | |
| 2 | 8 | | 0.55 | 0.96 | 821.9 | 71 | 66 | 111 | 112 | 60 | 3.5 | 54 | | |
| 3 | 12 | | 0.57 | 1.00 | 824.0 | 71 | 65 | 110 | 110 | 59 | 3.5 | 53 | | |
| 4 | 16 | | 0.60 | 1.05 | 826.4 | 71 | 65 | 110 | 110 | 57 | 3.5 | 53 | | $V_2$ |
| 5 | 20 | | 0.58 | 1.02 | 828.5 | 71 | 65 | 110 | 109 | 56 | 3.5 | 52 | | 26.35 |
| 6 | 24 | | 0.60 | 1.05 | 830.7 | 71 | 64 | 111 | 108 | 55 | 3.5 | 51 | | |
| 7 | 28 | | 0.57 | 1.00 | 832.9 | 71 | 65 | 111 | 111 | 56 | 3.5 | 51 | | |
| 8 | 32 | | 0.60 | 1.05 | 835.3 | 71 | 65 | 110 | 107 | 56 | 3.5 | 52 | | |
| 9 | 36 | | 0.55 | 0.96 | 837.3 | 71 | 65 | 111 | 113 | 56 | 3.5 | 52 | | |
| 10 | 40 | | 0.57 | 1.00 | 839.8 | 71 | 65 | 110 | 112 | 56 | 3.5 | 53 | | |
| 11 | 44 | | 0.55 | 0.96 | 841.8 | 71 | 65 | 110 | 110 | 57 | 3.5 | 53 | | |
| 12 | 48 | 1548 | 0.52 | 0.91 | 843.800 | 71 | 65 | 110 | 111 | 57 | 3.5 | 52 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 0.59042 | 1.03417 | 53.635 | 70.5 | 64.6 | | | | | | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 0.76784 | 1.01621 | | | | | | | | | | |

WESTON SOLUTIONS

EPA Method 0010 from EPA SW-846

# ISOKINETIC FIELD DATA SHEET

# EPA Method 0010 - HFPO Dimer Acid

Page ____ of ____

| | | Stack Conditions | Assumed | Actual | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Client | Chemours | | | | Meter Box ID | 30 | | K Factor | 1.75 |
| W.O.# | 15418.002.018 | | | | Meter Box Y | 0.9972 | | Initial | Mid-Point / Final |
| Project ID | Chemours | % Moisture | | | Meter Box Del H | 1.3715 | | | |
| Mode/Source ID | VE South | Impinger Vol (ml) | | | Probe ID / Length | P700 | Sample Train ($ft^3$) | .016 | .006 / .006 |
| Samp. Loc. ID | STK | Silica gel (g) | | | Probe Material | Boro | Leak Check @ (in Hg) | 15 | 3 / 3 |
| Run No.ID | 3 | CO2, % by Vol | | | Pitot / Thermocouple ID | P700 | Pitot leak check good | yes / no | yes / no / yes / no |
| Test Method ID | M0010 | O2, % by Vol | | | Pitot Coefficient | 0.84 | Pitot Inspection good | yes / no | yes / no / yes / no |
| Date ID | 21 NOV2019 | Temperature (°F) | | | Nozzle ID | 6200 | Method 3 System good | yes / no | yes / no / yes / no |
| Source/Location | VE South Stack | Meter Temp (°F) | | | Nozzle Measurements | 200 / 200 / 200 | **Temp Check** | Pre-Test Set | Post-Test Set |
| Sample Date | 11/21/19 | Static Press (in $H_2O$) | | 2.0 | Avg Nozzle Dia (in) | 0.200 | Meter Box Temp | 75 | 76 |
| Baro. Press (in Hg) | 30.30 | | | | Area of Stack ($ft^2$) | 9.62 | Reference Temp | 75.4 | 76.1 |
| Operator | SC | Ambient Temp (°F) | | | Sample Time | 96 | Pass/Fail (+/- 2°) | Pass / Fail | Pass / Fail |
| | | | | | Total Traverse Pts | 24 | Temp Change Response ? | yes / no | yes / no |

| TRAVERSE POINT NO. | SAMPLE TIME (min) | CLOCK TIME (plant time) | VELOCITY PRESSURE Delta P (in H2O) | ORIFICE PRESSURE Delta H (in H2O) | DRY GAS METER READING ($ft^3$) | STACK TEMP (°F) | DGM OUTLET TEMP (oF) | PROBE TEMP (oF) | FILTER BOX TEMP (F) | IMPINGER EXIT TEMP (oF) | SAMPLE TRAIN VAC (in Hg) | XAD EXIT TEMP (F) | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1143 | | | 844.206 | | | | | | | | | |
| B 1 | 4 | | 0.55 | 0.96 | 846.3 | 73 | 65 | 110 | 110 | 66 | 3.5 | 64 | | |
| 2 | 8 | | 0.55 | 0.96 | 848.5 | 73 | 66 | 111 | 109 | 57 | 3.5 | 59 | | |
| 3 | 12 | | 0.56 | 1.02 | 850.8 | 73 | 67 | 110 | 108 | 56 | 3.5 | 57 | | |
| 4 | 16 | | 0.57 | 1.00 | 853.0 | 73 | 68 | 111 | 110 | 54 | 3.5 | 53 | | $V_1$ = 25.978 |
| 5 | 20 | | 0.57 | 1.00 | 855.2 | 73 | 69 | 112 | 110 | 54 | 3.5 | 54 | | |
| 6 | 24 | | 0.57 | 1.00 | 857.6 | 73 | 70 | 110 | 110 | 54 | 3.5 | 52 | | |
| 7 | 28 | | 0.57 | 1.00 | 859.9 | 73 | 71 | 110 | 111 | 54 | 3.5 | 52 | | |
| 8 | 32 | | 0.55 | 0.96 | 861.7 | 73 | 73 | 110 | 110 | 55 | 3.5 | 54 | | |
| 9 | 36 | | 0.53 | 0.93 | 864.0 | 73 | 72 | 110 | 111 | 54 | 3.5 | 53 | | |
| 10 | 40 | | 0.50 | 0.88 | 866.0 | 73 | 71 | 110 | 110 | 53 | 3.5 | 51 | | |
| 11 | 44 | | 0.50 | 0.88 | 867.8 | 73 | 71 | 110 | 111 | 52 | 3.5 | 50 | | |
| 12 | 48 | 1231 | 0.52 | 0.91 | 870.184 | 73 | 72 | 110 | 110 | 53 | 3.5 | 52 | | |
| | 0 | 1252 | | | 870.235 | | | | | | | | | |
| A 1 | 4 | | 0.60 | 1.05 | 872.5 | 72 | 69 | 109 | 111 | 53 | 3.5 | 51 | | |
| 2 | 8 | | 0.60 | 1.05 | 874.8 | 72 | 72 | 110 | 110 | 54 | 3.5 | 56 | | |
| 3 | 12 | | 0.57 | 1.00 | 876.9 | 72 | 71 | 110 | 111 | 54 | 3.5 | 57 | | $V_2$ = 26.925 |
| 4 | 16 | | 0.63 | 1.10 | 879.3 | 72 | 71 | 110 | 110 | 54 | 3.5 | 57 | | |
| 5 | 20 | | 0.70 | 1.23 | 881.9 | 72 | 72 | 111 | 109 | 55 | 3.5 | 57 | | |
| 6 | 24 | | 0.68 | 1.19 | 884.2 | 72 | 73 | 110 | 112 | 56 | 3.5 | 59 | | |
| 7 | 28 | | 0.63 | 1.10 | 886.5 | 72 | 73 | 110 | 111 | 57 | 3.5 | 56 | | |
| 8 | 32 | | 0.60 | 1.05 | 888.8 | 72 | 74 | 110 | 110 | 55 | 3.5 | 54 | | |
| 9 | 36 | | 0.57 | 1.00 | 890.9 | 72 | 74 | 111 | 110 | 54 | 3.5 | 51 | | |
| 10 | 40 | | 0.51 | 0.90 | 893.1 | 72 | 75 | 110 | 112 | 53 | 3.5 | 52 | | |
| 11 | 44 | | 0.52 | 0.91 | 895.0 | 72 | 75 | 110 | 111 | 52 | 3.5 | 53 | | |
| 12 | 48 | 1340 | 0.50 | 0.88 | 897.158 | 72 | 76 | 110 | 112 | 53 | 3.5 | 55 | | |
| | | | Avg Delta P | Avg Delta H | Total Volume | Avg Ts | Avg Tm | Min/Max | Min/Max | Max | Max Vac | Min/Max | | |
| | | | 0.56954 | 0.99833 | 52.901 | 72.5 | 71.25 | | | | | | | |
| | | | Avg Sqrt Delta P | Avg Sqrt Del H | Comments: | | | | | | | | | |
| | | | 0.75394 | 0.99917 | | | | | | | | | | |

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 | VE South Stack |

**Run No.** 1 — Sample Date 11/19/19 — Recovery Date 11/20/19

Sample I.D. Chemours - VE South - STK - 1 - M0010 - — Analyst AMM/SR — Filter Number NA

| | Impinger | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Imp.Total | 8 | Total |
| **Contents** | Empty | HPLC H20 | HPLC H20 | | | | | | Silica Gel | |
| **Final** | 2 | 104 | 102 | 2 | | | | | 309.8 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 2 | 4 | 2 | 2 | | | | 10 | 9.8 | |

Impinger Color clear — Labeled? ✓

Silica Gel Condition Good — Sealed? ✓

**Run No.** 2 — Sample Date 11/20/19 — Recovery Date 11/21/19

Sample I.D. Chemours - VE South - STK - 2 - M0010 - — Analyst AMM/SR — 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 | 99 | 3 | | | | | 314.5 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 1 | 3 | -1 | 3 | | | | 6 | 14.5 | |

Impinger Color clear — Labeled? ✓

Silica Gel Condition Good — Sealed? ✓

**Run No.** 3 — Sample Date 11/21/19 — Recovery Date 11/22/19

Sample I.D. Chemours - VE South - STK - 3 - M0010 - — Analyst AMM/SR — 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 | 104 | 106 | 1 | | | | | 312.6 | |
| **Initial** | 0 | 100 | 100 | 0 | | | | | 300 | |
| **Gain** | 1 | 4 | 6 | 1 | | | | 12 | 12.6 | |

Impinger Color clear — Labeled? ✓

Silica Gel Condition Good — Sealed? ✓

Check COC for Sample IDs of Media Blanks

# APPENDIX C
# LABORATORY ANALYTICAL REPORT

eurofins | Environment Testing TestAmerica

# ANALYTICAL REPORT

Job Number: 140-17449-1

Job Description: VES CB 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 II
12/10/2019 1:20 PM

Courtney M Adkins, Project Manager II
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
12/10/2019

# Table of Contents

# Table of Contents

## Qualifiers

### LCMS

| Qualifier | Qualifier Description |
|---|---|
| * | LCS or LCSD is outside acceptance limits. |
| B | Compound was found in the blank and sample. |
| D | Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples. |

## 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: VES CB Inlet - M0010

Job ID: 140-17449-1

| 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: VES CB Inlet - M0010

Job ID: 140-17449-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received | Asset ID |
|---|---|---|---|---|---|
| 140-17449-1 | A-5612,5613 VES CB INLET R1 M0010 FH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-2 | A-5614,5615,5617 VES CB INLET R1 M0010 BH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-3 | A-5616 VES CB INLET R1 M0010 IMPINGER 1,2&3 COND | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-4 | A-5618 VES CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-5 | A-5619,5620 VES CB INLET R2 M0010 FH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-6 | A-5621,5622,5624 VES CB INLET R2 M0010 BH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-7 | A-5623 VES CB INLET R2 M0010 IMPINGER 1,2&3 COND | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-8 | A-5625 VES CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17449-9 | A-5626,5627 VES CB INLET R3 M0010 FH | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17449-10 | A-5628,5629,5631 VES CB INLET R3 M0010 BH | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17449-11 | A-5630 VES CB INLET R3 M0010 IMPINGER 1,2&3 COND | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17449-12 | A-5631 VES CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/21/19 00:00 | 11/25/19 08:00 | |

# Job Narrative
# 140-17449-1

**Sample Receipt**

The samples were received on November 25, 2019 at 8:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 1.0º C.

**Quality Control and Data Interpretation**

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

**Method 0010/Method 3542 Sampling Train Preparation**

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

**LCMS**

Method 8321A: The following samples were inadvertently spiked with a native solution of HFPO-DA rather than the isotope dilution internal standard prior to extraction in the Knoxville Laboratory:

140-17449-1 (VES CB Inlet R1 FH)
140-17449-5 (VES CB Inlet R2 FH)
140-17449-9 (VES CB Inlet R3 FH)

As a result, these samples received a relatively small fortification of the native HFPO-DA, and no labeled IDA as typically applied. Upon discovery of the processing issue, the IDAs were post spiked onto the extracted samples which were then re-analyzed to acquire the Total HFPO-DA content in the samples. The spiked amount of native HFPO-DA was subsequently subtracted from the Total HFPO-DA, and the corrected concentration is reported in with the data set below.
Please note that under these conditions, the affected samples are not corrected for extraction losses through isotope dilution internal standard data reduction. However, the HFPO-DA concentrations are accurate and useful for their intended purpose

Method 8321A: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 280-478940 and analytical batch 280-479928 recovered outside control limits for the following analytes: HFPO. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

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

**Organic Prep**

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

**Chemours VES Carbon Bed Inlet Test Analytical Report**
**TestAmerica Job No. 140-17449-1**
**December 9, 2019**

The following samples were inadvertently spiked with a native solution of HFPO-DA prior to extraction in the Knoxville laboratory:

- **VES CB Inlet R1 FH**
- **VES CB Inlet R2 FH**
- **VES VB Inlet R3 FH**

The HFPO-DA results presented below have been corrected to remove the laboratory contribution from the final result.

| TALS ID | Client ID | HFPO-DA Result (ug/sample) | HFPO-DA Added in the lab (ug/sample) | HFPO-DA Corrected Result (ug/sample) |
|---|---|---|---|---|
| 140-17449-1 | VEN CB Inlet R1 FH | 74 | 2 | 72 |
| 140-17449-5 | VEN CB Inlet R2 FH | 87.3 | 2 | 85.3 |
| 140-17449-9 | VEN CB Inlet R3 FH | 34.8 | 2.5 | 32.3 |

## 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: 478859

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17449-2 | A-5614,5615,5617 VES CB INLET R1 M0010 BH | Total/NA | Air | None | |
| 140-17449-4 | A-5618 VES CB INLET R1 M0010 BREAKTHRO | Total/NA | Air | None | |
| 140-17449-6 | A-5621,5622,5624 VES CB INLET R2 M0010 BH | Total/NA | Air | None | |
| 140-17449-8 | A-5625 VES CB INLET R2 M0010 BREAKTHRO | Total/NA | Air | None | |
| 140-17449-10 | A-5628,5629,5631 VES CB INLET R3 M0010 BH | Total/NA | Air | None | |
| 140-17449-12 | A-5631 VES CB INLET R3 M0010 BREAKTHRO | Total/NA | Air | None | |
| MB 280-478859/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478859/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478859/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Prep Batch: 478940

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17449-1 | A-5612,5613 VES CB INLET R1 M0010 FH | Total/NA | Air | None | |
| 140-17449-5 | A-5619,5620 VES CB INLET R2 M0010 FH | Total/NA | Air | None | |
| 140-17449-9 | A-5626,5627 VES CB INLET R3 M0010 FH | Total/NA | Air | None | |
| MB 280-478940/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478940/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478940/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Prep Batch: 478993

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17449-3 | A-5616 VES CB INLET R1 M0010 IMPINGER 1,2 | Total/NA | Air | None | |
| 140-17449-7 | A-5623 VES CB INLET R2 M0010 IMPINGER 1,2 | Total/NA | Air | None | |
| 140-17449-11 | A-5630 VES CB INLET R3 M0010 IMPINGER 1,2 | Total/NA | Air | None | |
| MB 280-478993/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478993/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478993/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Analysis Batch: 479491

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17449-2 | A-5614,5615,5617 VES CB INLET R1 M0010 BH | Total/NA | Air | 8321A | 478859 |
| 140-17449-4 | A-5618 VES CB INLET R1 M0010 BREAKTHRO | Total/NA | Air | 8321A | 478859 |
| 140-17449-6 | A-5621,5622,5624 VES CB INLET R2 M0010 BH | Total/NA | Air | 8321A | 478859 |
| 140-17449-8 | A-5625 VES CB INLET R2 M0010 BREAKTHRO | Total/NA | Air | 8321A | 478859 |
| 140-17449-10 | A-5628,5629,5631 VES CB INLET R3 M0010 BH | Total/NA | Air | 8321A | 478859 |
| 140-17449-12 | A-5631 VES CB INLET R3 M0010 BREAKTHRO | Total/NA | Air | 8321A | 478859 |
| MB 280-478859/1-A | Method Blank | Total/NA | Air | 8321A | 478859 |
| LCS 280-478859/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478859 |
| LCSD 280-478859/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478859 |

### Analysis Batch: 479814

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17449-3 | A-5616 VES CB INLET R1 M0010 IMPINGER 1,2 | Total/NA | Air | 8321A | 478993 |
| 140-17449-7 | A-5623 VES CB INLET R2 M0010 IMPINGER 1,2 | Total/NA | Air | 8321A | 478993 |
| 140-17449-11 | A-5630 VES CB INLET R3 M0010 IMPINGER 1,2 | Total/NA | Air | 8321A | 478993 |
| MB 280-478993/1-A | Method Blank | Total/NA | Air | 8321A | 478993 |
| LCS 280-478993/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478993 |

## LCMS (Continued)

### Analysis Batch: 479814 (Continued)

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| LCSD 280-478993/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478993 |

### Analysis Batch: 479928

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17449-1 | A-5612,5613 VES CB INLET R1 M0010 FH | Total/NA | Air | 8321A | 478940 |
| 140-17449-5 | A-5619,5620 VES CB INLET R2 M0010 FH | Total/NA | Air | 8321A | 478940 |
| 140-17449-9 | A-5626,5627 VES CB INLET R3 M0010 FH | Total/NA | Air | 8321A | 478940 |
| MB 280-478940/1-A | Method Blank | Total/NA | Air | 8321A | 478940 |
| LCS 280-478940/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478940 |
| LCSD 280-478940/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478940 |

## Client Sample ID: A-5612,5613 VES CB INLET R1 M0010 FH

**Lab Sample ID: 140-17449-1**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 74.0 | B * | 1.00 | 0.108 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:33 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *127* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:33* | *10* |

## Client Sample ID: A-5614,5615,5617 VES CB INLET R1 M0010 BH

**Lab Sample ID: 140-17449-2**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1880 | | 15.0 | 3.00 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:01 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *98* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:01* | *50* |

## Client Sample ID: A-5616 VES CB INLET R1 M0010 IMPINGER 1,2&3 COND

**Lab Sample ID: 140-17449-3**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | ND | | 4.90 | 0.250 | ug/Sample | | 11/27/19 12:36 | 12/06/19 11:58 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *129* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 11:58* | *1* |

## Client Sample ID: A-5618 VES CB INLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17449-4**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.675 | | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:04 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *76* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:04* | *1* |

## Client Sample ID: A-5619,5620 VES CB INLET R2 M0010 FH

**Lab Sample ID: 140-17449-5**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 87.3 | B * | 1.00 | 0.108 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:37 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *134* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:37* | *10* |

## Client Sample ID: A-5621,5622,5624 VES CB INLET R2 M0010 BH

**Lab Sample ID: 140-17449-6**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2930 | | 15.0 | 3.00 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:07 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *100* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:07* | *50* |

## Client Sample ID: A-5623 VES CB INLET R2 M0010 IMPINGER 1,2&3 COND

**Lab Sample ID: 140-17449-7**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | ND | | 4.90 | 0.250 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:01 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *131* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:01* | *1* |

## Client Sample ID: A-5625 VES CB INLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17449-8**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.261 | | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:11 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *77* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:11* | *1* |

## Client Sample ID: A-5626,5627 VES CB INLET R3 M0010 FH

**Lab Sample ID: 140-17449-9**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 34.8 | B * | 1.25 | 0.135 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:40 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *131* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:40* | *10* |

## Client Sample ID: A-5628,5629,5631 VES CB INLET R3 M0010 BH

**Lab Sample ID: 140-17449-10**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1330 | | 15.0 | 3.00 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:14 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *97* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:14* | *50* |

## Client Sample ID: A-5630 VES CB INLET R3 M0010 IMPINGER 1,2&3 COND

**Lab Sample ID: 140-17449-11**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | ND | | 5.10 | 0.260 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:05 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *130* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:05* | *1* |

## Client Sample ID: A-5631 VES CB INLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17449-12**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.860 | | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:17 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *83* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:17* | *1* |

# Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: VES CB Inlet - M0010

Job ID: 140-17449-1

## 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 |

eurofins | Environment Testing TestAmerica

# ANALYTICAL REPORT

Job Number: 140-17451-1

Job Description: VES CB 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 II
12/10/2019 1:31 PM

Courtney M Adkins, Project Manager II
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
12/10/2019

# Table of Contents

# Table of Contents

## Qualifiers

### LCMS

| Qualifier | Qualifier Description |
|---|---|
| * | LCS or LCSD is outside acceptance limits. |
| B | Compound was found in the blank and sample. |
| D | Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples. |
| J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |

## Glossary

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

# Method Summary

Client: Chemours Company FC, LLC The
Project/Site: VES CB Outlet M0010

Job ID: 140-17451-1

| 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: VES CB Outlet M0010

Job ID: 140-17451-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received | Asset ID |
|---|---|---|---|---|---|
| 140-17451-1 | D-1912,1913 VES CB OUTLET R1 M0010 FH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-2 | D-1914,1915,1917 VES CB OUTLET R1 M0010 BH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-3 | D-1916 VES CB OUTLET R1 M0010 IMPINGER 1,2&3 COND | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-4 | D-1918 VES CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-5 | D-1919,1920 VES CB OUTLET R2 M0010 FH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-6 | D-1921,1922,1924 VES CB OUTLET R2 M0010 BH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-7 | D-1923 VES CB OUTLET R2 M0010 IMPINGER 1,2&3 COND | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-8 | D-1925 VES CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17451-9 | D-1926,1927 VES CB OUTLET R3 M0010 FH | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17451-10 | D-1928,1929,1931 VES CB OUTLET R3 M0010 BH | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17451-11 | D-1930 VES CB OUTLET R3 M0010 IMPINGER 1,2&3 COND | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17451-12 | D-1931 VES CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/21/19 00:00 | 11/25/19 08:00 | |

# Job Narrative
# 140-17451-1

**Sample Receipt**

The samples were received on November 25, 2019 at 8:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 1.2º 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**

Method 8321A: The following samples were inadvertently spiked with a native solution of HFPO-DA rather than the isotope dilution internal standard prior to extraction in the Knoxville Laboratory:

- VES CB Outlet R1 FH
- VES CB Outlet R2 FH
- VES VB Outlet R3 FH

As a result, these samples received a relatively small fortification of the native HFPO-DA, and no labeled IDA as typically applied. Upon discovery of the processing issue, the IDAs were post spiked onto the extracted samples which were then re-analyzed to acquire the Total HFPO-DA content in the samples. The spiked amount of native HFPO-DA was subsequently subtracted from the Total HFPO-DA, and the corrected concentration is reported in with the data set below.
Please note that under these conditions, the affected samples are not corrected for extraction losses through isotope dilution internal standard data reduction. However, the HFPO-DA concentrations are accurate and useful for their intended purpose.
Method 8321A: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 280-478940 and analytical batch 280-479928 recovered outside control limits for the following analytes: HFPO. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.
The entire batch was spiked with target analyte. KXHFPO_IS_00057 was made with target analyte instead of IDA.

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

**Organic Prep**

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

**Chemours VES Carbon Bed Outlet Test Analytical Report**
**TestAmerica Job No. 140-17451-1**
**December 10, 2019**

The following samples were inadvertently spiked with a native solution of HFPO-DA prior to extraction in the Knoxville laboratory:

- **VES CB Outlet R1 FH**
- **VES CB Outlet R2 FH**
- **VES VB Outlet R3 FH**

The HFPO-DA results presented below have been corrected to remove the laboratory contribution from the final result.

| TALS ID | Client ID | HFPO-DA Result (ug/sample) | HFPO-DA Added in the lab (ug/sample) | HFPO-DA Corrected Result (ug/sample) |
|---|---|---|---|---|
| 140-17451-1 | VEN CB Outlet R1 FH | 102 | 2 | 100 |
| 140-17451-5 | VEN CB Outlet R2 FH | 116 | 2 | 114 |
| 140-17451-9 | VEN CB Outlet R3 FH | 36.8 | 2.5 | 34.3 |

## 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: 478859

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17451-2 | D-1914,1915,1917 VES CB OUTLET R1 M0010 I | Total/NA | Air | None | |
| 140-17451-4 | D-1918 VES CB OUTLET R1 M0010 BREAKTHF | Total/NA | Air | None | |
| 140-17451-6 | D-1921,1922,1924 VES CB OUTLET R2 M0010 I | Total/NA | Air | None | |
| 140-17451-8 | D-1925 VES CB OUTLET R2 M0010 BREAKTHF | Total/NA | Air | None | |
| 140-17451-10 | D-1928,1929,1931 VES CB OUTLET R3 M0010 I | Total/NA | Air | None | |
| 140-17451-12 | D-1931 VES CB OUTLET R3 M0010 BREAKTHF | Total/NA | Air | None | |
| MB 280-478859/13-A | Method Blank | Total/NA | Air | None | |
| MB 280-478859/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478859/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478859/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Prep Batch: 478940

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17451-1 | D-1912,1913 VES CB OUTLET R1 M0010 FH | Total/NA | Air | None | |
| 140-17451-5 | D-1919,1920 VES CB OUTLET R2 M0010 FH | Total/NA | Air | None | |
| 140-17451-9 | D-1926,1927 VES CB OUTLET R3 M0010 FH | Total/NA | Air | None | |
| MB 280-478940/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478940/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478940/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Prep Batch: 478993

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17451-3 | D-1916 VES CB OUTLET R1 M0010 IMPINGER | Total/NA | Air | None | |
| 140-17451-7 | D-1923 VES CB OUTLET R2 M0010 IMPINGER | Total/NA | Air | None | |
| 140-17451-11 | D-1930 VES CB OUTLET R3 M0010 IMPINGER | Total/NA | Air | None | |
| MB 280-478993/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478993/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478993/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Analysis Batch: 479491

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17451-2 | D-1914,1915,1917 VES CB OUTLET R1 M0010 I | Total/NA | Air | 8321A | 478859 |
| 140-17451-4 | D-1918 VES CB OUTLET R1 M0010 BREAKTHF | Total/NA | Air | 8321A | 478859 |
| 140-17451-6 | D-1921,1922,1924 VES CB OUTLET R2 M0010 I | Total/NA | Air | 8321A | 478859 |
| 140-17451-8 | D-1925 VES CB OUTLET R2 M0010 BREAKTHF | Total/NA | Air | 8321A | 478859 |
| 140-17451-10 | D-1928,1929,1931 VES CB OUTLET R3 M0010 I | Total/NA | Air | 8321A | 478859 |
| 140-17451-12 | D-1931 VES CB OUTLET R3 M0010 BREAKTHF | Total/NA | Air | 8321A | 478859 |
| MB 280-478859/13-A | Method Blank | Total/NA | Air | 8321A | 478859 |
| MB 280-478859/1-A | Method Blank | Total/NA | Air | 8321A | 478859 |
| LCS 280-478859/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478859 |
| LCSD 280-478859/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478859 |

### Analysis Batch: 479814

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17451-3 | D-1916 VES CB OUTLET R1 M0010 IMPINGER | Total/NA | Air | 8321A | 478993 |
| 140-17451-7 | D-1923 VES CB OUTLET R2 M0010 IMPINGER | Total/NA | Air | 8321A | 478993 |
| 140-17451-11 | D-1930 VES CB OUTLET R3 M0010 IMPINGER | Total/NA | Air | 8321A | 478993 |

## LCMS (Continued)

### Analysis Batch: 479814 (Continued)

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| MB 280-478993/1-A | Method Blank | Total/NA | Air | 8321A | 478993 |
| LCS 280-478993/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478993 |
| LCSD 280-478993/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478993 |

### Analysis Batch: 479928

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17451-1 | D-1912,1913 VES CB OUTLET R1 M0010 FH | Total/NA | Air | 8321A | 478940 |
| 140-17451-5 | D-1919,1920 VES CB OUTLET R2 M0010 FH | Total/NA | Air | 8321A | 478940 |
| 140-17451-9 | D-1926,1927 VES CB OUTLET R3 M0010 FH | Total/NA | Air | 8321A | 478940 |
| MB 280-478940/1-A | Method Blank | Total/NA | Air | 8321A | 478940 |
| LCS 280-478940/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478940 |
| LCSD 280-478940/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478940 |

## Client Sample ID: D-1912,1913 VES CB OUTLET R1 M0010 FH

**Lab Sample ID: 140-17451-1**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 102 | B * | 1.00 | 0.108 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:43 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *134* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:43* | *10* |

## Client Sample ID: D-1914,1915,1917 VES CB OUTLET R1 M0010 BH

**Lab Sample ID: 140-17451-2**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 1010 | | 13.8 | 2.75 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:24 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *83* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:24* | *50* |

## Client Sample ID: D-1916 VES CB OUTLET R1 M0010 IMPINGER 1,2&3 COND

**Lab Sample ID: 140-17451-3**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.0400 | J | 0.200 | 0.0102 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:08 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *118* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:08* | *1* |

## Client Sample ID: D-1918 VES CB OUTLET R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17451-4**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.0952 | J | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:27 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *80* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:27* | *1* |

## Client Sample ID: D-1919,1920 VES CB OUTLET R2 M0010 FH

**Lab Sample ID: 140-17451-5**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 116 | B * | 1.00 | 0.108 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:46 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *133* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:46* | *10* |

## Client Sample ID: D-1921,1922,1924 VES CB OUTLET R2 M0010 BH

**Lab Sample ID: 140-17451-6**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 694 | | 16.3 | 3.25 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:33 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *80* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:33* | *50* |

## Client Sample ID: D-1923 VES CB OUTLET R2 M0010 IMPINGER 1,2&3 COND

**Lab Sample ID: 140-17451-7**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | ND | | 0.210 | 0.0107 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:11 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *116* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:11* | *1* |

## Client Sample ID: D-1925 VES CB OUTLET R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17451-8**

**Date Collected: 11/20/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.576 | | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:37 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *85* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:37* | *1* |

## Client Sample ID: D-1926,1927 VES CB OUTLET R3 M0010 FH

**Lab Sample ID: 140-17451-9**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 36.8 | B * | 1.25 | 0.135 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:49 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *123* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:49* | *10* |

## Client Sample ID: D-1928,1929,1931 VES CB OUTLET R3 M0010 BH

**Lab Sample ID: 140-17451-10**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 713 | | 12.5 | 2.50 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:40 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *61* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:40* | *50* |

## Client Sample ID: D-1930 VES CB OUTLET R3 M0010 IMPINGER 1,2&3 COND

**Lab Sample ID: 140-17451-11**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | ND | | 0.202 | 0.0103 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:14 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *121* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:14* | *1* |

## Client Sample ID: D-1931 VES CB OUTLET R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17451-12**

**Date Collected: 11/21/19 00:00**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Matrix: Air**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.0826 | J | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:43 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *79* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:43* | *1* |

# Default Detection Limits

Client: Chemours Company FC, LLC The
Project/Site: VES CB Outlet M0010

Job ID: 140-17451-1

## 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 |

eurofins | Environment Testing TestAmerica

# ANALYTICAL REPORT

Job Number: 140-17452-1

Job Description: VES 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
12/10/2019 2:32 PM

Courtney M Adkins, Project Manager II
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
12/10/2019

# Table of Contents

# Table of Contents

## Qualifiers

### LCMS

| Qualifier | Qualifier Description |
|---|---|
| * | LCS or LCSD is outside acceptance limits. |
| B | Compound was found in the blank and sample. |
| D | Sample results are obtained from a dilution; the surrogate or matrix spike recoveries reported are calculated from diluted samples. |
| J | Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value. |

## Glossary

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

# Method Summary

Client: Chemours Company FC, LLC The
Job ID: 140-17452-1
Project/Site: VES Stack - 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: VES Stack - M0010

Job ID: 140-17452-1

| Lab Sample ID | Client Sample ID | Matrix | Collected | Received | Asset ID |
|---|---|---|---|---|---|
| 140-17452-1 | P-2805,2806 VES STACK R1 M0010 FH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-2 | P-2807,2808,2810 VES STACK R1 M0010 BH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-3 | P-2809 VES STACK R1 M0010 IMPINGERS 1,2&3 COND | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-4 | P-2811 VES STACK R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-5 | P-2812,2813 VES STACK R2 M0010 FH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-6 | P-2814,2815,2817 VES STACK R2 M0010 BH | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-7 | P-2816 VES STACK R2 M0010 IMPINGERS 1,2&3 COND | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-8 | P-2818 VES STACK R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/20/19 00:00 | 11/25/19 08:00 | |
| 140-17452-9 | P-2819,2820 VES STACK R3 M0010 FH | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17452-10 | P-2821,2822,2824 VES STACK R3 M0010 BH | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17452-11 | P-2823 VES STACK R3 M0010 IMPINGERS 1,2&3 COND | Air | 11/21/19 00:00 | 11/25/19 08:00 | |
| 140-17452-12 | P-2825 VES STACK R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE | Air | 11/21/19 00:00 | 11/25/19 08:00 | |

# Job Narrative
# 140-17452-1

**Sample Receipt**

The samples were received on November 25, 2019 at 8:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 1.1º C.

**Quality Control and Data Interpretation**

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

**Method 0010/Method 3542 Sampling Train Preparation**

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

**LCMS**

Method 8321A: The following samples were inadvertently spiked with a native solution of HFPO-DA rather than the isotope dilution internal standard prior to extraction in the Knoxville Laboratory.

- VES Stack R1 FH
- VES Stack R2 FH
- VES Stack R2 BH
- VES Stack R2 Breakthrough
- VES Stack R3 FH
- VES Stack R3 BH
- VES Stack R3 Breakthrough

As a result, these samples received a relatively small fortification of the native HFPO-DA, and no labeled IDA as typically applied. Upon discovery of the processing issue, the IDAs were post spiked onto the extracted samples which were then re-analyzed to acquire the Total HFPO-DA content in the samples. The spiked amount of native HFPO-DA was subsequently subtracted from the Total HFPO-DA, and the corrected concentration is reported in with the data set below.
Please note that under these conditions, the affected samples are not corrected for extraction losses through isotope dilution internal standard data reduction. However, the HFPO-DA concentrations are accurate and useful for their intended purpose.
Method 8321A: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 280-478940 and analytical batch 280-479928 recovered outside control limits for the following analytes: HFPO. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

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

**Organic Prep**

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

**Chemours VES Carbon Bed Outlet Test Analytical Report**
**TestAmerica Job No. 140-17452-1**
**December 10, 2019**

The following samples were inadvertently spiked with a native solution of HFPO-DA prior to extraction in the Knoxville laboratory:

- **VES Stack R1 FH**
- **VES Stack R2 FH**
- **VES Stack R2 BH**
- **VES Stack R2 Breakthrough**
- **VES Stack R3 FH**
- **VES Stack R3 BH**
- **VES Stack R3 Breakthrough**

The HFPO-DA results presented below have been corrected to remove the laboratory contribution from the final result.

| TALS ID | Client ID | HFPO-DA Result (ug/sample) | HFPO-DA Added in the lab (ug/sample) | HFPO-DA Corrected Result (ug/sample) |
|---|---|---|---|---|
| 140-17452-1 | **VES Stack R1 FH** | 74.9 | 2.5 | 72.4 |
| 140-17452-5 | **VES Stack R2 FH** | 89.5 | 2.5 | 87 |
| 140-17452-6 | **VES Stack R2 BH** | 446 | 5.5 | 440.5 |
| 140-17452-8 | **VES Stack R2 Breakthrough** | 2 | 4 | ND |
| 140-17452-9 | **VES Stack R3 FH** | 40.8 | 3.5 | 37.3 |
| 140-17452-10 | **VES Stack R3 BH** | 114 | 5.5 | 108.5 |
| 140-17452-12 | **VES Stack R3 Breakthrough** | 2.02 | 4 | ND |

# QC Association Summary

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

Job ID: 140-17452-1

## 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: 478859

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-2 | P-2807,2808,2810 VES STACK R1 M0010 BH | Total/NA | Air | None | |
| 140-17452-4 | P-2811 VES STACK R1 M0010 BREAKTHROUG | Total/NA | Air | None | |
| 140-17452-6 | P-2814,2815,2817 VES STACK R2 M0010 BH | Total/NA | Air | None | |
| 140-17452-8 | P-2818 VES STACK R2 M0010 BREAKTHROUG | Total/NA | Air | None | |
| 140-17452-10 | P-2821,2822,2824 VES STACK R3 M0010 BH | Total/NA | Air | None | |
| 140-17452-12 | P-2825 VES STACK R3 M0010 BREAKTHROUG | Total/NA | Air | None | |
| MB 280-478859/13-A | Method Blank | Total/NA | Air | None | |
| MB 280-478859/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478859/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478859/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Prep Batch: 478940

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-1 | P-2805,2806 VES STACK R1 M0010 FH | Total/NA | Air | None | |
| 140-17452-5 | P-2812,2813 VES STACK R2 M0010 FH | Total/NA | Air | None | |
| 140-17452-9 | P-2819,2820 VES STACK R3 M0010 FH | Total/NA | Air | None | |
| MB 280-478940/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478940/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478940/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Prep Batch: 478993

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-3 | P-2809 VES STACK R1 M0010 IMPINGERS 1,2 | Total/NA | Air | None | |
| 140-17452-7 | P-2816 VES STACK R2 M0010 IMPINGERS 1,2 | Total/NA | Air | None | |
| 140-17452-11 | P-2823 VES STACK R3 M0010 IMPINGERS 1,2 | Total/NA | Air | None | |
| MB 280-478993/1-A | Method Blank | Total/NA | Air | None | |
| LCS 280-478993/2-A | Lab Control Sample | Total/NA | Air | None | |
| LCSD 280-478993/3-A | Lab Control Sample Dup | Total/NA | Air | None | |

### Analysis Batch: 479491

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-2 | P-2807,2808,2810 VES STACK R1 M0010 BH | Total/NA | Air | 8321A | 478859 |
| 140-17452-4 | P-2811 VES STACK R1 M0010 BREAKTHROUG | Total/NA | Air | 8321A | 478859 |
| MB 280-478859/13-A | Method Blank | Total/NA | Air | 8321A | 478859 |
| MB 280-478859/1-A | Method Blank | Total/NA | Air | 8321A | 478859 |
| LCS 280-478859/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478859 |
| LCSD 280-478859/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478859 |

### Analysis Batch: 479814

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-3 | P-2809 VES STACK R1 M0010 IMPINGERS 1,2 | Total/NA | Air | 8321A | 478993 |
| 140-17452-7 | P-2816 VES STACK R2 M0010 IMPINGERS 1,2 | Total/NA | Air | 8321A | 478993 |
| 140-17452-11 | P-2823 VES STACK R3 M0010 IMPINGERS 1,2 | Total/NA | Air | 8321A | 478993 |
| MB 280-478993/1-A | Method Blank | Total/NA | Air | 8321A | 478993 |
| LCS 280-478993/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478993 |
| LCSD 280-478993/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478993 |

## LCMS

### Analysis Batch: 479928

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-1 | P-2805,2806 VES STACK R1 M0010 FH | Total/NA | Air | 8321A | 478940 |
| 140-17452-5 | P-2812,2813 VES STACK R2 M0010 FH | Total/NA | Air | 8321A | 478940 |
| 140-17452-9 | P-2819,2820 VES STACK R3 M0010 FH | Total/NA | Air | 8321A | 478940 |
| MB 280-478940/1-A | Method Blank | Total/NA | Air | 8321A | 478940 |
| LCS 280-478940/2-A | Lab Control Sample | Total/NA | Air | 8321A | 478940 |
| LCSD 280-478940/3-A | Lab Control Sample Dup | Total/NA | Air | 8321A | 478940 |

### Analysis Batch: 479930

| Lab Sample ID | Client Sample ID | Prep Type | Matrix | Method | Prep Batch |
|---|---|---|---|---|---|
| 140-17452-6 | P-2814,2815,2817 VES STACK R2 M0010 BH | Total/NA | Air | 8321A | 478859 |
| 140-17452-8 | P-2818 VES STACK R2 M0010 BREAKTHROUG | Total/NA | Air | 8321A | 478859 |
| 140-17452-10 | P-2821,2822,2824 VES STACK R3 M0010 BH | Total/NA | Air | 8321A | 478859 |
| 140-17452-12 | P-2825 VES STACK R3 M0010 BREAKTHROUG | Total/NA | Air | 8321A | 478859 |

## Client Sample ID: P-2805,2806 VES STACK R1 M0010 FH

**Lab Sample ID: 140-17452-1**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 74.9 | B * | 1.25 | 0.135 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:56 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *129* | *D* | *50 - 200* | *11/27/19 08:04* | *12/08/19 08:56* | *10* |

## Client Sample ID: P-2807,2808,2810 VES STACK R1 M0010 BH

**Lab Sample ID: 140-17452-2**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 630 | | 15.0 | 3.00 | ug/Sample | | 11/26/19 16:50 | 12/04/19 07:50 | 50 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *78* | *D* | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:50* | *50* |

## Client Sample ID: P-2809 VES STACK R1 M0010 IMPINGERS 1,2&3 COND

**Lab Sample ID: 140-17452-3**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.0886 | J | 0.206 | 0.0105 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:18 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *118* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:18* | *1* |

## Client Sample ID: P-2811 VES STACK R1 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17452-4**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 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 | | 11/26/19 16:50 | 12/04/19 07:53 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *77* | | *50 - 200* | *11/26/19 16:50* | *12/04/19 07:53* | *1* |

## Client Sample ID: P-2812,2813 VES STACK R2 M0010 FH

**Lab Sample ID: 140-17452-5**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 89.5 | B * | 1.25 | 0.135 | ug/Sample | | 11/27/19 08:04 | 12/08/19 08:59 | 10 |

## Client Sample ID: P-2812,2813 VES STACK R2 M0010 FH

**Lab Sample ID: 140-17452-5**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 124 | D | 50 - 200 | 11/27/19 08:04 | 12/08/19 08:59 | 10 |

## Client Sample ID: P-2814,2815,2817 VES STACK R2 M0010 BH

**Lab Sample ID: 140-17452-6**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 446 | | 2.75 | 0.550 | ug/Sample | | 11/26/19 16:50 | 12/08/19 10:11 | 10 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 129 | D | 50 - 200 | 11/26/19 16:50 | 12/08/19 10:11 | 10 |

## Client Sample ID: P-2816 VES STACK R2 M0010 IMPINGERS 1,2&3 COND

**Lab Sample ID: 140-17452-7**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.0496 | J | 0.206 | 0.0105 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:24 | 1 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 105 | | 50 - 200 | 11/27/19 12:36 | 12/06/19 12:24 | 1 |

## Client Sample ID: P-2818 VES STACK R2 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17452-8**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.00 | | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/08/19 10:14 | 1 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 127 | | 50 - 200 | 11/26/19 16:50 | 12/08/19 10:14 | 1 |

## Client Sample ID: P-2819,2820 VES STACK R3 M0010 FH

**Lab Sample ID: 140-17452-9**

**Date Collected: 11/21/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 40.8 | B * | 1.75 | 0.189 | ug/Sample | | 11/27/19 08:04 | 12/08/19 09:02 | 10 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 133 | D | 50 - 200 | 11/27/19 08:04 | 12/08/19 09:02 | 10 |

## Client Sample ID: P-2821,2822,2824 VES STACK R3 M0010 BH

**Lab Sample ID: 140-17452-10**

**Date Collected: 11/21/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 114 | | 2.75 | 0.550 | ug/Sample | | 11/26/19 16:50 | 12/08/19 10:17 | 10 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *130* | *D* | *50 - 200* | *11/26/19 16:50* | *12/08/19 10:17* | *10* |

## Client Sample ID: P-2823 VES STACK R3 M0010 IMPINGERS 1,2&3 COND

**Lab Sample ID: 140-17452-11**

**Date Collected: 11/21/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - HFPO-DA

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.0367 | J | 0.202 | 0.0103 | ug/Sample | | 11/27/19 12:36 | 12/06/19 12:27 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *113* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:27* | *1* |

## Client Sample ID: P-2825 VES STACK R3 M0010 BREAKTHROUGH XAD-2 RESIN TUBE

**Lab Sample ID: 140-17452-12**

**Date Collected: 11/21/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 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 | | 0.200 | 0.0400 | ug/Sample | | 11/26/19 16:50 | 12/08/19 10:21 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *128* | | *50 - 200* | *11/26/19 16:50* | *12/08/19 10:21* | *1* |

# Default Detection Limits

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

Job ID: 140-17452-1

## 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 |

eurofins | Environment Testing TestAmerica

# ANALYTICAL REPORT

Job Number: 140-17453-1

Job Description: VES Field QC Samples - 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
12/10/2019 2:51 PM

Courtney M Adkins, Project Manager II
5815 Middlebrook Pike, Knoxville, TN, 37921
(865)291-3000
courtney.adkins@testamericainc.com
12/10/2019

# Table of Contents

# Table of Contents

## Qualifiers

### LCMS

| Qualifier | Qualifier Description |
|---|---|
| * | LCS or LCSD is outside acceptance limits. |
| B | Compound was found in the blank and sample. |

## 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) |

# Job Narrative
# 140-17453-1

**Sample Receipt**

The samples were received on November 25, 2019 at 8:00 AM in good condition and properly preserved. The temperature of the cooler at receipt was 1.9º C.

**Quality Control and Data Interpretation**

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

**Method 0010/Method 3542 Sampling Train Preparation**

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

**LCMS**

Method 8321A: The following samples were inadvertently spiked with a native solution of HFPO-DA rather than the isotope dilution internal standard prior to extraction in the Knoxville Laboratory.

- VES QC BT FH
- VES QC BT BH
- VES QC BT Breakthrough
- VES QC MeOH RB
- VES QC MeOH PB
- XAD Media Check
- Filter Media Check

As a result, these samples received a relatively small fortification of the native HFPO-DA, and no labeled IDA as typically applied. Upon discovery of the processing issue, the IDAs were post spiked onto the extracted samples which were then re-analyzed to acquire the Total HFPO-DA content in the samples. The spiked amount of native HFPO-DA was subsequently subtracted from the Total HFPO-DA, and the corrected concentration is reported in with the data set below.
Please note that under these conditions, the affected samples are not corrected for extraction losses through isotope dilution internal standard data reduction. However, the HFPO-DA concentrations are accurate and useful for their intended purpose.
Method 8321A: The laboratory control sample (LCS) and / or laboratory control sample duplicate (LCSD) for preparation batch 280-478940 and analytical batch 280-479928 recovered outside control limits for the following analytes: HFPO. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

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

**Organic Prep**

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

**Chemours VES Carbon Bed Outlet Test Analytical Report**
**TestAmerica Job No. 140-17453-1**
**December 10, 2019**

The following samples were inadvertently spiked with a native solution of HFPO-DA prior to extraction in the Knoxville laboratory:

- **VES QC BT FH**
- **VES QC BT BH**
- **VES QC BT Breakthrough**
- **VES QC MeOH RB**
- **VES QC MeOH PB**
- **XAD Media Check**
- **Filter Media Check**

The HFPO-DA results presented below have been corrected to remove the laboratory contribution from the final result.

| TALS ID | Client ID | HFPO-DA Result (ug/sample) | HFPO-DA Added in the lab (ug/sample) | HFPO-DA Corrected Result (ug/sample) |
|---|---|---|---|---|
| 140-17453-1 | **VES QC BT FH** | 0.521 | 0.5 | 0.021 |
| 140-17453-2 | **VES QC BT BH** | 2.22 | 4 | ND |
| 140-17453-4 | **VES QC BT Breakthrough** | 2.07 | 4 | ND |
| 140-17453-6 | **VES QC MeOH RB** | 0.361 | 0.5 | ND |
| 140-17453-7 | **VES QC MeOH PB** | 0.450 | 0.5 | ND |
| 140-17453-8 | **XAD Media Check** | 2.52 | 4 | ND |
| 140-17453-9 | **Filter Media Check** | 0.396 | 0.5 | ND |

## Client Sample ID: GF-1501,1502 VES QC M0010 FH BT
**Lab Sample ID: 140-17453-1**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.521 | B * | 0.0250 | 0.00270 | ug/Sample | | 11/27/19 08:04 | 12/08/19 09:09 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *135* | | *50 - 200* | *11/27/19 08:04* | *12/08/19 09:09* | *1* |

## Client Sample ID: GF-1503,1504,1506 VES QC M0010 BH BT
**Lab Sample ID: 140-17453-2**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.22 | B | 0.200 | 0.0400 | ug/Sample | | 12/02/19 11:25 | 12/08/19 09:35 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *132* | | *50 - 200* | *12/02/19 11:25* | *12/08/19 09:35* | *1* |

## Client Sample ID: GF-1505 VES QC M0010 IMPINGERS 1,2&3 COND BT
**Lab Sample ID: 140-17453-3**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 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 | | 11/27/19 12:36 | 12/06/19 12:31 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *121* | | *50 - 200* | *11/27/19 12:36* | *12/06/19 12:31* | *1* |

## Client Sample ID: GF-1507 VES QC M0010 BREAKTHROUGH XAD-2 RESIN TUBE BT
**Lab Sample ID: 140-17453-4**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

### Method: 8321A - PFOA and PFOS

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.07 | B | 0.200 | 0.0400 | ug/Sample | | 12/02/19 11:25 | 12/08/19 09:38 | 1 |

| *Surrogate* | *%Recovery* | *Qualifier* | *Limits* | *Prepared* | *Analyzed* | *Dil Fac* |
|---|---|---|---|---|---|---|
| *13C3 HFPO-DA* | *133* | | *50 - 200* | *12/02/19 11:25* | *12/08/19 09:38* | *1* |

## Client Sample ID: GF-1508 VES QC M0010 DI WATER RB
**Lab Sample ID: 140-17453-5**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 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 | | 11/27/19 12:36 | 12/06/19 12:37 | 1 |

## Client Sample ID: GF-1508 VES QC M0010 DI WATER RB
**Lab Sample ID: 140-17453-5**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 125 | | 50 - 200 | 11/27/19 12:36 | 12/06/19 12:37 | 1 |

## Client Sample ID: GF-1509 VES QC M0010 MEOH WITH 5% NH4OH RB
**Lab Sample ID: 140-17453-6**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Method: 8321A - PFOA and PFOS**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.361 | B | 0.0250 | 0.00500 | ug/Sample | | 12/02/19 11:25 | 12/08/19 09:42 | 1 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 141 | | 50 - 200 | 12/02/19 11:25 | 12/08/19 09:42 | 1 |

## Client Sample ID: GF-1510 VES QC M0010 COMBINED GLASSWARE RINSES (MEOH/5% NH4OH) PB
**Lab Sample ID: 140-17453-7**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Method: 8321A - PFOA and PFOS**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.450 | B | 0.0250 | 0.00500 | ug/Sample | | 12/02/19 11:25 | 12/08/19 09:45 | 1 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 136 | | 50 - 200 | 12/02/19 11:25 | 12/08/19 09:45 | 1 |

## Client Sample ID: A-6925 MEDIA CHECK XAD
**Lab Sample ID: 140-17453-8**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Method: 8321A - PFOA and PFOS**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 2.52 | B | 0.200 | 0.0400 | ug/Sample | | 12/02/19 11:25 | 12/08/19 09:48 | 1 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 136 | | 50 - 200 | 12/02/19 11:25 | 12/08/19 09:48 | 1 |

## Client Sample ID: A-6926 MEDIA CHECK FILTER
**Lab Sample ID: 140-17453-9**

**Date Collected: 11/20/19 00:00**
**Matrix: Air**
**Date Received: 11/25/19 08:00**
**Sample Container: Air Train**

**Method: 8321A - PFOA and PFOS**

| Analyte | Result | Qualifier | RL | MDL | Unit | D | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|---|---|---|
| HFPO-DA | 0.396 | B * | 0.0250 | 0.00270 | ug/Sample | | 11/27/19 08:04 | 12/08/19 09:12 | 1 |

| Surrogate | %Recovery | Qualifier | Limits | Prepared | Analyzed | Dil Fac |
|---|---|---|---|---|---|---|
| 13C3 HFPO-DA | 129 | | 50 - 200 | 11/27/19 08:04 | 12/08/19 09:12 | 1 |

# Default Detection Limits

Client: Chemours Company FC, LLC The
Job ID: 140-17453-1
Project/Site: VES Field QC Samples - M0010

## Method: 8321A - HFPO-DA

### Prep: None

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

## Method: 8321A - PFOA and PFOS

### Prep: None

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

# APPENDIX D
# SAMPLE CALCULATIONS

## SAMPLE CALCULATIONS FOR
## HFPO DIMER ACID (METHOD 0010)

**Client: Chemours** | **Plant: Fayetteville, NC**
**Test Number: Run 1** | **Test Date: 11/20/19**
**Test Location: VES CBed Inlet** | **Test Period: 0953-1157**

**1. HFPO Dimer Acid concentration, lbs/dscf.**

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

$$Conc1 = \frac{1952.7 \times 2.2046 \times 10\text{-}9}{51.453}$$

Conc1 = 8.37E-08

Where:

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

Conc1 = HFPO Dimer Acid concentration, lbs/dscf.

$2.2046 \times 10^{-9}$ = Conversion factor from ug to lbs.

**2. HFPO Dimer Acid concentration, ug/dscm.**

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

Conc2 = 1952.7 / ( 51.453 x 0.02832 )

Conc2 = 1339.9

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

$MR1_{(Inlet)}$ = 8.37E-08 x 27407 x 60

$MR1_{(Inlet)}$ = 1.38E-01

Where:

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

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

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

$MR2_{(Inlet)}$ = 1.38E-01 x 453.59 /3600

$MR2_{(Inlet)}$ = 1.73E-02

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, %**

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

$$RE = \frac{(1.38E\text{-}01) - (6.54E\text{-}02)}{1.38E\text{-}01}$$

RE = 52.4

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: 11/20/19 |
| Test Location: VES-Carbon Bed Inlet | Test Period: 0953-1157 |

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

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

$$Vm(std) = \frac{17.64 \times 1.0066 \times 50.118 \times \left( 30.05 + \frac{1.025}{13.6} \right)}{61.04 + 460} = 51.453$$

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.**

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

$$Vw(std) = ( 0.04707 \times 3.0 ) + ( 0.04715 \times 16.0 ) = 0.90$$

Where:

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

**3. Moisture content**

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

$$bws = \frac{0.90}{0.90 + 51.453} = 0.017$$

Where:

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

**4. Mole fraction of dry gas.**

$$Md = 1 - bws$$

$$Md = 1 - 0.017 = 0.983$$

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.**

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

$$MWs = ( 28.84 \times 0.983 ) +( 18 ( 1 - 0.983 )) = 28.65$$

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.**

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

$$Vs = 85.49 \times 0.84 \times 1.17800 \times \left( \frac{534}{29.68 \times 28.65} \right)^{\wedge}1/2 = 67.0$$

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.**

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

$$Qs(act) = 60 \times 67.0 \times 7.07 = 28418$$

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.**

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

$$Qs(std) = 17.64 \times 0.983 \times \frac{29.68}{533.6} \times 28418$$

$$Qs(std) = 27407$$

Where:

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

**10. Isokinetic variation calculated from intermediate values, percent.**

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

$$I = \frac{17.327 \times 534 \times 51.453}{67.0 \times 96 \times 29.68 \times 0.983 \times (0.160)\text{^}2} = 99.0$$

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: 11/20/19**
**Test Location: VES CBed Outlet** | **Test Period: 0953-1157**

**1. HFPO Dimer Acid concentration, lbs/dscf.**

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

$$Conc1 = \frac{1110.1 \times 2.2046 \times 10\text{-}9}{58.698}$$

Conc1 = 4.17E-08

Where:

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

Conc1 = HFPO Dimer Acid concentration, lbs/dscf.

$2.2046 \times 10^{-9}$ = Conversion factor from ug to lbs.

**2. HFPO Dimer Acid concentration, ug/dscm.**

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

Conc2 = 1110.1 / ( 58.698 x 0.02832 )

Conc2 = 667.8

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

$MR1_{(Inlet)}$ = 4.17E-08 x 26156 x 60

$MR1_{(Inlet)}$ = 6.54E-02

Where:

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

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

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

$MR2_{(Inlet)}$ = 6.54E-02 x 453.59 /3600

$MR2_{(Inlet)}$ = 8.24E-03

Where:

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

453.59 = Conversion factor from pounds to grams.

3600 = Conversion factor from hours to seconds.

**5. HFPO Dimer Acid Removal Efficiency, %**

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

$$RE = \frac{(1.38E\text{-}01) - (6.54E\text{-}02)}{1.38E\text{-}01}$$

RE = 52.4

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: 11/20/19 |
| Test Location: VES-Carbon Bed Outlet | Test Period: 0953-1157 |

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

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

$$Vm(std) = \frac{17.64 \times 1.0005 \times 57.729 \times \left( 30.05 + \frac{1.461}{13.6} \right)}{63.46 + 460} = 58.698$$

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.**

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

$$Vw(std) = ( 0.04707 \times 4.0 ) + ( 0.04715 \times 15.0 ) = 0.90$$

Where:

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

**3. Moisture content**

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

$$bws = \frac{0.90}{0.90 + 58.698} = 0.015$$

Where:

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

**4. Mole fraction of dry gas.**

$$Md = 1 - bws$$

$$Md = 1 - 0.015 = 0.985$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

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

$$MWd = 28.84$$

Where:

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

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

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

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

Where:

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

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

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

$$Vs = 85.49 \times 0.84 \times 0.83668 \times \left( \frac{533}{30.25 \times 28.67} \right)^{\wedge}1/2 = 47.1$$

Where:

Vs = Average gas stream velocity, ft/sec.

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

Cp = Pitot tube coefficient, dimensionless.

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

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

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

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

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

$$Qs(act) = 60 \times 47.1 \times 9.39 = 26547$$

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.**

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

$$Qs(std) = 17.64 \times 0.985 \times \frac{30.25}{533.4} \times 26547$$

$$Qs(std) = 26156$$

Where:

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

**10. Isokinetic variation calculated from intermediate values, percent.**

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

$$I = \frac{17.327 \times 533 \times 58.698}{47.1 \times 96 \times 30.25 \times 0.985 \times (0.200)^2} = 100.6$$

Where:

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

**SAMPLE CALCULATIONS FOR**
**HFPO DIMER ACID (METHOD 0010)**

**Client: Chemours** | **Plant: Fayetteville, NC**
**Test Number: Run 3** | **Test Date: 11/21/19**
**Test Location: VE South Stack** | **Test Period: 1143-1340**

**1. HFPO Dimer Acid concentration, lbs/dscf.**

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

$$Conc1 = \frac{145.8 \times 2.2046 \times 10\text{-}9}{53.203}$$

Conc1 = 6.04E-09

Where:

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

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

$2.2046 \times 10^{-9}$ = Conversion factor from ug to lbs.

**2. HFPO Dimer Acid concentration, ug/dscm.**

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

Conc2 = 145.8 / ( 53.203 x 0.02832 )

Conc2 = 96.78

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

$MR1_{(Outlet)}$ = 6.04E-09 x 24121 x 60

$MR1_{(Outlet)}$ = 8.75E-03

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

$MR2_{(Outlet)}$ = 8.75E-03 x 453.59 /3600

$MR2_{(Outlet)}$ = 1.10E-03

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: 11/21/19 |
| Test Location: VE South Stack | Test Period: 1143-1340 |

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

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

$$Vm(std) = \frac{17.64 \times 0.9972 \times 52.901 \times \left( 30.30 + \frac{0.998}{13.6} \right)}{71.25 + 460} = 53.203$$

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.**

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

$$Vw(std) = ( 0.04707 \times 12.0 ) + ( 0.04715 \times 12.6 ) = 1.16$$

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**

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

$$bws = \frac{1.16}{1.16 + 53.203} = 0.021$$

Where:

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

**4. Mole fraction of dry gas.**

$$Md = 1 - bws$$

$$Md = 1 - 0.021 = 0.979$$

Where:

Md = Mole fraction of dry gas, dimensionless.

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

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

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

$$MWd = 28.84$$

Where:

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

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

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

$$MWs = ( 28.84 \times 0.979 ) +( 18 ( 1 - 0.979 )) = 28.60$$

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.**

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

$$Vs = 85.49 \times 0.84 \times 0.75394 \times \left( \frac{533}{30.45 \times 28.60} \right)^{\wedge}1/2 = 42.3$$

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.**

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

$$Qs(act) = 60 \times 42.3 \times 9.62 = 24436$$

Where:

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

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

60 = Conversion factor from seconds to minutes.

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

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

$$Qs(std) = 17.64 \times 0.979 \times \frac{30.45}{532.5} \times 24436$$

$$Qs(std) = 24121$$

Where:

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

**10. Isokinetic variation calculated from intermediate values, percent.**

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

$$I = \frac{17.327 \times 533 \times 53.203}{42.3 \times 96 \times 30.45 \times 0.979 \times (0.200)^{\wedge}2} = 101.3$$

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), $\frac{(\text{in. Hg})(\text{in}^2)(\text{min})}{(\text{deg R})(\text{ft}^2)(\text{sec})}$ |

# 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** 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**
**11/20/19 and 11/21/19**

| | 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($^oR$) | | | |
| Tm = Average dry gas meter temperature , deg F. | 61.0 | 66.4 | 60.0 |

$$Tma = Ts + 460$$

$$Tma = 61.04 + 460$$

| | | | |
|---|---|---|---|
| **Tma =** | 521.04 | 526.38 | 520.04 |

| | | | |
|---|---|---|---|
| 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 | 1.03 | 1.05 | 0.98 |
| Pb = Barometric Pressure, in Hg. | 30.05 | 30.10 | 30.30 |

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

$$Pm = 30.05 + ( 1.02541666666667 / 13.6)$$

| | | | |
|---|---|---|---|
| **Pm =** | 30.13 | 30.18 | 30.37 |

| | | | |
|---|---|---|---|
| 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. | 50.118 | 51.536 | 49.722 |
| 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. $H_2O$ | 0.9853 | 0.9934 | 0.9639 |
| O = Total sampling time, minutes. | 96 | 96 | 96 |

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

$$Yqa = ( 96.00 / 50.12 ) * SQRT ( 0.0319 * 521.04 * 29 ) / ( 1.95 * 30.13 * 28.84 ) * 0.99$$

$$Yqa = 1.915 * SQRT\ 482.016 / 1,696.822 * 0.99$$

| | | | |
|---|---|---|---|
| **Yqa =** | 1.006 | 0.991 | 0.987 |

| | | | |
|---|---|---|---|
| Diff = Absolute difference between Yqa and Y | 0.06 | 1.55 | 1.95 |

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

$$Diff = (( 1.0066 - 1.006 ) / 1.0066 ) * 100$$

**Average Diff = 1.19**

**Allowable = 5.0**

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

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

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

**Dry Gas Meter Number** 17087349

| Baro Press, in Hg ( Pb) | 30.7 |
|---|---|

| Setting | Gas Volume | | Temperatures | | | | | Calibration Results | |
|---|---|---|---|---|---|---|---|---|---|
| Orifice Manometer | Wet Test Meter | Dry gas Meter | Wet Test Meter | Dry Gas Meter | | | | | |
| in $H_20$ ($\Delta H$) | $ft^3$ (Vw) | $ft^3$ (Vd) | °F (Tw) | Outlet, °F ($Td_o$) | Inlet, °F ($Td_i$) | Average, °F (Td) | Time, min (O) | Y | $\Delta H$ |
| 0.5 | 5.0 | 531.257 | 72.0 | 73.00 | 73.00 | 73.0 | 14.0 | 1.0363 | 2.1493 |
| | | 536.085 | | 73.00 | 73.00 | | | | |
| | | 4.828 | | 73.00 | 73.00 | | | | |
| 1.0 | 5.0 | 537.085 | 72.0 | 73.00 | 73.00 | 73.5 | 10.2 | 1.0034 | 2.2797 |
| | | 542.070 | | 74.00 | 74.00 | | | | |
| | | 4.985 | | 73.50 | 73.50 | | | | |
| 1.5 | 10.0 | 543.080 | 72.0 | 76.00 | 76.00 | 76.0 | 16.8 | 0.9905 | 2.3083 |
| | | 553.215 | | 76.00 | 76.00 | | | | |
| | | 10.135 | | 76.00 | 76.00 | | | | |
| 2.0 | 10.0 | 554.221 | 72.0 | 77.00 | 77.00 | 77.0 | 14.8 | 0.9850 | 2.3841 |
| | | 564.420 | | 77.00 | 77.00 | | | | |
| | | 10.199 | | 77.00 | 77.00 | | | | |
| 3.0 | 10.0 | 565.462 | 72.0 | 77.00 | 77.00 | 77.0 | 12.0 | 0.9871 | 2.3416 |
| | | 575.635 | | 77.00 | 77.00 | | | | |
| | | 10.173 | | 77.00 | 77.00 | | | | |
| | | | | | | | **Average** | **1.0005** | **2.2926** |

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

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

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

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

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

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

2 - Acceptable Temperature Difference less than 1.5 %

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

# Y Factor Calibration Check Calculation

**MODIFIED METHOD 0010 TEST TRAIN**
**VES CARBON BED OUTLET**
**METER BOX NO. 23**
**11/20/19 and 11/21/19**

| | 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($^oR$) | | | |
| Tm = Average dry gas meter temperature , deg F. | 63.5 | 62.0 | 67.1 |

$$Tma = Ts + 460$$

$$Tma = 63.46 + 460$$

| | | | |
|---|---|---|---|
| **Tma =** | 523.46 | 522.00 | 527.13 |

| | | | |
|---|---|---|---|
| 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 | 1.46 | 1.53 | 1.55 |
| Pb = Barometric Pressure, in Hg. | 30.05 | 30.10 | 30.30 |

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

$$Pm = 30.05 + ( 1.46083333333333 / 13.6)$$

| | | | |
|---|---|---|---|
| **Pm =** | 30.16 | 30.21 | 30.41 |

| | | | |
|---|---|---|---|
| Yqa = dry gas meter calibration check value, dimensionless. | | | |
| 0.03 = (29.92/528)(0.75)2 (in. Hg/°/R) cfm2. | | | |
| 29.00 = dry molecular weight of air, lb/lb-mole. | | | |
| Vm = Volume of gas sample measured by the dry gas meter at meter conditions, dcf. | 57.729 | 58.798 | 59.342 |
| Y = Dry gas meter calibration factor (based on full calibration) | 1.0005 | 1.0005 | 1.0005 |
| Delta H@ = Dry Gas meter orifice calibration coefficient, in. H2O. | 2.2926 | 2.2926 | 2.2926 |
| avg SQRT Delta H = Avg SQRT press. drop across the orifice meter during sampling , in. $H_2O$ | 1.1952 | 1.2224 | 1.2283 |
| O = Total sampling time, minutes. | 96 | 96 | 96 |

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

$$Yqa = ( 96.00 / 57.73 ) * SQRT ( 0.0319 * 523.46 * 29 ) / ( 2.29 * 30.16 * 28.84 ) * 1.20$$

$$Yqa = 1.663 * SQRT 484.251 / 1,993.860 * 1.20$$

| | | | |
|---|---|---|---|
| **Yqa =** | 0.980 | 0.981 | 0.979 |

| | | | |
|---|---|---|---|
| Diff = Absolute difference between Yqa and Y | 2.05 | 1.95 | 2.15 |

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

$$Diff = (( 1.0005 - 0.980 ) / 1.0005 ) * 100$$

**Average Diff = 2.05**

**Allowable = 5.0**

# 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 $H_20$ ($\Delta H$) | $ft^3$ (Vw) | $ft^3$ (Vd) | °F (Tw) | Outlet, °F ($Td_o$) | Inlet, °F ($Td_i$) | Average, °F (Td) | Time, min (O) | Y | $\Delta H$ |
| 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
$\Delta H$ - 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 %

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

# Y Factor Calibration Check Calculation

**MODIFIED METHOD 0010 TEST TRAIN**
**VE SOUTH STACK**
**METER BOX NO. 30**
**11/20/2019 & 11/21/2019**

| | 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($^oR$) | | | |
| Tm = Average dry gas meter temperature , deg F. | 59.2 | 64.6 | 71.3 |

$$Tma = Ts + 460$$

$$Tma = 59.17 + 460$$

| | | | |
|---|---|---|---|
| **Tma =** | 519.17 | 524.63 | 531.25 |

| | | | |
|---|---|---|---|
| Ps = Absolute meter pressure, inches Hg. | | | |
| 13.60 = Specific gravity of mercury. | | | |
| delta H = Avg pressure drop across the orifice meter during sampling, in H2O | 0.70 | 1.03 | 1.00 |
| Pb = Barometric Pressure, in Hg. | 30.05 | 30.10 | 30.30 |

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

$$Pm = 30.05 + ( 0.697916666666667 / 13.6)$$

| | | | |
|---|---|---|---|
| **Pm =** | 30.10 | 30.18 | 30.37 |

| | | | |
|---|---|---|---|
| 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. | 44.030 | 53.635 | 52.901 |
| Y = Dry gas meter calibration factor (based on full calibration) | 0.9972 | 0.9972 | 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. $H_2O$ | 0.8347 | 1.0162 | 0.9982 |
| O = Total sampling time, minutes. | 96 | 96 | 96 |

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

$$Yqa = ( 96.00 / 44.03 ) * SQRT ( 0.0319 * 519.17 * 29 ) / ( 1.83 * 30.10 * 28.84 ) * 0.83$$

$$Yqa = 2.180 * SQRT 480.281 / 1,590.977 * 0.83$$

| | | | |
|---|---|---|---|
| **Yqa =** | 1.0000 | 1.0033 | 1.0023 |

| | | | |
|---|---|---|---|
| Diff = Absolute difference between Yqa and Y | 0.28 | 0.61 | 0.15 |

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

$$Diff = (( 0.9972 - 1.000 ) / 0.9972 ) * 100$$

**Average Diff = 0.35**

**Allowable = 5.0**

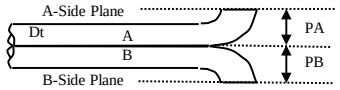
# Type S Pitot Tube Inspection Data Form

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

If all Criteria PASS
Cp is equal to 0.84

Inspection Date 1/5/18 Individual Conducting Inspection PM

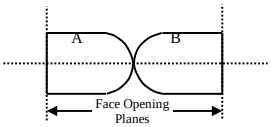
**PASS/FAIL**



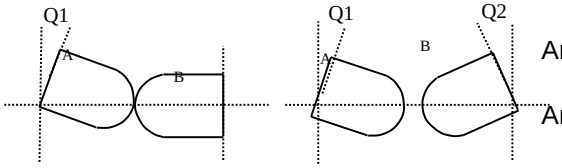

Distance to A Plane (PA) - inches 0.46 PASS
Distance to B Plane (PB) - inches 0.46 PASS
Pitot OD ($D_t$) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

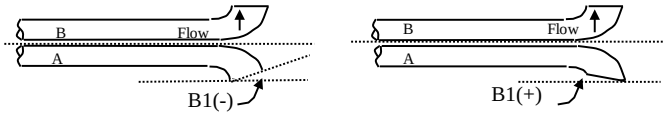



Are Open Faces Aligned Perpendicular to the Tube Axis (●) YES ( ) NO PASS

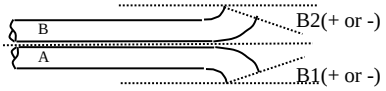



Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS
Angle of Q2 from vertical B Tube- degrees (absolute) 0 PASS

Q1 and Q2 must be ≤ 10°




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

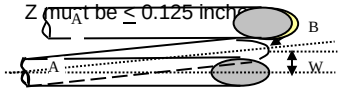



Angle of B1 from vertical B Tube- degrees (absolute) 0 PASS

B1 or B2 must be ≤ 5°

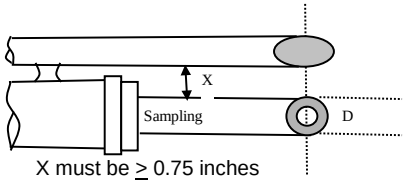

Horizontal offset between A and B Tubes (Z) - inches 0.007 PASS

Z must be ≤ 0.125 inches



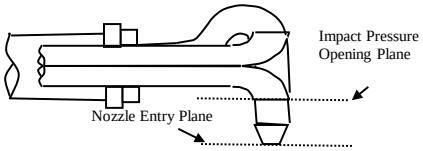

Vertical offset between A and B Tubes (W) - inches 0.018 PASS

W must be ≤ 0.03125 inches

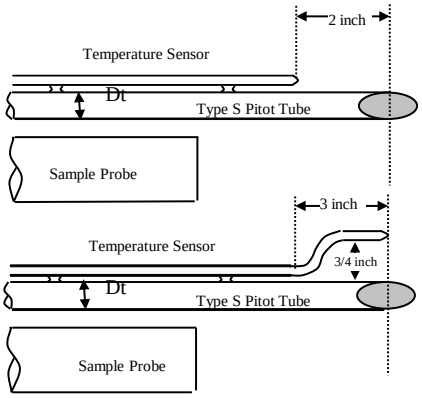



Distance between Sample Nozzle and Pitot (X) - inches 0.8 PASS

X must be ≥ 0.75 inches




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




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

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

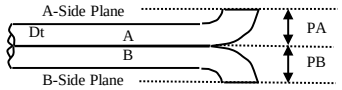
# Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/18 Individual Conducting Inspection KS

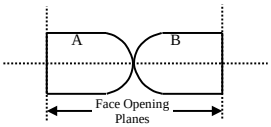
If all Criteria PASS
Cp is equal to 0.84

| | | 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 | |

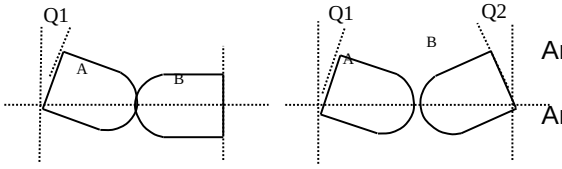



$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB



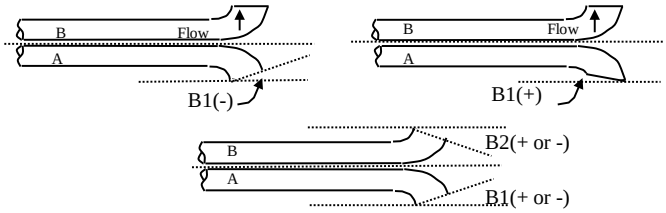

Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS




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

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

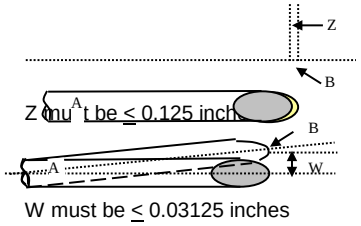
Q1 and Q2 must be $\leq 10^o$




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

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

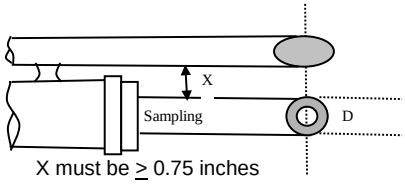
B1 or B2 must be $\leq 5^o$




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

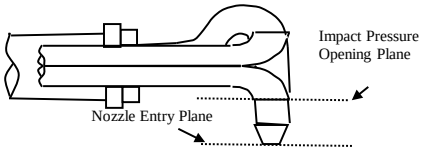
Vertical offset between A and B Tubes (W) - inches 0.012 PASS

W must be $\leq$ 0.03125 inches

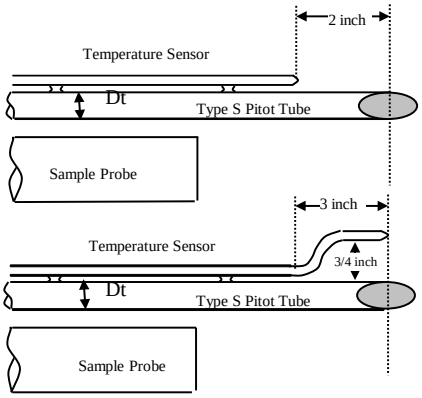



Distance between Sample Nozzle and Pitot (X) - inches 0.984 PASS

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

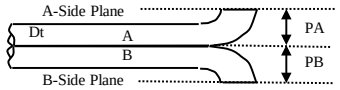
Thermocouple meets the Distance Criteria in the adjacent figure: ( ) YES ( ) NO (●) NA

# Type S Pitot Tube Inspection Data Form

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

Inspection Date 2/19/19 Individual Conducting Inspection ks

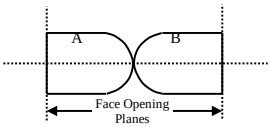
If all Criteria PASS
Cp is equal to 0.84



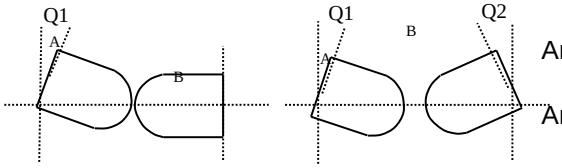

| | | PASS/FAIL |
|---|---|---|
| Distance to A Plane (PA) - inches | 0.459 | PASS |
| Distance to B Plane (PB) - inches | 0.459 | PASS |
| Pitot OD ($D_t$) - inches | 0.375 | |

$1.05\ D_t < P < 1.5\ D_t$

PA must Equal PB

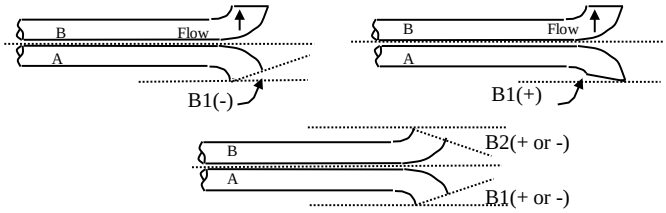



Are Open Faces Aligned Perpendicular to the Tube Axis: (●) YES ( ) NO — PASS




| | | |
|---|---|---|
| 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 $\leq 10^o$

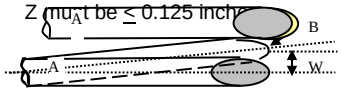



| | | |
|---|---|---|
| Angle of B1 from vertical A Tube- degrees (absolute) | 0 | PASS |
| Angle of B1 from vertical B Tube- degrees (absolute) | 0 | PASS |

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

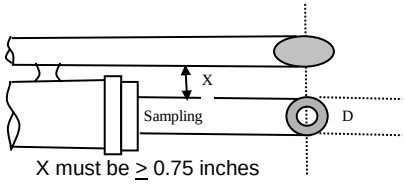

| | | |
|---|---|---|
| Horizontal offset between A and B Tubes (Z) - inches | 0.003 | PASS |

Z must be $\leq$ 0.125 inches



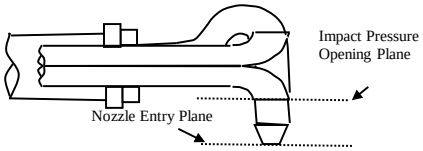

| | | |
|---|---|---|
| Vertical offset between A and B Tubes (W) - inches | 0.012 | PASS |

W must be $\leq$ 0.03125 inches

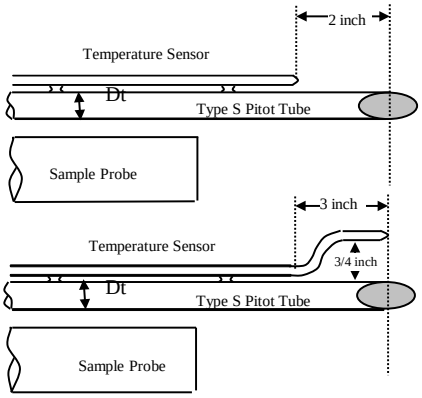



| | | |
|---|---|---|
| Distance between Sample Nozzle and Pitot (X) - inches | 0.93 | PASS |

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

# APPENDIX F
# LIST OF PROJECT PARTICIPANTS

The following WESTON employees participated in this project.

| | |
|---|---|
| Paul Meeter | Senior Project Manager |
| Jeff O'Neill | Team Member |
| Wes Fritz | Team Member |
| Jack Mills | Team Member |
| Steve Rathfon | Team Member |
| Kyle Schweitzer | Team Member |
| Austin Squires | Team Member |
| Brandon Berger | Team Member |
| Johnnie Vitello | Team Member |