SOURCE TEST REPORT
2019 COMPLIANCE – CIVIL PENALTY ORDER RESPONSE TESTING
OWENS-BROCKWAY GLASS CONTAINER FURNACES “A” AND “D”
PORTLAND, OREGON

Prepared For:

Owens-Brockway Glass Container Inc.
9710 NE Glass Plant Road
Portland, OR 97220

For Submittal To:

Oregon Department of Environmental Quality
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Salem, OR 97302

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Test Dates:	**May 15-17 and 20-23, 2019**
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REVIEW AND CERTIFICATION

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature: ______________ Date: 8/08/2019

Name: Joe Heffernan Title: Project Manager

I have reviewed, technically and editorially, details calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature: Andy Vella Date: 08/08/2019

Name: Andy Vella Title: Reporting/QC Specialist

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1.0 SUMMARY OF TEST PROGRAM AND RESULTS

1.1 PROGRAM OBJECTIVES

Montrose Air Quality Services, LLC (Montrose) was contracted by Owens-Brockway Glass Container (Owens-Brockway) to perform a series of air emission tests at the facility located in Portland, Oregon. The tests were conducted to determine compliance with the testing terms outlined in the Notice of Civil Penalty Assessment and Order Case No. AQ/V-NWR-2019-016.

The testing was conducted by Joe Heffernan, Sean Hillery, Austin Goracke, Preston Bauder, Josh Muswieck and Allon Kienitz of Montrose on May 15-17 and 20-23, 2019. Dennis Buenger of Owens Illinois coordinated the testing program. Thomas Rhodes of the Oregon Department of Environmental Quality (ODEQ) was present to observe. The tests were conducted according to a test plan dated May 9, 2019 that was submitted to the ODEQ. Montrose performed the tests to measure the following emission parameters:

- Emission Compliance:
  - ➢ CO (ppm volume dry, lb/hr, lb/ton)
  - ➢ NO_x (ppm volume dry, lb/hr, lb/ton)
  - ➢ VOC (ppm volume dry, lb/hr, lb/ton)
  - ➢ SO_2 (ppm volume dry, lb/hr, lb/ton)
  - ➢ PM (total) as PM_{10} (gr/dscf, lb/hr, lb/ton, g/kg glass)
  - ➢ Formaldehyde (mg/dscm, lb/hr)
  - ➢ Chromium (VI) and Total Chromium (ug/dscm, lb/hr, lb/ton, gm/kg glass)
  - ➢ Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), and Selenium (Se) (ug/dscm, lb/hr, lb/ton, gm/kg glass)
- O_2 and CO_2 (% volume dry) – for molecular weight
- Stack volumetric flow rate (dscfm) and moisture content (% by volume)

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Tables 1-1 through 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

TABLE 1-1
SUMMARY OF AVERAGE PARTICULATE AND GASEOUS EMISSIONS
OWENS BROCKWAY
FURNACES "A" AND "D"
JUNE 15-23, 2019

Parameter	FURNACE "A" NORTH	FURNACE "A" SOUTH	FURNACE "D"	Permit Limit
CO Emissions:				
ppm volume dry	< 1.1	< 1.1	< 1.1	--
lb/hr	< 0.16	< 0.16	< 0.029	--
lb/ton	< 0.019	< 0.019	< 0.004	--
NO_X Emissions:				
ppm volume dry	143	143	632	--
lb/hr as NO_2	33	33	27	--
lb/ton as NO_2	3.9	3.9	3.6	--
SO_2 Emissions:				
ppm volume dry	87	87	387	--
lb/hr	28	28	23	--
lb/ton	3.3	3.3	3.1	--
THC Emissions:				
ppm volume dry as C_3H_8	6.8	6.8	1.6	--
lb/hr as C_3H_8	1.5	1.5	0.06	--
lb/ton as C_3H_8	0.18	0.18	0.009	--
Formaldehyde Emissions:				
ppm volume dry	< 0.014	< 0.013	< 0.012	--
mg/dscm	< 0.017	< 0.016	< 0.015	--
lb/hr	< 0.0022	< 0.0019	< 0.00032	--
lb/ton	< 0.00026	< 0.00023	< 0.000044	--
Front Half Particulate Matter:				
gr/dscf	0.015	0.013	0.10	0.10
lb/hr	4.0	3.5	5.1	--
lb/ton Glass	0.48	0.42	0.69	--
gm/kg Glass	0.24	0.21	0.35	--
Back Half Particulate Matter:				
gr/dscf	0.018	0.019	0.02	0.10
lb/hr	4.9	5.3	1.2	--
lb/ton Glass	0.58	0.63	0.16	--
gm/kg Glass	0.29	0.31	0.08	--
Total Particulate Matter:				
gr/dscf	0.032	0.032	0.12	0.10
lb/hr	8.9	8.8	6.3	--
lb/ton Glass	1.1	1.0	0.85	--
gm/kg Glass	0.53	0.52	0.42	--
gm/kg Glass[1]	0.50	0.49	0.39	0.5

NOTE: Run 3 of Furnace A-North Particulate and Run 3 of the South formaldehyde was not used in the results average.
[1] Equation 15a of the permit was used.

MONTROSE AIR QUALITY SERVICES

TABLE 1-2
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACES "A" AND "D"
JUNE 15-23, 2019

Parameter	FURNACE "A" NORTH	FURNACE "A" SOUTH	FURNACE "D"	Permit Limit
Antimony Emissions:				
µg/dscm	5.25×10^{0}	5.70×10^{0}	1.06×10^{1}	--
lb/hr	7.07×10^{-4}	7.24×10^{-4}	2.19×10^{-4}	--
lb/ton	8.40×10^{-5}	8.60×10^{-5}	2.96×10^{-5}	--
gm/kg glass	4.20×10^{-5}	4.30×10^{-4}	1.48×10^{-5}	--
Arsenic Emissions:				
µg/dscm	1.11×10^{2}	1.14×10^{2}	1.98×10^{2}	--
lb/hr	1.49×10^{-2}	1.45×10^{-2}	4.12×10^{-3}	--
lb/ton	1.78×10^{-3}	1.72×10^{-3}	5.56×10^{-4}	--
gm/kg glass	8.87×10^{-4}	8.59×10^{-4}	2.78×10^{-4}	--
Beryllium Emissions:				
µg/dscm	1.58×10^{-2}	1.70×10^{-2}	4.21×10^{-2}	--
lb/hr	2.12×10^{-6}	2.17×10^{-6}	8.74×10^{-7}	--
lb/ton	2.52×10^{-7}	2.57×10^{-7}	1.18×10^{-7}	--
gm/kg glass	1.26×10^{-7}	1.29×10^{-7}	5.90×10^{-8}	--
Cadmium Emissions:				
µg/dscm	3.88×10^{0}	2.93×10^{0}	1.91×10^{1}	--
lb/hr	5.23×10^{-4}	3.71×10^{-4}	3.97×10^{-4}	--
lb/ton	6.22×10^{-5}	4.41×10^{-5}	5.37×10^{-5}	--
gm/kg glass	3.11×10^{-5}	2.21×10^{-5}	2.68×10^{-5}	--
Cobalt Emissions:				
µg/dscm	4.10×10^{-2}	4.57×10^{-2}	1.68×10^{-1}	--
lb/hr	5.52×10^{-6}	5.83×10^{-6}	3.49×10^{-6}	--
lb/ton	6.56×10^{-7}	6.93×10^{-7}	4.71×10^{-7}	--
gm/kg glass	3.28×10^{-7}	3.46×10^{-7}	2.35×10^{-7}	--
Copper Emissions:				
µg/dscm	5.44×10^{0}	5.19×10^{0}	2.06×10^{1}	--
lb/hr	7.33×10^{-4}	6.61×10^{-4}	4.28×10^{-4}	--
lb/ton	8.70×10^{-5}	7.85×10^{-5}	5.78×10^{-5}	--
gm/kg glass	4.35×10^{-5}	3.92×10^{-5}	2.89×10^{-5}	--
Lead Emissions:				
µg/dscm	2.86×10^{2}	2.47×10^{2}	2.32×10^{3}	--
lb/hr	3.85×10^{-2}	3.14×10^{-2}	4.82×10^{-2}	--
lb/ton	4.57×10^{-3}	3.73×10^{-3}	6.51×10^{-3}	--
gm/kg glass	2.29×10^{-3}	1.86×10^{-3}	3.25×10^{-3}	--

TABLE 1-2 (CONTINUED)
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACES "A" AND "D"
JUNE 15-23, 2019

Parameter	FURNACE "A" NORTH	FURNACE "A" SOUTH	FURNACE "D"	Permit Limit
Manganese Emissions:				
µg/dscm	2.40×10^{0}	4.14×10^{-1}	5.55×10^{0}	--
lb/hr	3.17×10^{-4}	5.24×10^{-5}	1.15×10^{-4}	--
lb/ton	3.76×10^{-5}	6.22×10^{-6}	1.55×10^{-5}	--
gm/kg glass	1.88×10^{-5}	3.11×10^{-6}	7.76×10^{-6}	--
Mercury Emissions:				
µg/dscm	5.36×10^{-1}	4.88×10^{-1}	2.53×10^{0}	--
lb/hr	7.23×10^{-5}	6.17×10^{-5}	5.25×10^{-5}	--
lb/ton	8.59×10^{-6}	7.32×10^{-6}	7.09×10^{-6}	--
gm/kg glass	4.29×10^{-6}	3.66×10^{-6}	3.55×10^{-6}	--
Nickel Emissions:				
µg/dscm	4.75×10^{-1}	4.37×10^{-1}	9.42×10^{0}	--
lb/hr	6.38×10^{-5}	5.55×10^{-5}	1.96×10^{-4}	--
lb/ton	7.58×10^{-6}	6.59×10^{-6}	2.64×10^{-5}	--
gm/kg glass	3.79×10^{-6}	3.29×10^{-6}	1.32×10^{-5}	--
Selenium Emissions:				
µg/dscm	2.45×10^{1}	2.73×10^{1}	1.29×10^{2}	--
lb/hr	3.30×10^{-3}	3.47×10^{-3}	2.69×10^{-3}	--
lb/ton	3.92×10^{-4}	4.12×10^{-4}	3.63×10^{-4}	--
gm/kg glass	1.96×10^{-4}	2.06×10^{-4}	1.81×10^{-4}	--
Total Chromium Emissions:				
µg/dscm	4.22×10^{1}	3.88×10^{1}	1.14×10^{2}	--
lb/hr	5.74×10^{-3}	5.41×10^{-3}	2.47×10^{-3}	--
lb/ton	6.82×10^{-4}	6.43×10^{-4}	3.33×10^{-4}	--
gm/kg glass	3.41×10^{-4}	3.21×10^{-4}	1.67×10^{-4}	--
Chrome (Cr^{+6}) Emissions:				
µg/dscm	1.04×10^{-1}	9.06×10^{-2}	9.24×10^{-2}	--
lb/hr	1.41×10^{-5}	1.27×10^{-5}	1.99×10^{-6}	--
lb/ton	1.67×10^{-6}	1.50×10^{-6}	2.69×10^{-7}	--
gm/kg glass	8.37×10^{-7}	7.52×10^{-7}	1.34×10^{-7}	--

1.2 PROJECT CONTACTS

A list of project participants is included below:

Facility Information

Source Location:	Owens-Brockway Glass Container 9710 NE Glass Plant Road Portland, OR 97220	
Project Contact:	Dennis Buenger, CHMM	Ashleigh Henry
Role:	Global Environmental Technical Leader	EHS Manager
Company:	Owens Illinois	Owens Illinois
Telephone:	567-336-7519	
Email:	Dennis.Buenger@o-i.com	Ashleigh.Henry@o-i.com

Agency Information

Regulatory Agency:	Oregon Department of Environmental Quality
Agency Contact:	Suzanne Blackburn
Telephone:	503-378-5034
Email:	Suzanne.blackburn@state.or.us

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC (Montrose)	
Contact:	Jeremiah Hicks	Joe Heffernan
Title:	Project Coordinator	Client Project Manager
Telephone:	440-340-8189	971-282-5336
Email:	jhicks@montrose-env.com	jheffernan@montrose-env.com

Laboratory Information

Laboratory:	Chester LabNet
City, State:	Tigard, Oregon

1.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices.

2.0 SOURCE DESCRIPTION

2.1 FACILITY AND SOURCE DESCRIPTION

Owens-Brockway Glass Container's Portland facility is located at 9710 NE Glass Plant Road in Portland, Oregon. Plant No. 21 produces a variety of glass bottles and jars from post-consumer recycled glass with other essential raw materials. The glass manufacturing comprises of the following areas of operations: raw material and cullet receiving and storage, materials blending and transport, glass melting furnaces, glass forming, final bottle treatment, and the maintenance and support systems such as boiler and storage tanks. The plant has four glass melting furnaces (EU4) at their Portland, Oregon, facility (Plant No. 21), but Furnaces B (GM2) and C (GM3) are no longer in operation. The furnaces tested were Glass Melting Furnaces A (GM1) and D (GM4) with estimated maximum capacities of 270 tons per day and 225 tons per day respectively (based on 98,550 and 82,185 tons/year respectively).

2.2 SAMPLING LOCATIONS AND ACCESS

Information regarding the sampling locations is presented below:

Sample location ID:	Furnace D Exhaust Duct
Stack exit height:	Cylindrical, vertical
Configuration:	29 inches internal diameter
Dimensions:	Appx. 348" (~12 duct diameters) upstream from the stack exit
Port locations:	Appx. 18" (~0.6 duct diameters) downstream from the nearest stack disturbance
Port access:	Permanent platform

Sample location ID:	Furnace A North Exhaust Duct
Configuration:	Cylindrical, vertical
Dimensions:	44.4 inches internal diameter
Port locations:	Appx. 180" (~4.1 duct diameters) upstream from the stack exit
	Appx. 108" (~2.4 duct diameters) downstream from the nearest stack disturbance
Port access:	Permanent platform

Sample location ID:	Furnace A South Exhaust Duct
Configuration:	Elliptical, vertical
Dimensions:	44.0 x 44.5 inches
Port locations:	Appx. 180" (~4.0 duct diameters) upstream from the stack exit
	Appx. 100" (~2.2 duct diameters) downstream from the nearest stack disturbance
Port access:	Permanent platform

Traverse point information is presented below:

- Particulate tests - 24 points total, 12 from each of 2 ports located 90 degrees apart from one another
- Gaseous emission tests – stratification test and sampling point selection performed per EPA Method 7E

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while the furnaces were operating at the conditions required by the permit. The units were tested when operating normally.

Plant personnel established the test conditions and collected all applicable unit-operating data. Montrose monitored the collection of process data and provided additional data collection as necessary to document operation. Data collected included the following parameters:

- Hourly production data and all glass colors for the previous 12 months
- Glass production
- Recycled-to-raw material ratios (% cullet)
- Natural gas usage
- Electric boost rate
- Bridgewall temperature

3.0 TEST METHOD DETAILS

3.1 LIST OF TEST METHODS

The test procedures for this test program are summarized in Table 3-1 below. Additional information regarding specific applications or modifications to standard procedures is presented in the following sub-sections.

TABLE 3-1
TEST PROCEDURES

Parameter	Measurement Principle	Reference Method
Volumetric flow rate	Pitot/temperature traverse	EPA 1, 2
O_2	Paramagnetism	EPA 3A
CO_2	Non-dispersive infrared	EPA 3A
SO_2	UV Fluorescence	EPA 6C
NO_x	Chemiluminescence	EPA 7E
CO	Gas filter correlation NDIR	EPA 10
THC	Flame ionization detection	EPA 25A
Moisture	Impinger weight gain	EPA 4
Filterable & Condensable PM	Gravimetry with condensable analysis	ODEQ 5
Formaldehyde	Spectrophotometrically	EPA 316
Cr and Cr^{+6}	Ion chromatographic-colorimetric	CARB 425
Metals (Sb, As, Be, Cd, Co, Cu, Pb, Mn, Hg, Ni, Se)	ICP and CVAA	EPA 29

3.1.1 Determination of Sampling Traverse Points (Gaseous Sampling)

Sampling traverse points for gaseous methods are determined in accordance with EPA Method 7E.

3.1.2 Alternative EPA Method 2 Thermocouple Calibration Procedure (ALT-011)

Approved Alternative Method 011 (ALT-011) is used as an alternative to the EPA Method 2 two-point thermocouple calibration. This procedure involves a single-point in-field check using a reference thermometer to confirm that the thermocouple system is operating properly. The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F.

3.1.3 Gaseous Emissions

Concentrations of the gaseous constituents of stack gas (O_2, CO_2, NO_X, CO and SO_2) are measured using Montrose's dry extractive reference method (RM) monitor system in accordance with EPA Method 3A, 6C, 7E and 10. This system meets the requirements of EPA methods for gaseous species. Pertinent information regarding the performance of the method is presented below:

- Method Deviations: None
- Method Options: N/A
- Detection Limits: 2% of calibration span

Sampling traverse points for gaseous emissions were determined in accordance with EPA Method 7E.

3.1.4 Volatile Organic Compounds

Concentrations of volatile organic compounds (VOCs) or total hydrocarbons (THCs) were measured per EPA Method 25A. Pertinent information regarding the performance of the method is presented below:

- Method Deviations: None
- Sampling Media: Heated sample line to analyzer
- Detection Limit: 2% of instrument range

The sampling apparatus for each system includes a stainless steel probe and heated Teflon line connected to the inlet port of the analyzer. The analyzers include internal sampling pumps and heated oven/analysis sections that keep the sample gas at a minimum of 180 degrees Celsius (356 °F). The heated lines are maintained at a minimum of 135 degrees Celsius (275 °F) during the test program. The heated line temperatures are monitored during each test run.

3.1.5 Particulate Matter Emissions

Emissions of total particulate matter (PM) were measured using ODEQ Method 5. Pertinent information regarding the performance of the methods are presented below:

- Method Deviations: None
- Minimum Required Sample Duration: 60 minutes
- Minimum Required Sample Volume: 31.8 dscf
- In Stack Detection Limit (ISDL): 7 mg
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

3.1.6 Formaldehyde Emissions

Concentrations of formaldehyde were determined using EPA Method 316. Gaseous and particulate pollutants are withdrawn isokinetically from an emission source and are collected in high purity water. The high purity water containing formaldehyde is then analyzed using the modified pararosaniline method. The intensity of the purple color, formed from the reaction of the formaldehyde with acidic pararosaniline and sodium sulfite is measured spectrophotometrically and provides an accurate measurement of the sample's formaldehyde concentration:

- Method Deviations: None
- Minimum Required Sample Volume: 30 dscf
- Detection Limit: 0.03 mg/L
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

3.1.7 Multi-Metals

Select trace metals were measured at the exhaust stacks using EPA Method 29. Triplicate test runs were 240 minutes in duration and the sampling was performed isokinetically with a multi-point traverse of the sampling plane. The samples were analyzed for selected trace metals from Method 29 metals including Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), and Selenium (Se). Pertinent information regarding the performance of the audit is presented below:

- Method Deviations: None
- Minimum Required Sample Volume: 120 dscf
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

3.1.8 Total Chromium and Hexavalent Chromium

Total chromium and hexavalent chromium (Cr^{+6}) are determined using CARB Method 425 in lieu of SW-846 0061. The elevated temperatures at the furnace exit make the proper operation of a SW-846 0061 train impossible. Triplicate test runs were performed and the sampling was performed isokinetically with a multi-point traverse of the sampling plane.

- Method Deviations: None
- Minimum Required Sample Volume: 60 dscf
- Detection Limit: 0.02 µg/L
- Analytical Laboratory: Chester LabNet, Tigard, Oregon

4.0 TEST RESULTS AND OVERVIEW

4.1 DISCUSSION OF RESULTS

The average results are compared to the permit limits in Tables 1-1 and 1-2. The results of individual compliance test runs performed for the gaseous emissions are presented in Tables 4-1 through 4-3. The results of individual compliance test runs performed for the particulate emissions are presented in Tables 4-4 through 4-6. The results of individual compliance test runs performed for the formaldehyde emissions are presented in Tables 4-7 through 4-9. The results of individual compliance test runs performed for the multi-metals emissions are presented in Tables 4-10 through 4-12. The results of individual compliance test runs performed for the chromium emissions are presented in Tables 4-13 through 4-15. Emissions have been reported in units consistent with those in the permits.

The carbon monoxide concentration for both furnaces, three sampling locations, was below zero and are reported at the 2% of span as a reporting limit.

The formaldehyde concentration for both furnaces, three sampling locations, were non-detects and are reported at the detection limit.

All particulate test run sample volumes were greater than 31.8 dscf and more than 7 mg PM was collected for each run.

For all CARB 425 runs, the pH was maintained above 8 and sample volumes were greater than 60 dscf, see section B5.

For all EPA M29 runs, the sample volumes were greater than 140 dscf, see section A4.

For all EPA M316 runs were sampled at less than 1.0 cfm, see section A3.

There were two runs during all the testing that failed to reach a vacuum equal to or greater than the vacuum experienced during testing. That was on run 3 of particulate testing on Furnace A-North and run 3 of formaldehyde testing on Furnace D. 40 CRF 60.8 (f)(1) says that, with the Administrator’s approval, two valid runs can be averaged and used when conditions are beyond owner’s control.

Additional information is included in the appendices. Appendix A presents the general and specific equations used for the emissions calculations and computer spreadsheets. Raw field data sheets and data acquisition printouts are included in Appendix B. Laboratory reports and chain of custody sheets for the samples are located in Appendix C. Process data provided by the facility is located in Appendix D. Appendix E presents the quality assurance information, including instrument calibration data. Additional correspondence and relevant regulatory information are located in Appendix F.

4.2 DEVIATIONS AND EXCEPTIONS

There was a failed post-test leak check on run 3 of the particulate testing on Furnace “D”. A fourth test was conducted.

Furnace “D” downstream diameters did not meet the criteria of EPA Method 1.

Two posttest leak checks failed to achieve vacuums equal to or greater than the maximum recorded during the tests. These runs were not used in their respective averages.

TABLE 4-1
SUMMARY OF AVERAGE GASEOUS EMISSIONS
OWENS BROCKWAY
FURNACE "A" NORTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/20/19	5/20/19	5/20/19	--
Time:	1254-1408	1503-1718	1737-1952	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.3	17.2	17.4	17.3
CO_2, % volume dry	2.7	2.8	2.6	2.7
Stack temperature, °F	413	421	405	413
Moisture content, % volume	5.2	5.3	4.3	4.9
Volumetric flow rate, dscf/min	31,827	32,002	31,826	31,885
CO Emissions:				
ppm volume dry	< 1.1	< 1.1	< 1.1	< 1.1
lb/hr	< 0.16	< 0.16	< 0.16	< 0.16
lb/ton	< 0.019	< 0.019	< 0.019	< 0.019
NO_X Emissions:				
ppm volume dry	147	152	132	143
lb/hr as NO_2	33	35	30	33
lb/ton as NO_2	4.0	4.1	3.6	3.9
SO_2 Emissions:				
ppm volume dry	85	90	86	87
lb/hr	27	29	27	28
lb/ton	3.2	3.4	3.2	3.3
THC Emissions:				
ppm volume dry as C_3H_8	7.4	6.5	6.3	6.8
lb/hr as C_3H_8	1.6	1.4	1.4	1.5
lb/ton as C_3H_8	0.19	0.17	0.16	0.18

NOTE: Carbon Monoxide is being reported at the 2% of span value because actual values were less than zero.

**TABLE 4-2
SUMMARY OF AVERAGE GASEOUS EMISSIONS
OWENS BROCKWAY
FURNACE "A" SOUTH**

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/20/19	5/20/19	5/20/19	--
Time:	1254-1408	1503-1718	1737-1952	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.3	17.2	17.4	17.3
CO_2, % volume dry	2.7	2.8	2.6	2.7
Stack temperature, °F	360	353	360	358
Moisture content, % volume	5.0	4.7	4.6	4.7
Volumetric flow rate, dscf/min	31,598	30,414	33,877	31,963
CO Emissions:				
ppm volume dry	< 1.1	< 1.1	< 1.1	< 1.1
lb/hr	< 0.16	< 0.15	< 0.17	< 0.16
lb/ton	< 0.019	< 0.018	< 0.020	< 0.019
NO_X Emissions:				
ppm volume dry	147	152	132	143
lb/hr as NO_2	33	33	32	33
lb/ton as NO_2	3.9	3.9	3.8	3.9
SO_2 Emissions:				
ppm volume dry	85	90	86	87
lb/hr	27	27	29	28
lb/ton	3.2	3.3	3.4	3.3
THC Emissions:				
ppm volume dry as C_3H_8	7.4	6.5	6.3	6.8
lb/hr as C_3H_8	1.6	1.4	1.5	1.5
lb/ton as C_3H_8	0.19	0.16	0.17	0.18

NOTE: Carbon Monoxide is being reported at the 2% of span value because actual values were less than zero.

MONTROSE AIR QUALITY SERVICES

**TABLE 4-3
SUMMARY OF AVERAGE GASEOUS EMISSIONS
OWENS BROCKWAY
FURNACE "D"**

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/15/19	5/15/19	5/15/19	--
Time:	0932-1059	1144-1244	1345-1445	--
Process Data:				
Glass production, tons/hr	7.40	7.40	7.40	7.40
Flue Gas:				
O_2, % volume dry	6.7	7.1	6.9	6.9
CO_2, % volume dry	9.9	9.7	9.8	9.8
Stack temperature, °F	712	702	705	706
Moisture content, % volume	15.6	15.4	14.0	15.0
Volumetric flow rate, dscf/min	5,943	5,749	5,928	5,873
CO Emissions:				
ppm volume dry	< 1.1	< 1.1	< 1.1	< 1.1
lb/hr	< 0.029	< 0.028	< 0.029	< 0.029
lb/ton	< 0.004	< 0.004	< 0.004	< 0.004
NO_X Emissions:				
ppm volume dry	631	629	635	632
lb/hr as NO_2	27	26	27	27
lb/ton as NO_2	3.6	3.5	3.6	3.6
SO_2 Emissions:				
ppm volume dry	406	374	380	387
lb/hr	24	21	22	23
lb/ton	3.3	2.9	3.0	3.1
THC Emissions:				
ppm volume dry as C_3H_8	1.5	1.7	1.6	1.6
lb/hr as C_3H_8	0.06	0.07	0.06	0.06
lb/ton as C_3H_8	0.009	0.009	0.009	0.009

NOTE: Carbon Monoxide is being reported at the 2% of span value because actual values were less than zero.

TABLE 4-4
SUMMARY OF AVERAGE PARTICULATE EMISSIONS
OWENS BROCKWAY
FURNACE “A” NORTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/20/19	5/20/19	5/20/19	--
Time:	1205-1411	1507-1706	1801-1930	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.3	17.2	17.4	17.3
CO_2, % volume dry	2.7	2.8	2.6	2.7
Stack temperature, °F	413	421	405	417
Moisture content, % volume	5.2	5.3	4.3	5.3
Volumetric flow rate, dscf/min	31,827	32,002	31,826	31,914
Total Particulate Matter:				
gr/dscf	0.034	0.031	0.028	0.032
lb/hr	9.1	8.6	7.5	8.9
lb/ton Glass	1.1	1.0	0.89	1.1
gm/kg Glass	0.54	0.51	0.45	0.53
gm/kg Glass[1]	0.51	0.48	0.42	0.50
Filterable Particulate Matter:				
gr/dscf	0.015	0.014	0.014	0.015
lb/hr	4.2	3.8	3.8	4.0
lb/ton Glass	0.49	0.46	0.45	0.48
gm/kg Glass	0.25	0.23	0.22	0.24
Condensable Particulate Matter:				
gr/dscf	0.018	0.017	0.014	0.018
lb/hr	5.0	4.7	3.7	4.9
lb/ton Glass	0.59	0.56	0.44	0.58
gm/kg Glass	0.30	0.28	0.22	0.29

NOTE: Run 3 was not used in the average because leak check was not conducted at a high enough vacuum.
[1] Equation 15a of the permit was used.

TABLE 4-5
SUMMARY OF AVERAGE PARTICULATE EMISSIONS
OWENS BROCKWAY
FURNACE "A" SOUTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/20/19	5/20/19	5/20/19	--
Time:	1146-1351	1531-1700	1731-1900	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.3	17.2	17.4	17.3
CO_2, % volume dry	2.7	2.8	2.6	2.7
Stack temperature, °F	360	353	360	358
Moisture content, % volume	5.0	4.7	4.6	4.7
Volumetric flow rate, dscf/min	31,598	30,414	33,877	31,963
Total Particulate Matter:				
gr/dscf	0.036	0.026	0.034	0.032
lb/hr	9.6	6.9	9.9	8.8
lb/ton Glass	1.1	0.82	1.2	1.0
gm/kg Glass	0.57	0.41	0.59	0.52
gm/kg Glass[1]	0.54	0.38	0.56	0.49
Filterable Particulate Matter:				
gr/dscf	0.013	0.013	0.013	0.013
lb/hr	3.4	3.3	3.7	3.5
lb/ton Glass	0.41	0.40	0.44	0.42
gm/kg Glass	0.20	0.20	0.22	0.21
Condensable Particulate Matter:				
gr/dscf	0.023	0.014	0.021	0.019
lb/hr	6.2	3.5	6.1	5.3
lb/ton Glass	0.74	0.42	0.73	0.63
gm/kg Glass	0.37	0.21	0.37	0.31

[1] Equation 15a of the permit was used.

TABLE 4-6
SUMMARY OF AVERAGE PARTICULATE EMISSIONS
OWENS BROCKWAY
FURNACE “D”

Parameter	Run 1	Run 2	Run 4	Average
Date:	5/15/19	5/15/19	5/15/19	--
Time:	0932-1104	1144-1247	1526-1627	--
Process Data:				
Glass production, tons/hr	7.40	7.40	7.40	7.40
Flue Gas:				
O_2, % volume dry	6.7	7.1	6.8	6.9
CO_2, % volume dry	9.9	9.7	9.8	9.8
Stack temperature, °F	712	702	711	708
Moisture content, % volume	15.6	15.4	14.0	15.0
Volumetric flow rate, dscf/min	5,943	5,749	6,105	5,932
Total Particulate Matter:				
gr/dscf	0.124	0.138	0.109	0.124
lb/hr	6.3	6.8	5.7	6.3
lb/ton Glass	0.85	0.92	0.77	0.85
gm/kg Glass	0.43	0.46	0.39	0.42
gm/kg Glass[1]	0.39	0.43	0.35	0.39
Filterable Particulate Matter:				
gr/dscf	0.096	0.113	0.095	0.101
lb/hr	4.9	5.5	4.9	5.1
lb/ton Glass	0.66	0.75	0.67	0.69
gm/kg Glass	0.33	0.37	0.33	0.35
Condensable Particulate Matter:				
gr/dscf	0.028	0.026	0.014	0.023
lb/hr	1.4	1.3	0.8	1.2
lb/ton Glass	0.19	0.17	0.10	0.16
gm/kg Glass	0.10	0.09	0.05	0.08

NOTE: Run 3 failed the posttest leak check
[1] Equation 15a of the permit was used.

TABLE 4-7
SUMMARY OF AVERAGE FORMALDEHYDE EMISSIONS
OWENS BROCKWAY
FURNACE “A” NORTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/20/19	5/20/19	5/20/19	--
Time:	1205-1411	1503-1706	1801-1930	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.3	17.2	17.4	17.3
CO_2, % volume dry	2.7	2.8	2.6	2.7
Stack temperature, °F	394	382	402	393
Moisture content, % volume	4.8	5.4	5.3	5.2
Volumetric flow rate, dscf/min	34,668	33,909	34,014	34,197
Formaldehyde Emissions:				
mg/m^3	< 0.017	< 0.018	< 0.016	< 0.017
ppmv	< 0.014	< 0.014	< 0.013	< 0.014
lb/hr	< 0.0022	< 0.0022	< 0.0021	< 0.0022
lb/ton-Glass	< 0.00027	< 0.00026	< 0.00025	< 0.00026

TABLE 4-8
SUMMARY OF AVERAGE FORMALDEHYDE EMISSIONS
OWENS BROCKWAY
FURNACE "A" SOUTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/20/19	5/20/19	5/20/19	--
Time:	1146-1351	1531-1701	1730-1900	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.3	17.2	17.4	17.3
CO_2, % volume dry	2.7	2.8	2.6	2.7
Stack temperature, °F	353	359	352	356
Moisture content, % volume	5.1	6.6	5.0	5.8
Volumetric flow rate, dscf/min	34,560	30,331	31,232	32,446
Formaldehyde Emissions:				
mg/m^3	< 0.017	< 0.015	< 0.018	< 0.016
ppmv	< 0.013	< 0.012	< 0.014	< 0.013
lb/hr	< 0.0022	< 0.0017	< 0.0021	< 0.0019
lb/ton-Glass	< 0.00026	< 0.00020	< 0.00025	< 0.00023

Run 3 was not used in the average because leak check was not conducted at a high enough vacuum.

TABLE 4-9
SUMMARY OF AVERAGE FORMALDEHYDE EMISSIONS
OWENS BROCKWAY
FURNACE "D"

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/15/19	5/15/19	5/15/19	--
Time:	0932-1104	1144-1247	1345-1447	--
Process Data:				
Glass production, tons/hr	7.40	7.40	7.40	7.40
Flue Gas:				
O_2, % volume dry	6.7	7.1	6.9	6.9
CO_2, % volume dry	9.9	9.7	9.8	9.8
Stack temperature, °F	713	706	709	709
Moisture content, % volume	15.6	15.7	15.4	15.5
Volumetric flow rate, dscf/min	6,207	5,823	5,862	5,964
Formaldehyde Emissions:				
mg/m^3	< 0.014	< 0.016	< 0.014	< 0.015
ppmv	< 0.011	< 0.013	< 0.011	< 0.012
lb/hr	< 0.00032	< 0.00035	< 0.00030	< 0.00032
lb/ton-Glass	< 0.000043	< 0.000047	< 0.000041	< 0.000044

TABLE 4-10
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACE “A” NORTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/21/19	5/22/19	5/23/19	--
Time:	0900-1630	0900-1730	0800-1530	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.5	16.8	17.0	17.1
CO_2, % volume dry	2.6	2.8	2.7	2.7
Stack temperature, °F	400	402	412	404
Moisture content, % volume	5.4	5.5	5.8	5.6
Volumetric flow rate, dscf/min	36,547	36,246	35,107	35,967
Antimony Emissions:				
µg/dscm	5.82×10^{0}	4.91×10^{0}	5.03×10^{0}	5.25×10^{0}
lb/hr	7.96×10^{-4}	6.66×10^{-4}	6.60×10^{-4}	7.07×10^{-4}
lb/ton-glass	9.45×10^{-5}	7.91×10^{-5}	7.84×10^{-5}	8.40×10^{-5}
gm/kg-glass	4.73×10^{-5}	3.95×10^{-5}	3.92×10^{-5}	4.40×10^{-5}
Arsenic Emissions:				
µg/dscm	1.19×10^{2}	1.07×10^{2}	1.07×10^{2}	1.11×10^{2}
lb/hr	1.62×10^{-2}	1.45×10^{-2}	1.41×10^{-2}	1.49×10^{-2}
lb/ton-glass	1.93×10^{-3}	1.72×10^{-3}	1.68×10^{-3}	1.78×10^{-3}
gm/kg-glass	9.62×10^{-4}	8.61×10^{-4}	8.37×10^{-4}	8.87×10^{-4}
Beryllium Emissions:				
µg/dscm	1.56×10^{-2}	1.57×10^{-2}	1.61×10^{-2}	1.58×10^{-2}
lb/hr	2.13×10^{-6}	2.13×10^{-6}	2.12×10^{-6}	2.12×10^{-6}
lb/ton-glass	2.53×10^{-7}	2.52×10^{-7}	2.52×10^{-7}	2.52×10^{-7}
gm/kg-glass	1.26×10^{-7}	1.26×10^{-7}	1.26×10^{-7}	1.26×10^{-7}
Cadmium Emissions:				
µg/dscm	5.02×10^{0}	3.30×10^{0}	3.33×10^{0}	3.88×10^{0}
lb/hr	6.87×10^{-4}	4.48×10^{-4}	4.38×10^{-4}	5.24×10^{-4}
lb/ton-glass	8.15×10^{-5}	5.32×10^{-5}	5.20×10^{-5}	6.22×10^{-5}
gm/kg-glass	4.08×10^{-5}	2.66×10^{-5}	2.60×10^{-5}	3.11×10^{-5}
Cobalt Emissions:				
µg/dscm	4.32×10^{-2}	3.91×10^{-2}	4.08×10^{-2}	4.10×10^{-2}
lb/hr	5.91×10^{-6}	5.30×10^{-6}	5.36×10^{-6}	5.52×10^{-6}
lb/ton-glass	7.02×10^{-7}	6.29×10^{-7}	6.36×10^{-7}	6.56×10^{-7}
gm/kg-glass	3.51×10^{-7}	3.15×10^{-7}	3.18×10^{-7}	3.28×10^{-7}

**TABLE 4-10 (CONTINUED)
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACE "A" NORTH**

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/21/19	5/22/19	5/23/19	--
Time:	0900-1630	0900-1730	0800-1530	--
Copper Emissions:				
µg/dscm	5.88×10^{0}	5.32×10^{0}	5.12×10^{0}	5.44×10^{0}
lb/hr	8.05×10^{-4}	7.21×10^{-4}	6.72×10^{-4}	7.33×10^{-4}
lb/ton-glass	9.56×10^{-5}	8.57×10^{-5}	7.98×10^{-5}	8.70×10^{-5}
gm/kg-glass	4.78×10^{-5}	4.28×10^{-5}	3.99×10^{-5}	4.35×10^{-5}
Lead Emissions:				
µg/dscm	3.23×10^{2}	2.84×10^{2}	2.50×10^{2}	2.86×10^{2}
lb/hr	4.42×10^{-2}	3.85×10^{-2}	3.28×10^{-2}	3.85×10^{-2}
lb/ton-glass	5.25×10^{-3}	4.57×10^{-3}	3.90×10^{-3}	4.57×10^{-3}
gm/kg-glass	2.62×10^{-3}	2.29×10^{-3}	1.95×10^{-3}	2.29×10^{-3}
Manganese Emissions:				
µg/dscm	5.34×10^{-1}	4.55×10^{-1}	6.21×10^{0}	2.40×10^{0}
lb/hr	7.31×10^{-5}	6.17×10^{-5}	8.15×10^{-4}	3.17×10^{-4}
lb/ton-glass	8.68×10^{-6}	7.32×10^{-6}	9.68×10^{-5}	3.76×10^{-5}
gm/kg-glass	4.34×10^{-6}	3.66×10^{-6}	4.84×10^{-5}	1.88×10^{-5}
Mercury Emissions:				
µg/dscm	7.29×10^{-1}	3.98×10^{-1}	4.81×10^{-1}	5.36×10^{-1}
lb/hr	9.97×10^{-5}	5.40×10^{-5}	6.32×10^{-5}	7.23×10^{-5}
lb/ton-glass	1.18×10^{-5}	6.41×10^{-6}	7.51×10^{-6}	8.59×10^{-6}
gm/kg-glass	5.92×10^{-6}	3.21×10^{-6}	3.75×10^{-6}	4.29×10^{-6}
Nickel Emissions:				
µg/dscm	4.90×10^{-1}	3.86×10^{-1}	5.49×10^{-1}	4.75×10^{-1}
lb/hr	6.71×10^{-5}	5.23×10^{-5}	7.22×10^{-5}	6.38×10^{-5}
lb/ton-glass	7.96×10^{-6}	6.21×10^{-6}	8.57×10^{-6}	7.58×10^{-6}
gm/kg-glass	3.98×10^{-6}	3.11×10^{-6}	4.29×10^{-6}	3.79×10^{-6}
Selenium Emissions:				
µg/dscm	2.38×10^{1}	2.89×10^{1}	2.07×10^{1}	2.45×10^{1}
lb/hr	3.26×10^{-3}	3.92×10^{-3}	2.73×10^{-3}	3.30×10^{-3}
lb/ton-glass	3.87×10^{-4}	4.65×10^{-4}	3.24×10^{-4}	3.92×10^{-4}
gm/kg-glass	1.94×10^{-4}	2.33×10^{-4}	1.62×10^{-4}	1.96×10^{-4}

TABLE 4-11
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACE "A" SOUTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/21/19	5/22/19	5/23/19	--
Time:	0930-1800	0830-1643	0830-1600	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.5	16.8	17.0	17.1
CO_2, % volume dry	2.6	2.8	2.7	2.7
Stack temperature, °F	354	355	350	353
Moisture content, % volume	5.1	4.9	5.0	5.0
Volumetric flow rate, dscf/min	32,481	33,797	35,878	34,052
Antimony Emissions:				
µg/dscm	6.34×10^{0}	5.40×10^{0}	5.34×10^{0}	5.70×10^{0}
lb/hr	7.71×10^{-4}	6.84×10^{-4}	7.17×10^{-4}	7.24×10^{-4}
lb/ton-glass	9.16×10^{-5}	8.12×10^{-5}	8.51×10^{-5}	8.60×10^{-5}
gm/kg-glass	4.58×10^{-5}	4.06×10^{-5}	4.26×10^{-5}	4.30×10^{-5}
Arsenic Emissions:				
µg/dscm	1.20×10^{2}	1.14×10^{2}	1.08×10^{2}	1.14×10^{2}
lb/hr	1.45×10^{-2}	1.44×10^{-2}	1.45×10^{-2}	1.45×10^{-2}
lb/ton-glass	1.73×10^{-3}	1.71×10^{-3}	1.72×10^{-3}	1.72×10^{-3}
gm/kg-glass	8.61×10^{-4}	8.55×10^{-4}	8.61×10^{-4}	8.59×10^{-4}
Beryllium Emissions:				
µg/dscm	1.80×10^{-2}	1.72×10^{-2}	1.60×10^{-2}	1.70×10^{-2}
lb/hr	2.19×10^{-6}	2.17×10^{-6}	2.15×10^{-6}	2.17×10^{-6}
lb/ton-glass	2.60×10^{-7}	2.58×10^{-7}	2.55×10^{-7}	2.57×10^{-7}
gm/kg-glass	1.30×10^{-7}	1.29×10^{-7}	1.28×10^{-7}	1.29×10^{-7}
Cadmium Emissions:				
µg/dscm	3.59×10^{0}	2.69×10^{0}	2.51×10^{0}	2.93×10^{0}
lb/hr	4.37×10^{-4}	3.41×10^{-4}	3.37×10^{-4}	3.71×10^{-4}
lb/ton-glass	5.19×10^{-5}	4.05×10^{-5}	4.00×10^{-5}	4.41×10^{-5}
gm/kg-glass	2.59×10^{-5}	2.02×10^{-5}	2.00×10^{-5}	2.21×10^{-5}
Cobalt Emissions:				
µg/dscm	4.60×10^{-2}	4.37×10^{-2}	4.75×10^{-2}	4.57×10^{-2}
lb/hr	5.59×10^{-6}	5.53×10^{-6}	6.38×10^{-6}	5.83×10^{-6}
lb/ton-glass	6.64×10^{-7}	6.56×10^{-7}	7.58×10^{-7}	6.93×10^{-7}
gm/kg-glass	3.32×10^{-7}	3.28×10^{-7}	3.79×10^{-7}	3.46×10^{-7}

TABLE 4-11 (CONTINUED)
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACE "A" SOUTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/21/19	5/22/19	5/23/19	--
Time:	0930-1800	0830-1643	0830-1600	--
Copper Emissions:				
µg/dscm	5.45×10^{0}	5.21×10^{0}	4.92×10^{0}	5.19×10^{0}
lb/hr	6.63×10^{-4}	6.59×10^{-4}	6.61×10^{-4}	6.61×10^{-4}
lb/ton-glass	7.87×10^{-5}	7.82×10^{-5}	7.85×10^{-5}	7.85×10^{-5}
gm/kg-glass	3.94×10^{-5}	3.91×10^{-5}	3.92×10^{-5}	3.92×10^{-5}
Lead Emissions:				
µg/dscm	2.86×10^{2}	2.30×10^{2}	2.25×10^{2}	2.47×10^{2}
lb/hr	3.48×10^{-2}	2.91×10^{-2}	3.03×10^{-2}	3.14×10^{-2}
lb/ton-glass	4.13×10^{-3}	3.46×10^{-3}	3.60×10^{-3}	3.73×10^{-3}
gm/kg-glass	2.07×10^{-3}	1.73×10^{-3}	1.80×10^{-3}	1.86×10^{-3}
Manganese Emissions:				
µg/dscm	4.65×10^{-1}	4.57×10^{-1}	3.19×10^{-1}	4.14×10^{-1}
lb/hr	5.65×10^{-5}	5.79×10^{-5}	4.28×10^{-5}	5.24×10^{-5}
lb/ton-glass	6.71×10^{-6}	6.87×10^{-6}	5.08×10^{-6}	6.22×10^{-6}
gm/kg-glass	3.35×10^{-6}	3.44×10^{-6}	2.54×10^{-6}	3.11×10^{-6}
Mercury Emissions:				
µg/dscm	6.45×10^{-1}	4.32×10^{-1}	3.87×10^{-1}	4.88×10^{-1}
lb/hr	7.84×10^{-5}	5.46×10^{-5}	5.20×10^{-5}	6.17×10^{-5}
lb/ton-glass	9.31×10^{-6}	6.48×10^{-6}	6.18×10^{-6}	7.32×10^{-6}
gm/kg-glass	4.66×10^{-6}	3.24×10^{-6}	3.09×10^{-6}	3.66×10^{-6}
Nickel Emissions:				
µg/dscm	4.90×10^{-1}	4.63×10^{-1}	3.60×10^{-1}	4.38×10^{-1}
lb/hr	5.96×10^{-5}	5.86×10^{-5}	4.83×10^{-5}	5.55×10^{-5}
lb/ton-glass	7.07×10^{-6}	6.95×10^{-6}	5.74×10^{-6}	6.59×10^{-6}
gm/kg-glass	3.54×10^{-6}	3.48×10^{-6}	2.87×10^{-6}	3.30×10^{-6}
Selenium Emissions:				
µg/dscm	2.38×10^{1}	3.45×10^{1}	2.36×10^{1}	2.73×10^{1}
lb/hr	2.89×10^{-3}	4.36×10^{-3}	3.16×10^{-3}	3.47×10^{-3}
lb/ton-glass	3.43×10^{-4}	5.18×10^{-4}	3.76×10^{-4}	4.12×10^{-4}
gm/kg-glass	1.72×10^{-4}	2.59×10^{-4}	1.88×10^{-4}	2.06×10^{-4}

**TABLE 4-12
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACE "D"**

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/16/19	5/16/19	5/17/19	--
Time:	0850-1352	1507-1933	0751-1216	--
Process Data:				
Glass production, tons/hr	7.40	7.40	7.40	7.40
Flue Gas:				
O_2, % volume dry	6.8	7.4	7.3	7.2
CO_2, % volume dry	9.4	9.4	9.6	9.5
Stack temperature, °F	711	719	710	713
Moisture content, % volume	15.3	15.9	15.8	15.7
Volumetric flow rate, dscf/min	5,485	5,544	5,625	5,551
Antimony Emissions:				
µg/dscm	9.45×10^{0}	1.18×10^{1}	1.04×10^{1}	1.06×10^{1}
lb/hr	1.94×10^{-4}	2.46×10^{-4}	2.18×10^{-4}	2.19×10^{-4}
lb/ton-glass	2.62×10^{-5}	3.32×10^{-5}	2.95×10^{-5}	2.96×10^{-5}
gm/kg-glass	1.31×10^{-5}	1.66×10^{-5}	1.47×10^{-5}	1.48×10^{-5}
Arsenic Emissions:				
µg/dscm	1.73×10^{2}	2.22×10^{2}	1.99×10^{2}	1.98×10^{2}
lb/hr	3.55×10^{-3}	4.60×10^{-3}	4.20×10^{-3}	4.12×10^{-3}
lb/ton-glass	4.79×10^{-4}	6.22×10^{-4}	5.67×10^{-4}	5.56×10^{-4}
gm/kg-glass	2.40×10^{-4}	3.11×10^{-4}	2.84×10^{-4}	2.78×10^{-4}
Beryllium Emissions:				
µg/dscm	4.13×10^{-2}	4.13×10^{-2}	4.35×10^{-2}	$4.21x 10^{-2}$
lb/hr	8.49×10^{-7}	8.58×10^{-7}	9.16×10^{-7}	8.74×10^{-7}
lb/ton-glass	1.15×10^{-7}	1.16×10^{-7}	1.24×10^{-7}	1.18×10^{-7}
gm/kg-glass	5.73×10^{-8}	5.79×10^{-8}	6.19×10^{-8}	5.90×10^{-8}
Cadmium Emissions:				
µg/dscm	1.72×10^{1}	$2.02x 10^{1}$	2.00×10^{1}	1.91×10^{1}
lb/hr	3.54×10^{-4}	4.18×10^{-4}	4.20×10^{-4}	3.97×10^{-4}
lb/ton-glass	4.78×10^{-5}	5.65×10^{-5}	5.67×10^{-5}	5.37×10^{-5}
gm/kg-glass	2.39×10^{-5}	2.82×10^{-5}	2.84×10^{-5}	2.68×10^{-5}
Cobalt Emissions:				
µg/dscm	1.65×10^{-1}	2.21×10^{-1}	1.18×10^{-1}	1.68×10^{-1}
lb/hr	3.39×10^{-6}	4.59×10^{-6}	2.48×10^{-6}	3.49×10^{-6}
lb/ton-glass	4.58×10^{-7}	6.20×10^{-7}	3.35×10^{-7}	4.71×10^{-7}
gm/kg-glass	2.29×10^{-7}	3.10×10^{-7}	1.67×10^{-7}	2.35×10^{-7}

TABLE 4-12 (CONTINUED)
SUMMARY OF AVERAGE METALS RESULTS
OWENS BROCKWAY
FURNACE "D"

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/16/19	5/16/19	5/17/19	--
Time:	0850-1352	1507-1933	0751-1216	--
Copper Emissions:				
µg/dscm	2.00×10^{1}	2.15×10^{1}	2.04×10^{1}	2.06×10^{1}
lb/hr	4.10×10^{-4}	4.45×10^{-4}	4.30×10^{-4}	4.28×10^{-4}
lb/ton-glass	5.53×10^{-5}	6.01×10^{-5}	5.81×10^{-5}	5.78×10^{-5}
gm/kg-glass	2.77×10^{-5}	3.01×10^{-5}	2.90×10^{-5}	2.89×10^{-5}
Lead Emissions:				
µg/dscm	2.25×10^{3}	2.42×10^{3}	2.29×10^{3}	2.32×10^{3}
lb/hr	4.61×10^{-2}	5.02×10^{-2}	4.83×10^{-2}	4.82×10^{-2}
lb/ton-glass	6.23×10^{-3}	6.78×10^{-3}	6.52×10^{-3}	6.51×10^{-3}
gm/kg-glass	3.11×10^{-3}	3.39×10^{-3}	3.26×10^{-3}	3.25×10^{-3}
Manganese Emissions:				
µg/dscm	7.30×10^{0}	6.03×10^{0}	3.32×10^{0}	5.55×10^{0}
lb/hr	1.50×10^{-4}	1.25×10^{-4}	6.98×10^{-5}	1.15×10^{-4}
lb/ton-glass	2.02×10^{-5}	1.69×10^{-5}	9.43×10^{-6}	1.55×10^{-5}
gm/kg-glass	1.01×10^{-5}	8.44×10^{-6}	4.71×10^{-6}	7.76×10^{-6}
Mercury Emissions:				
µg/dscm	2.64×10^{0}	2.78×10^{0}	2.17×10^{0}	2.53×10^{0}
lb/hr	5.41×10^{-5}	5.78×10^{-5}	4.56×10^{-5}	5.25×10^{-5}
lb/ton-glass	7.31×10^{-6}	7.80×10^{-6}	6.16×10^{-6}	7.09×10^{-6}
gm/kg-glass	3.65×10^{-6}	3.90×10^{-6}	3.08×10^{-6}	3.55×10^{-6}
Nickel Emissions:				
µg/dscm	7.65×10^{0}	1.31×10^{1}	7.50×10^{0}	9.42×10^{0}
lb/hr	1.57×10^{-4}	2.72×10^{-4}	1.58×10^{-4}	1.96×10^{-4}
lb/ton-glass	2.12×10^{-5}	3.67×10^{-5}	2.13×10^{-5}	2.64×10^{-5}
gm/kg-glass	1.06×10^{-5}	1.84×10^{-5}	1.07×10^{-5}	1.32×10^{-5}
Selenium Emissions:				
µg/dscm	1.13×10^{2}	1.40×10^{2}	1.35×10^{2}	1.29×10^{2}
lb/hr	2.33×10^{-3}	2.90×10^{-3}	2.83×10^{-3}	2.69×10^{-3}
lb/ton-glass	3.15×10^{-4}	3.91×10^{-4}	3.83×10^{-4}	3.63×10^{-4}
gm/kg-glass	1.57×10^{-4}	1.96×10^{-4}	1.91×10^{-4}	1.81×10^{-4}

TABLE 4-13
SUMMARY OF AVERAGE CHROMIUM RESULTS
OWENS BROCKWAY
FURNACE "A" NORTH

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/21/19	5/22/19	5/23/19	--
Time:	0900-1630	0900-1730	0800-1530	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.5	16.8	17.0	17.1
CO_2, % volume dry	2.6	2.8	2.7	2.7
Stack temperature, °F	387	394	391	391
Moisture content, % volume	4.8	5.9	5.4	5.3
Volumetric flow rate, dscf/min	34,753	36,616	37,309	36,226
Total Chromium Emissions:				
µg/dscm	3.83×10^{1}	4.52×10^{1}	4.32×10^{1}	4.22×10^{1}
lb/hr	4.98×10^{-3}	6.19×10^{-3}	6.04×10^{-3}	5.74×10^{-3}
lb/ton-glass	5.92×10^{-4}	7.36×10^{-4}	7.18×10^{-4}	6.82×10^{-4}
gm/kg-glass	2.96×10^{-4}	3.68×10^{-4}	3.59×10^{-4}	3.41×10^{-4}
Chromium (VI) Emissions:				
µg/dscm	1.11×10^{-1}	8.03×10^{-2}	1.21×10^{-1}	1.04×10^{-1}
lb/hr	1.44×10^{-5}	1.10×10^{-5}	1.69×10^{-5}	1.41×10^{-5}
lb/ton-glass	1.71×10^{-6}	1.31×10^{-6}	2.00×10^{-6}	1.67×10^{-6}
gm/kg-glass	8.56×10^{-7}	6.54×10^{-7}	1.00×10^{-6}	8.37×10^{-7}

TABLE 4-14
SUMMARY OF AVERAGE CHROMIUM RESULTS
OWENS BROCKWAY
FURNACE "A" SOUTH

Parameter	**Run 1**	**Run 2**	**Run 3**	**Average**
Date:	5/21/19	5/22/19	5/23/19	--
Time:	0930-1800	0830-1645	0830-1600	--
Process Data:				
Glass production, tons/hr	8.42	8.42	8.42	8.42
Flue Gas:				
O_2, % volume dry	17.5	16.8	17.0	17.1
CO_2, % volume dry	2.6	2.8	2.7	2.7
Stack temperature, °F	344	351	351	349
Moisture content, % volume	4.6	5.4	4.5	4.8
Volumetric flow rate, dscf/min	39,575	35,463	36,717	37,252
Total Chromium Emissions:				
µg/dscm	3.98×10^{1}	4.35×10^{1}	3.30×10^{1}	3.88×10^{1}
lb/hr	5.91×10^{-3}	5.78×10^{-3}	4.54×10^{-3}	5.41×10^{-3}
lb/ton-glass	7.01×10^{-4}	6.87×10^{-4}	5.40×10^{-4}	6.43×10^{-4}
gm/kg-glass	3.51×10^{-4}	3.43×10^{-4}	2.70×10^{-4}	3.21×10^{-4}
Chromium (VI) Emissions:				
µg/dscm	1.02×10^{-1}	1.04×10^{-1}	6.59×10^{-2}	9.06×10^{-2}
lb/hr	1.51×10^{-5}	1.38×10^{-5}	9.06×10^{-6}	1.50×10^{-5}
lb/ton-glass	1.80×10^{-6}	1.64×10^{-6}	1.08×10^{-6}	1.45×10^{-6}
gm/kg-glass	8.98×10^{-7}	8.20×10^{-7}	5.38×10^{-7}	7.52×10^{-7}

TABLE 4-15
SUMMARY OF AVERAGE CHROMIUM RESULTS
OWENS BROCKWAY
FURNACE "D"

Parameter	Run 1	Run 2	Run 3	Average
Date:	5/16/19	5/16/19	5/17/19	--
Time:	0850-1343	1507-1947	0751-1238	--
Process Data:				
Glass production, tons/hr	7.40	7.40	7.40	7.40
Flue Gas:				
O_2, % volume dry	6.8	7.4	7.3	7.2
CO_2, % volume dry	9.4	9.4	9.6	9.5
Stack temperature, °F	703	718	699	706
Moisture content, % volume	15.6	14.1	14.8	14.8
Volumetric flow rate, dscf/min	5,696	5,792	5,761	5,750
Total Chromium Emissions:				
µg/dscm	7.37×10^{1}	1.19×10^{2}	1.50×10^{2}	1.14×10^{2}
lb/hr	1.57×10^{-3}	2.59×10^{-3}	3.24×10^{-3}	2.47×10^{-3}
lb/ton-glass	2.12×10^{-4}	3.50×10^{-4}	4.37×10^{-4}	3.33×10^{-4}
gm/kg-glass	1.06×10^{-4}	1.75×10^{-4}	2.19×10^{-4}	1.67×10^{-4}
Chromium (VI) Emissions:				
µg/dscm	1.03×10^{-1}	8.23×10^{-2}	9.17×10^{-2}	9.24×10^{-2}
lb/hr	2.20×10^{-6}	1.79×10^{-6}	1.98×10^{-6}	1.99×10^{-6}
lb/ton-glass	2.97×10^{-7}	2.41×10^{-7}	2.67×10^{-7}	2.69×10^{-7}
gm/kg-glass	1.49×10^{-7}	1.21×10^{-7}	1.34×10^{-7}	1.34×10^{-7}

APPENDIX A
CALCULATIONS

Appendix A.1
Gaseous Emissions Spreadsheets

SOURCE TEST DATA SUMMARY
GASEOUS EMISSIONS

Client				Owens IL
Unit / Location				Furnace A North
Stack area, square feet				10.752
Reference temperature, °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1254-1408	1503-1718	1737-1952	--
SAMPLE TRAIN DATA				
Meter box number/ID	MB 33	MB 33	MB 33	--
Pitot coefficient	0.84	0.84	0.84	0.84
Meter calibration, Yd	1.0058	1.0058	1.0058	1.0058
Barometric pressure, in Hg	29.76	29.76	29.76	29.76
Meter box volume, acf	45.795	45.791	44.523	45.370
Impinger liquid volume, gm	52.8	54.7	42.5	50.0
Meter temperature, °F	71.25	71.88	68.00	70.4
Meter pressure, (Delta H) iwg	1.769	1.744	1.733	1.749
Velocity head, (Delta P) iwg	1.4151	1.4476	1.3795	1.4141
Static pressure, iwg	-0.94	-0.91	-0.91	-0.92
Stack temperature, °F	413.3	420.9	404.7	413.0
ANALYZER DATA				
O_2, % volume dry	17.34	17.18	17.44	17.32
CO_2, % volume dry	2.71	2.76	2.58	2.68
CO emissions, ppm volume dry	*1.13*	*1.13*	*1.13*	*1.13*
NO_X emissions, ppm volume dry	146.8	152.1	131.5	143.5
SO_2 emissions, ppm volume dry	84.72	90.24	85.63	86.86
THC emissions, ppm volume wet (as Propane)	7.056	6.195	6.038	6.430
THC emissions, ppm volume dry (as Propane)	7.440	6.545	6.308	6.764
VOLUMETRIC FLOW RATE				
Standard sample volume, dscf	45.733	45.673	44.732	45.379
Water vapor volume, scf	2.4895	2.5791	2.0039	2.3575
Moisture fraction, nondimensional	0.0516	0.0535	0.0429	0.0493
Stack gas molecular weight, dry	29.127	29.129	29.110	29.122
Stack gas molecular weight, wet	28.553	28.534	28.634	28.574
Absolute stack pressure, in Hg	29.691	29.693	29.693	29.692
Stack gas velocity, ft/sec	86.702	88.099	85.058	86.620
Stack flow rate, acfm	55,934	56,835	54,873	55,881
Stack Flow Rate (wscfm)	33,559	33,809	33,252	33,540
Stack flow rate - based on pitot, dscfm	31,827	32,002	31,826	31,885
EMISSIONS				
CO concentrations, ppm volume dry	*1.134*	*1.134*	*1.134*	*1.134*
CO concentrations, ppm volume wet	*1.076*	*1.074*	*1.086*	*1.078*
CO mass emissions, lb/hr	*0.157*	*0.158*	*0.157*	*0.158*
CO mass emissions, tons/yr	*0.690*	*0.693*	*0.690*	*0.691*
CO mass emissions, lb/ton-Glass	*0.019*	*0.019*	*0.019*	*0.019*
NO_X concentrations, ppm volume dry	146.8	152.1	131.5	143.5
NO_X concentrations, ppm volume wet	139.2	144.0	125.9	136.4
NO_X mass emissions, lb/hr as NO_2	33.47	34.87	29.98	32.78
NO_X mass emissions, tons/yr as NO_2	146.6	152.7	131.3	143.6
NO_X mass emissions, lb/ton-Glass as NO_2	3.97	4.14	3.56	3.89
SO_2 concentrations, ppm volume dry	84.7	90.2	85.6	86.9
SO_2 concentrations, ppm volume wet	80.3	85.4	82.0	82.6
SO_2 mass emissions, lb/hr	26.90	28.80	27.18	27.63
SO_2 mass emissions, tons/yr	117.8	126.2	119.1	121.0
SO_2 mass emissions, lb/ton-Glass	3.19	3.42	3.23	3.28
THC concentrations, ppm volume dry	7.44	6.54	6.31	6.76
THC concentrations, ppm volume wet	7.06	6.20	6.04	6.43
THC mass emissions, lb/hr	1.63	1.44	1.38	1.48
THC mass emissions, tons/yr	7.12	6.30	6.04	6.49
THC mass emissions, lb/ton-Glass	0.19	0.17	0.16	0.18

Note(s): CO emissions being reported at 2% of 56.72 ppmv span gas.
Annual hours of operation assumed to be 8760.

SOURCE TEST DATA SUMMARY
GASEOUS EMISSIONS

Client				Owens IL
Unit / Location				Furnace A South
Stack area, square feet				10.679
Reference temperature, °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42

Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1254-1408	1503-1718	1737-1952	--
SAMPLE TRAIN DATA				
Meter box number/ID	MB 30	MB 30	MB 30	--
Pitot coefficient	0.84	0.84	0.84	0.84
Meter calibration, Yd	0.9865	0.9865	0.9865	0.9865
Barometric pressure, in Hg	29.76	29.76	29.76	29.76
Meter box volume, acf	44.142	42.802	47.023	44.656
Impinger liquid volume, gm	48.0	43.6	47.6	46.4
Meter temperature, °F	69.21	72.19	68.79	70.1
Meter pressure, (Delta H) iwg	1.856	1.739	2.105	1.900
Velocity head, (Delta P) iwg	1.3235	1.2106	1.5118	1.3486
Static pressure, iwg	-0.93	-1.20	-1.20	-1.11
Stack temperature, °F	360.4	353.2	359.8	357.8
ANALYZER DATA				
O_2, % volume dry	17.34	17.18	17.44	17.32
CO_2, % volume dry	2.71	2.76	2.58	2.68
CO emissions, ppm volume dry	*1.13*	*1.13*	*1.13*	*1.13*
NO_X emissions, ppm volume dry	146.8	152.1	131.5	143.5
SO_2 emissions, ppm volume dry	84.72	90.24	85.63	86.86
THC emissions, ppm volume wet (as Propane)	7.06	6.20	6.04	6.43
THC emissions, ppm volume dry (as Propane)	7.42	6.50	6.33	6.75
VOLUMETRIC FLOW RATE				
Standard sample volume, dscf	43.412	41.847	46.311	43.857
Water vapor volume, scf	2.2632	2.0557	2.2443	2.1878
Moisture fraction, nondimensional	0.0495	0.0468	0.0462	0.0475
Stack gas molecular weight, dry	29.127	29.129	29.110	29.122
Stack gas molecular weight, wet	28.576	28.608	28.597	28.593
Absolute stack pressure, in Hg	29.692	29.672	29.672	29.678
Stack gas velocity, ft/sec	81.235	77.334	86.791	81.787
Stack flow rate, acfm	52,052	49,552	55,611	52,405
Stack Flow Rate (wscfm)	33,245	31,908	35,518	33,557
Stack flow rate - based on pitot, dscfm	31,598	30,414	33,877	31,963
EMISSIONS				
CO concentrations, ppm volume dry	*1.134*	*1.134*	*1.134*	*1.134*
CO concentrations, ppm volume wet	*1.078*	*1.081*	*1.082*	*1.080*
CO mass emissions, lb/hr	*0.156*	*0.150*	*0.168*	*0.158*
CO mass emissions, tons/yr	*0.685*	*0.659*	*0.734*	*0.693*
CO mass emissions, lb/ton-Glass	*0.019*	*0.018*	*0.020*	*0.019*
NO_X concentrations, ppm volume dry	146.8	152.1	131.5	143.5
NO_X concentrations, ppm volume wet	139.5	145.0	125.4	136.6
NO_X mass emissions, lb/hr as NO_2	33.23	33.14	31.91	32.76
NO_X mass emissions, tons/yr as NO_2	145.6	145.2	139.8	143.5
NO_X mass emissions, lb/ton-Glass as NO_2	3.95	3.94	3.79	3.89
SO_2 concentrations, ppm volume dry	84.7	90.2	85.6	86.9
SO_2 concentrations, ppm volume wet	80.5	86.0	81.7	82.7
SO_2 mass emissions, lb/hr	26.70	27.38	28.93	27.67
SO_2 mass emissions, tons/yr	117.0	119.9	126.7	121.2
SO_2 mass emissions, lb/ton-Glass	3.17	3.25	3.44	3.29
THC concentrations, ppm volume dry	7.42	6.50	6.33	6.75
THC concentrations, ppm volume wet	7.06	6.20	6.04	6.43
THC mass emissions, lb/hr	1.61	1.36	1.47	1.48
THC mass emissions, tons/yr	7.06	5.95	6.45	6.48
THC mass emissions, lb/ton-Glass	0.19	0.16	0.17	0.18

Note(s): CO emissions being reported at 2% of 56.72 ppmv span gas.
Annual hours of operation assumed to be 8760.

SOURCE TEST DATA SUMMARY
GASEOUS EMISSIONS

Client				Owens IL
Unit / Location				Furnace D
Stack area, square feet				4.587
Reference temperature, °F				68
Production Basis, tons/hr	7.40	7.40	7.40	7.40
Test number	Run 1	Run 2	*Run 3	Average
Date	May 15, 2019	May 15, 2019	May 15, 2019	--
Start / Stop time	0932-1059	1144-1244	1345-1445	--
SAMPLE TRAIN DATA				
Meter box number/ID	MB 30	MB 30	MB 30	--
Pitot coefficient	0.84	0.84	0.84	0.84
Meter calibration, Yd	0.9865	0.9865	0.9865	0.9865
Barometric pressure, in Hg	29.67	29.67	29.67	29.67
Meter box volume, acf	44.228	42.298	44.854	43.793
Impinger liquid volume, gm	170.5	160.5	152.3	161.1
Meter temperature, °F	69.3	69.3	68.2	68.9
Meter pressure, (Delta H) iwg	1.791	1.667	1.823	1.760
Velocity head, (Delta P) iwg	0.4509	0.4166	0.4323	0.4333
Static pressure, iwg	0.08	0.08	0.08	0.08
Stack temperature, °F	711.6	701.7	705.1	706.1
ANALYZER DATA				
O_2, % volume dry	6.703	7.062	6.871	6.879
CO_2, % volume dry	9.885	9.730	9.810	9.808
CO emissions, ppm volume dry	*1.13*	*1.13*	*1.13*	*1.13*
NO_X emissions, ppm volume dry	631.3	628.5	634.9	631.6
SO_2 emissions, ppm volume dry	406.1	373.8	380.0	386.6
THC emissions, ppm volume wet (as Propane)	1.306	1.398	1.363	1.356
THC emissions, ppm volume dry (as Propane)	1.548	1.653	1.585	1.596
VOLUMETRIC FLOW RATE				
Standard sample volume, dscf	43.348	41.448	44.060	42.952
Water vapor volume, scf	8.039	7.568	7.181	7.596
Moisture fraction, nondimensional	0.1564	0.1544	0.1401	0.1503
Stack gas molecular weight, dry	29.850	29.839	29.844	29.844
Stack gas molecular weight, wet	27.996	28.011	28.185	28.064
Absolute stack pressure, in Hg	29.676	29.676	29.676	29.676
Stack gas velocity, ft/sec	57.265	54.793	55.725	55.928
Stack flow rate, acfm	15,760	15,080	15,337	15,392
Stack Flow Rate (wscfm)	7,045	6,798	6,894	6,912
Stack flow rate - based on pitot, dscfm	5,943	5,749	5,928	5,873
EMISSIONS				
CO concentrations, ppm volume dry	*1.134*	*1.134*	*1.134*	*1.134*
CO concentrations, ppm volume wet	*0.957*	*0.959*	*0.975*	*0.964*
CO mass emissions, lb/hr	*0.0294*	*0.0284*	*0.0293*	*0.0291*
CO mass emissions, tons/yr	*0.129*	*0.125*	*0.128*	*0.127*
CO mass emissions, lb/ton-Glass	*0.004*	*0.004*	*0.004*	*0.004*
NO_X concentrations, ppm volume dry	631.3	628.5	634.9	631.6
NO_X concentrations, ppm volume wet	532.5	531.5	545.9	536.6
NO_X mass emissions, lb/hr as NO_2	26.88	25.88	26.96	26.57
NO_X mass emissions, tons/yr as NO_2	117.7	113.4	118.1	116.4
NO_X mass emissions, lb/ton-Glass as NO_2	3.63	3.50	3.64	3.59
SO_2 concentrations, ppm volume dry	406.1	373.8	380.0	386.6
SO_2 concentrations, ppm volume wet	342.6	316.1	326.7	328.5
SO_2 mass emissions, lb/hr	24.07	21.43	22.47	22.66
SO_2 mass emissions, tons/yr	105.4	93.9	98.4	99.2
SO_2 mass emissions, lb/ton-Glass	3.25	2.89	3.03	3.06
THC concentrations, ppm volume dry	1.55	1.65	1.59	1.60
THC concentrations, ppm volume wet	1.31	1.40	1.36	1.36
THC mass emissions, lb/hr	0.063	0.065	0.065	0.064
THC mass emissions, tons/yr	0.28	0.29	0.28	0.28
THC mass emissions, lb/ton-Glass	0.009	0.009	0.009	0.009

Note(s): CO emissions being reported at 2% of 56.72 ppmv span gas.
Annual hours of operation assumed to be 8760.
*Run 4 moisture was used because run 3 failed a post test leak check.

Appendix A.2
Particulate Matter Spreadsheets

SOURCE TEST DATA SUMMARY

OREGON DEQ METHOD 5

Client				Owens IL
Unit / Location				Furnace A North
A (stack area), ft^2				10.752
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Production Basis, Kg/hr	7,639	7,639	7,639	7,639
Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1205-1411	1507-1706	1801-1930	--
Meter box number	MB 33	MB 33	MB 33	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	1.0058	1.0058	1.0058	1.0058
Θ (sample time), min	60	60	60	60
Nozzle diameter, in.	0.2132	0.2132	0.2132	0.2132
A_n (cross-sectional area of nozzle), ft^2	0.0002478	0.0002478	0.0002478	0.0002478
P_{bar} (barometric pressure), in Hg	29.76	29.76	29.76	29.76
V_m (meter box volume), acf	45.795	45.791	44.523	45.793
V_{lc} (impinger liquid), gm	52.8	54.7	42.5	53.7
T_m (meter temperature), °F	71.3	71.9	68.0	71.6
ΔH (meter pressure), in. H_2O	1.769	1.744	1.733	1.757
ΔP (velocity head), in. H_2O	1.4151	1.4476	1.3795	1.4314
P_g (static pressure), in. H_2O	-0.94	-0.91	-0.91	-0.93
T_s (stack temperature), °F	413.3	420.9	404.7	417.1
$\%O_2$ (oxygen stack gas), % volume dry	17.340	17.180	17.440	17.260
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.709	2.761	2.579	2.735
PM				
m_f (F½ particulate matter catch - filter), mg	43.18	40.05	37.41	41.62
m_a (F½ particulate matter catch - acetone rinse corrected), mg	2.15	1.43	2.93	1.79
m_{nf} (F½ particulate matter catch - combined), mg	45.33	41.48	40.34	43.40
m_{nb} (B½ particulate matter catch - combined), mg	54.18	51.17	39.80	52.68
m_n (total particulate matter catch - combined), mg	99.51	92.66	80.14	96.08
OREGON DEQ IN-STACK DETECTION LIMIT				
m_n (particulate matter catch - ISDL), mg	7.00	7.00	7.00	7.00
m_n (particulate matter catch - REPORTING), mg	99.51	92.66	80.14	96.08
$V_{m(std)}$ (standard sample volume), dscf	45.733	45.673	44.732	45.703
$V_{m(std)}$ (standard sample volume), dscm	1.295	1.293	1.267	1.294
$V_{w(std)}$ (water vapor volume), scf	2.490	2.579	2.004	2.534
B_{ws} (moisture fraction), non-dimensional	0.0516	0.0535	0.0429	0.0525
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	#DIV/0!
B_{ws} (moisture fraction applicable)), non-dimensional	0.0516	0.0535	0.0429	0.0525
M_d (stack gas molecular weight), dry	29.127	29.129	29.110	29.128
M_s (stack gas molecular weight), wet	28.553	28.534	28.634	28.543
P_s (absolute stack pressure), in Hg	29.691	29.693	29.693	29.692
V_s (stack gas velocity), ft/sec	86.702	88.099	85.058	87.401
Q (stack flow rate), acf/min	55,934	56,835	54,873	56,384
Q_{sw} (stack flow rate), wscf/min	33,559	33,809	33,252	33,684
Q_{sd} (stack flow rate), dscf/min	31,827	32,002	31,826	31,914
Q_{sd} (stack flow rate), dscm/hr	54,074	54,371	54,073	54,222
I (isokinetic ratio), %	103.9	103.2	101.6	103.5
C_S (F½ grain loading), gr/dscf	0.0153	0.0140	0.0139	0.0146
E (F½ mass emissions), lb/hr	4.164	3.837	3.789	4.000
E (F½ mass emissions), lb/ton-Glass	0.494	0.456	0.450	0.475
E (F½ mass emissions), gm/hr	1,889	1,740	1,719	1,814
E (F½ mass emissions),gm/Kg-Glass	0.247	0.228	0.225	0.238
C_S (B½ grain loading), gr/dscf	0.0182	0.0173	0.0137	0.0177
M (B½ mass emissions), lb/hr	4.977	4.733	3.738	4.855
E (B½ mass emissions), lb/ton-Glass	0.591	0.562	0.444	0.577
E (B½ mass emissions), gm/hr	2,258	2,147	1,695	2,202
E (B½ mass emissions),gm/Kg-Glass	0.296	0.281	0.222	0.288
C_S (total grain loading), gr/dscf	0.0335	0.0312	0.0276	0.0324
C_S (total grain loading), gm/dscm	0.0768	0.0716	0.0633	0.0742
M (total mass emissions), lb/hr	9.141	8.570	7.526	8.855
E (total mass emissions), lb/ton-Glass	1.086	1.018	0.894	1.052
E (total mass emissions), gm/hr	4,146	3,887	3,414	4,017
E (total mass emissions),gm/Kg-Glass	0.543	0.509	0.447	0.526
[1]E (total mass emissions),gm/Kg-Glass	0.514	0.480	0.418	0.497

NOTE: The post-test leak check for Run 3 was done at 11" while the highest vaccum during testing was 13.5". Run 3 was not used in the average results.

[1] Equation 15a of the permit is used.

LAB SUMMARY

OREGON DEQ METHOD 5

Client				Owens IL
Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1205-1411	1507-1706	1801-1930	--
BLANK				
Solvent	Acetone	Water	*Dichloromethane	
V_a (volume of blank), ml	128	162	150	--
m_a (mass of residue in solvent), mg-PM residue	0.86	1.05	0.00	--
m_{max} (mass of residue in solvent correction limit), mg-PM residue	1.01	1.62	1.99	--
ρ_a (density of solvent) mg-solvent/ml-solvent	791	1,000	1,325	--
C_a (solvent blank residue conc.) mg-PM residue/mg-solvent	0.000008	0.000006	0.000000	--
C_{max} (solvent blank residue conc. limit) mg-PM residue/mg-solvent	0.000010	0.000010	0.000010	--
C_a (solvent blank residue conc. applicable) mg-PM residue/mg-solve	0.000008	0.000006	0.000000	--
PM				
m_f (F½ particulate matter catch - filter), mg	43.18	40.05	37.41	40.21
V_{aw} (volume of acetone wash used) ml-Acetone	75	59	62	--
W_a (residue in acetone wash) mg-PM residue	0.504	0.396	0.417	--
m_a (F½ particulate matter catch - acetone rinse), mg	2.65	1.83	3.35	2.61
m_a (F½ particulate matter catch - acetone rinse corrected), mg	2.15	1.43	2.93	2.17
m_{nf} (F½ particulate matter catch - combined), mg	45.33	41.48	40.34	42.38
V_{ww} (volume of DI H_2O sample), ml-water	290	400	347	--
V_{ww} (volume of DI H_2O wash & impinger charge used), ml-water	247	357	314	--
W_w (residue in water wash) mg-PM residue	1.600	2.311	2.034	--
m_w (B½ particulate matter catch - water fraction), mg	43.34	52.20	39.34	44.96
m_w (B½ particulate matter catch - water rinse corrected), mg	41.74	49.89	37.31	42.98
V_{baw} (volume of acetone wash used), ml-acetone	116	102	101	--
W_{ba} (residue in acetone wash) mg-PM residue	0.779	0.685	0.679	--
m_{ba} (B½ particulate matter catch - acetone fraction), mg	13.09	1.97	3.07	6.04
m_{ba} (B½ particulate matter catch - acetone rinse corrected), mg	12.31	1.28	2.39	5.33
V_{dw} (volume of dichloromethane wash used), ml-$MeCl_2$	150	150	150	--
W_d (residue in $MeCl_2$ wash) mg-PM residue	0.000	0.000	0.000	--
m_d (B½ particulate matter catch - $MeCl_2$ fraction), mg	0.13	-0.34	0.10	-0.04
m_d (B½ particulate matter catch - $MeCl_2$ rinse corrected), mg	0.13	0.00	0.10	0.08
m_{nb} (B½ particulate matter catch - combined), mg	54.18	51.17	39.80	48.38
m_n (total particulate matter catch - combined), mg	99.51	92.66	80.14	90.77
OREGON DEQ IN-STACK DETECTION LIMIT				
m_n (particulate matter catch - ISDL), mg	7.00	7.00	7.00	7.00
m_n (particulate matter catch - REPORTING), mg	99.51	92.66	80.14	90.77

* There was no DCM blank.

SOURCE TEST DATA SUMMARY

OREGON DEQ METHOD 5

Client				Owens IL
Unit / Location				Furnace A South
A (stack area), ft^2				10.679
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Production Basis, Kg/hr	7,639	7,639	7,639	7,639
Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1146-1351	1531-1700	1731-1900	--
Meter box number	MB 30	MB 30	MB 30	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9865	0.9865	0.9865	0.9865
Θ (sample time), min	60	60	60	60
Nozzle diameter, in	0.2117	0.2117	0.2117	0.2117
P_{bar} (barometric pressure), in Hg	29.76	29.76	29.76	29.76
V_m (meter box volume), acf	44.142	42.802	47.023	44.656
V_{lc} (impinger liquid), gm	48.0	43.6	47.6	46.4
T_m (meter temperature), °F	69.2	72.2	68.8	70.1
ΔH (meter pressure), in. H_2O	1.856	1.739	2.105	1.900
ΔP (velocity head), in. H_2O	1.3235	1.2106	1.5118	1.3486
P_g (static pressure), in. H_2O	-0.93	-1.20	-1.20	-1.11
T_s (stack temperature), °F	360.4	353.2	359.8	357.8
$\%O_2$ (oxygen stack gas), % volume dry	17.340	17.180	17.440	17.320
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.709	2.761	2.579	2.683
PM				
m_f (F½ particulate matter catch - filter), mg	33.07	33.13	35.86	34.02
m_a (F½ particulate matter catch - acetone rinse corrected), mg	2.44	1.77	2.82	2.35
m_{nf} (F½ particulate matter catch - combined), mg	35.51	34.90	38.68	36.37
m_{nb} (B½ particulate matter catch - combined), mg	64.83	36.84	63.68	55.12
m_n (total particulate matter catch - combined), mg	100.35	71.74	102.37	91.49
OREGON DEQ IN-STACK DETECTION LIMIT				
m_n (particulate matter catch - ISDL), mg	7.00	7.00	7.00	7.00
m_n (particulate matter catch - REPORTING), mg	100.35	71.74	102.37	91.49
$V_{m(std)}$ (standard sample volume), dscf	43.412	41.847	46.311	43.857
$V_{m(std)}$ (standard sample volume), dscm	1.229	1.185	1.311	1.242
$V_{w(std)}$ (water vapor volume), scf	2.263	2.056	2.244	2.188
B_{ws} (moisture fraction), non-dimensional	0.0495	0.0468	0.0462	0.0475
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.0495	0.0468	0.0462	0.0475
M_d (stack gas molecular weight), dry	29.127	29.129	29.110	29.122
M_s (stack gas molecular weight), wet	28.576	28.608	28.597	28.593
P_s (absolute stack pressure), in Hg	29.692	29.672	29.672	29.678
V_s (stack gas velocity), ft/sec	81.235	77.334	86.791	81.787
Q (stack flow rate), acf/min	52,052	49,552	55,611	52,405
Q_{sw} (stack flow rate), wscf/min	33,245	31,908	35,518	33,557
Q_{sd} (stack flow rate), dscf/min	31,598	30,414	33,877	31,963
Q_{sd} (stack flow rate), dscm/hr	53,685	51,674	57,557	54,305
I (isokinetic ratio), %	100.0	100.2	99.5	99.9
C_S (F½ grain loading), gr/dscf	0.0126	0.0128	0.0129	0.0128
E (F½ mass emissions), lb/hr	3.412	3.348	3.735	3.499
E (F½ mass emissions), lb/ton-Glass	0.405	0.398	0.444	0.416
E (F½ mass emissions), gm/hr	1,548	1,519	1,694	1,587
E (F½ mass emissions),gm/Kg-Glass	0.203	0.199	0.222	0.208
C_S (B½ grain loading), gr/dscf	0.0230	0.0136	0.0212	0.0192
M (B½ mass emissions), lb/hr	6.229	3.534	6.149	5.304
E (B½ mass emissions), lb/ton-Glass	0.740	0.420	0.730	0.630
E (B½ mass emissions), gm/hr	2,825	1,603	2,789	2,406
E (B½ mass emissions),gm/Kg-Glass	0.370	0.210	0.365	0.315
C_S (total grain loading), gr/dscf	0.0356	0.0264	0.0340	0.0320
C_S (total grain loading), gm/dscm	0.0816	0.0605	0.0781	0.0734
M (total mass emissions), lb/hr	9.641	6.883	9.884	8.803
E (total mass emissions), lb/ton-Glass	1.145	0.817	1.174	1.045
E (total mass emissions), gm/hr	4,373	3,122	4,483	3,993
E (total mass emissions),gm/Kg-Glass	0.573	0.409	0.587	0.523
[1]E (total mass emissions),gm/Kg-Glass	0.544	0.380	0.558	0.494

[1] Equation 15a of the permit is used.

LAB SUMMARY
OREGON DEQ METHOD 5

Client	Owens IL
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1146-1351	1531-1700	1731-1900	--
BLANK				
Solvent	Acetone	Water	*Dichloromethane	
V_a (volume of blank), ml	128	162	150	--
m_a (mass of residue in solvent), mg-PM residue	0.86	1.05	0.00	--
m_{max} (mass of residue in solvent correction limit), mg-PM residue	1.01	1.62	1.99	--
ρ_a (density of solvent) mg-solvent/ml-solvent	791	1,000	1,325	--
C_a (solvent blank residue conc.) mg-PM residue/mg-solvent	0.000008	0.000006	0.000000	--
C_{max} (solvent blank residue conc. limit) mg-PM residue/mg-solvent	0.000010	0.000010	0.000010	--
C_a (solvent blank residue conc. applicable) mg-PM residue/mg-solve	0.000008	0.000006	0.000000	--
PM				
m_f (F½ particulate matter catch - filter), mg	33.07	33.13	35.86	34.02
V_{aw} (volume of acetone wash used) ml-Acetone	102	68	59	--
W_a (residue in acetone wash) mg-PM residue	0.685	0.457	0.396	--
m_a (F½ particulate matter catch - acetone rinse), mg	3.13	2.23	3.22	2.86
m_a (F½ particulate matter catch - acetone rinse corrected), mg	2.44	1.77	2.82	2.35
m_{nf} (F½ particulate matter catch - combined), mg	35.51	34.90	38.68	36.37
V_{ww} (volume of DI H_2O sample), ml-water	335	362	354	--
V_{ww} (volume of DI H_2O wash & impinger charge used), ml-water	300	328	322	--
W_w (residue in water wash) mg-PM residue	1.944	2.125	2.085	--
m_w (B½ particulate matter catch - water fraction), mg	61.74	37.87	64.28	54.63
m_w (B½ particulate matter catch - water rinse corrected), mg	59.80	35.74	62.19	52.58
V_{baw} (volume of acetone wash used), ml-acetone	115	136	100	--
W_{ba} (residue in acetone wash) mg-PM residue	0.773	0.914	0.672	--
m_{ba} (B½ particulate matter catch - acetone fraction), mg	5.62	1.94	1.85	3.14
m_{ba} (B½ particulate matter catch - acetone rinse corrected), mg	4.85	1.03	1.18	2.35
V_{dw} (volume of dichloromethane wash used), ml-$MeCl_2$	150	150	150	--
W_d (residue in $MeCl_2$ wash) mg-PM residue	0.000	0.000	0.000	--
m_d (B½ particulate matter catch - $MeCl_2$ fraction), mg	0.19	0.07	0.31	0.19
m_d (B½ particulate matter catch - $MeCl_2$ rinse corrected), mg	0.19	0.07	0.31	0.19
m_{nb} (B½ particulate matter catch - combined), mg	64.83	36.84	63.68	55.12
m_n (total particulate matter catch - combined), mg	100.35	71.74	102.37	91.49
OREGON DEQ IN-STACK DETECTION LIMIT				
m_n (particulate matter catch - ISDL), mg	7.00	7.00	7.00	7.00
m_n (particulate matter catch - REPORTING), mg	100.35	71.74	102.37	91.49

* There was no DCM Blank

SOURCE TEST DATA SUMMARY
OREGON DEQ METHOD 5

Client				Owens IL
Unit / Location				Furnace D
A (stack area), ft^2				4.587
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	7.40	7.40	7.40	7.40
Production Basis, Kg/hr	6,717	6,717	6,717	6,717
Test number	Run 1	Run 2	Run 4	Average
Date	May 15 2019	May 15 2019	May 15, 2019	--
Start / Stop time	0932-1104	1144-1247	1526-1627	--
Meter box number	MB 30	MB 30	MB 30	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9865	0.9865	0.9865	0.9865
Θ (sample time), min	60	60	60	60
Nozzle diameter, in	0.3256	0.3256	0.3260	0.3257
P_{bar} (barometric pressure), in Hg	29.67	29.67	29.67	29.67
V_m (meter box volume), acf	44.228	42.298	44.854	43.793
V_{lc} (impinger liquid), gm	170.5	160.5	152.3	161.1
T_m (meter temperature), °F	69.3	69.3	68.2	68.9
ΔH (meter pressure), in. H_2O	1.791	1.667	1.823	1.760
ΔP (velocity head), in. H_2O	0.4509	0.4166	0.4610	0.4429
P_g (static pressure), in. H_2O	0.08	0.08	0.08	0.08
T_s (stack temperature), °F	711.6	701.7	711.4	708.2
$\%O_2$ (oxygen stack gas), % volume dry	6.703	7.062	6.849	6.871
$\%CO_2$ (carbon dioxide stack gas), % volume dry	9.885	9.730	9.795	9.803
PM				
m_f (F½ particulate matter catch - filter), mg	233.39	224.35	223.29	227.01
m_a (F½ particulate matter catch - acetone rinse corrected), mg	36.83	78.56	47.33	54.24
m_{nf} (F½ particulate matter catch - combined), mg	270.22	302.91	270.62	281.25
m_{nb} (B½ particulate matter catch - combined), mg	79.30	69.68	41.16	63.38
m_n (total particulate matter catch - combined), mg	349.52	372.58	311.78	344.63
OREGON DEQ IN-STACK DETECTION LIMIT				
m_n (particulate matter catch - ISDL), mg	7.00	7.00	7.00	7.00
m_n (particulate matter catch - REPORTING), mg	349.52	372.58	311.78	344.63
$V_{m(std)}$ (standard sample volume), dscf	43.348	41.448	44.060	42.952
$V_{m(std)}$ (standard sample volume), dscm	1.227	1.174	1.248	1.216
$V_{w(std)}$ (water vapor volume), scf	8.039	7.568	7.181	7.596
B_{ws} (moisture fraction), non-dimensional	0.1564	0.1544	0.1401	0.1503
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.1564	0.1544	0.1401	0.1503
M_d (stack gas molecular weight), dry	29.850	29.839	29.841	29.843
M_s (stack gas molecular weight), wet	27.996	28.011	28.182	28.063
P_s (absolute stack pressure), in Hg	29.676	29.676	29.676	29.676
V_s (stack gas velocity), ft/sec	57.265	54.793	57.707	56.588
Q (stack flow rate), acf/min	15,760	15,080	15,882	15,574
Q_{sw} (stack flow rate), wscf/min	7,045	6,798	7,100	6,981
Q_{sd} (stack flow rate), dscf/min	5,943	5,749	6,105	5,932
Q_{sd} (stack flow rate), dscm/hr	10,097	9,767	10,373	10,079
I (isokinetic ratio), %	96.4	95.3	95.2	95.6
C_S (F½ grain loading), gr/dscf	0.0960	0.1125	0.0946	0.1010
E (F½ mass emissions), lb/hr	4.890	5.546	4.950	5.128
E (F½ mass emissions), lb/ton-Glass	0.660	0.749	0.669	0.693
E (F½ mass emissions), gm/hr	2,218	2,515	2,245	2,326
E (F½ mass emissions),gm/Kg-Glass	0.330	0.374	0.334	0.346
C_S (B½ grain loading), gr/dscf	0.0282	0.0259	0.0144	0.0228
M (B½ mass emissions), lb/hr	1.435	1.276	0.753	1.155
E (B½ mass emissions), lb/ton-Glass	0.194	0.172	0.102	0.156
E (B½ mass emissions), gm/hr	651	579	341	524
E (B½ mass emissions),gm/Kg-Glass	0.097	0.086	0.051	0.078
C_S (total grain loading), gr/dscf	0.1242	0.1384	0.1090	0.1239
C_S (total grain loading), gm/dscm	0.2847	0.3174	0.2499	0.2840
M (total mass emissions), lb/hr	6.325	6.821	5.703	6.283
E (total mass emissions), lb/ton-Glass	0.854	0.921	0.770	0.849
E (total mass emissions), gm/hr	2,869	3,094	2,587	2,850
E (total mass emissions),gm/Kg-Glass	0.427	0.461	0.385	0.424
[1]E (total mass emissions),gm/Kg-Glass	0.394	0.428	0.352	0.391

NOTES: Run 3 failed the post test leak check.

[1] Equation 15a of the permit is used.

LAB SUMMARY
OREGON DEQ METHOD 5

Client				Owens IL
Unit / Location				Furnace D
Test number	Run 1	Run 2	Run 4	Average
Date	May 15 2019	May 15 2019	May 15, 2019	--
Start / Stop time	0932-1104	1144-1247	1526-1627	--
BLANK				
Solvent	Acetone	Water	*Dichloromethane	
V_a (volume of blank), ml	128	162	150	--
m_a (mass of residue in solvent), mg-PM residue	0.86	1.05	0.00	--
m_{max} (mass of residue in solvent correction limit), mg-PM residue	1.01	1.62	1.99	--
ρ_a (density of solvent) mg-solvent/ml-solvent	791	1,000	1,325	--
C_a (solvent blank residue conc.) mg-PM residue/mg-solvent	0.000008	0.000006	0.000000	--
C_{max} (solvent blank residue conc. limit) mg-PM residue/mg-solvent	0.000010	0.000010	0.000010	--
C_a (solvent blank residue conc. applicable) mg-PM residue/mg-solve	0.000008	0.000006	0.000000	--
PM				
m_f (F½ particulate matter catch - filter), mg	233.39	224.35	223.29	227.01
V_{aw} (volume of acetone wash used) ml-Acetone	94	96	124	--
W_a (residue in acetone wash) mg-PM residue	0.632	0.645	0.833	--
m_a (F½ particulate matter catch - acetone rinse), mg	37.46	79.20	48.16	54.94
m_a (F½ particulate matter catch - acetone rinse corrected), mg	36.83	78.56	47.33	54.24
m_{nf} (F½ particulate matter catch - combined), mg	270.22	302.91	270.62	281.25
V_{ww} (volume of DI H_2O sample), ml-water	365	385	390	--
V_{ww} (volume of DI H_2O wash & impinger charge used), ml-water	218	237	250	--
W_w (residue in water wash) mg-PM residue	1.413	1.535	1.621	--
m_w (B½ particulate matter catch - water fraction), mg	74.34	66.58	40.53	60.48
m_w (B½ particulate matter catch - water rinse corrected), mg	72.93	65.04	38.91	58.96
V_{baw} (volume of acetone wash used), ml-acetone	156	95	101	--
W_{ba} (residue in acetone wash) mg-PM residue	1.048	0.638	0.679	--
m_{ba} (B½ particulate matter catch - acetone fraction), mg	7.15	4.99	2.90	5.01
m_{ba} (B½ particulate matter catch - acetone rinse corrected), mg	6.10	4.35	2.22	4.23
V_{dw} (volume of dichloromethane wash used), ml-$MeCl_2$	150	150	150	--
W_d (residue in $MeCl_2$ wash) mg-PM residue	0.000	0.000	0.000	--
m_d (B½ particulate matter catch - $MeCl_2$ fraction), mg	0.27	0.28	0.03	0.19
m_d (B½ particulate matter catch - $MeCl_2$ rinse corrected), mg	0.27	0.28	0.03	0.19
m_{nb} (B½ particulate matter catch - combined), mg	79.30	69.68	41.16	63.38
m_n (total particulate matter catch - combined), mg	349.52	372.58	311.78	344.63
OREGON DEQ IN-STACK DETECTION LIMIT				
m_n (particulate matter catch - ISDL), mg	7.00	7.00	7.00	7.00
m_n (particulate matter catch - REPORTING), mg	349.52	372.58	311.78	344.63

* There was no DCM blank.

Appendix A.3
Formaldehyde Spreadsheets

SOURCE TEST DATA SUMMARY

EPA METHOD 316 - FORMALDEHYDE

Client				Owens IL
Unit / Location				Furnace A North
A (stack area), ft^2				10.752
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Test number	1	2	3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1205-1411	1503-1706	1801-1930	--
Meter box number	MB 4	MB 4	MB 4	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9875	0.9875	0.9875	0.9875
Θ (sample time), min	60	60	60	60
Nozzle diameter, in	0.1778	0.1778	0.1778	0.1778
P_{bar} (barometric pressure), in Hg	29.76	29.76	29.76	29.76
V_m (meter box volume), acf	34.102	32.648	33.228	33.326
V_{lc} (impinger liquid), gm	35.6	38.7	39.2	37.8
T_m (meter temperature), °F	73.0	69.9	65.1	69.3
ΔH (meter pressure), in. H_2O	0.994	0.956	0.972	0.974
ΔP (velocity head), in. H_2O	1.6322	1.5548	1.5984	1.5951
P_g (static pressure), in. H_2O	-0.93	-0.91	-0.91	-0.92
T_s (stack temperature), °F	394.2	382.0	401.9	392.7
$\%O_2$ (oxygen stack gas), % volume dry	17.340	17.180	17.440	17.320
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.709	2.761	2.579	2.683
$V_{m(std)}$ (standard sample volume), dscf	33.260	32.030	32.897	32.729
$V_{m(std)}$ (standard sample volume), dscm	0.942	0.907	0.932	0.927
$V_{w(std)}$ (water vapor volume), scf	1.679	1.825	1.848	1.784
B_{ws} (moisture fraction), non-dimensional	0.0480	0.0539	0.0532	0.0517
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.0480	0.0539	0.0532	0.0517
M_d (stack gas molecular weight), dry	29.127	29.129	29.110	29.122
M_s (stack gas molecular weight), wet	28.592	28.529	28.519	28.547
P_s (absolute stack pressure), in Hg	29.692	29.693	29.693	29.693
V_s (stack gas velocity), ft/sec	92.025	89.276	91.594	90.965
Q (stack flow rate), acf/min	59,368	57,594	59,089	58,684
Q_{sw} (stack flow rate), wscf/min	36,418	35,840	35,925	36,061
Q_{sd} (stack flow rate), dscf/min	34,668	33,909	34,014	34,197
I (isokinetic ratio), %	99.7	98.1	100.5	99.4
FORMALDEHYDE				
Formaldehyde, ug	*16.20*	*15.90*	*15.20*	*15.77*
Formaldehyde, mg	*0.0162*	*0.0159*	*0.0152*	*0.0158*
Formaldehyde, mg/m^3	*0.0172*	*0.0175*	*0.0163*	*0.0170*
Formaldehyde, ppmv	*0.0138*	*0.0140*	*0.0131*	*0.0136*
Formaldehyde), lb/hr	*0.0022*	*0.0022*	*0.0021*	*0.0022*
Formaldehyde), lb/ton-Glass	*0.00027*	*0.00026*	*0.00025*	*0.00026*

NOTE: All Formaldehyde results are reported at the detection limit and are ***Italic*** .

SOURCE TEST DATA SUMMARY

EPA METHOD 316 - FORMALDEHYDE

Client				Owens IL
Unit / Location				Furnace A South
A (stack area), ft^2				10.679
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Test number	Run 1	Run 2	Run 3	Average
Date	May 20, 2019	May 20, 2019	May 20, 2019	--
Start / Stop time	1146-1351	1531-1701	1730-1900	--
Meter box number	MB 29	MB 29	MB 29	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9927	0.9927	0.9927	0.9927
Θ (sample time), min	60	60	60	60
Nozzle diameter, in	0.1783	0.1783	0.1783	0.1783
P_{bar} (barometric pressure), in Hg	29.76	29.76	29.76	29.76
V_m (meter box volume), acf	32.835	30.333	30.420	31.584
V_{lc} (impinger liquid), gm	36.7	44.8	34.0	40.7
T_m (meter temperature), °F	69.7	70.1	67.2	69.9
ΔH (meter pressure), in. H_2O	1.039	0.826	0.833	0.932
ΔP (velocity head), in. H_2O	1.5730	1.2538	1.2828	1.4134
P_g (static pressure), in. H_2O	-1.20	-1.20	-1.70	-1.20
T_s (stack temperature), °F	352.9	359.2	351.5	356.0
$\%O_2$ (oxygen stack gas), % volume dry	17.340	17.180	17.440	17.260
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.709	2.761	2.579	2.735
$V_{m(std)}$ (standard sample volume), dscf	32.402	29.894	30.146	31.148
$V_{m(std)}$ (standard sample volume), dscm	0.918	0.846	0.854	0.882
$V_{w(std)}$ (water vapor volume), scf	1.730	2.112	1.603	1.921
B_{ws} (moisture fraction), non-dimensional	0.0507	0.0660	0.0505	0.0583
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	
B_{ws} (moisture fraction applicable)), non-dimensional	0.0507	0.0660	0.0505	0.0583
M_d (stack gas molecular weight), dry	29.127	29.129	29.110	29.128
M_s (stack gas molecular weight), wet	28.563	28.394	28.549	28.479
P_s (absolute stack pressure), in Hg	29.672	29.672	29.635	29.672
V_s (stack gas velocity), ft/sec	88.209	79.287	79.657	83.748
Q (stack flow rate), acf/min	56,520	50,803	51,041	53,662
Q_{sw} (stack flow rate), wscf/min	36,406	32,474	32,893	34,440
Q_{sd} (stack flow rate), dscf/min	34,560	30,331	31,232	32,446
I (isokinetic ratio), %	96.2	101.2	99.1	98.7
FORMALDEHYDE				
Formaldehyde, ug	*15.30*	*12.80*	*15.30*	*14.05*
Formaldehyde, mg	*0.0153*	*0.0128*	*0.0153*	*0.0141*
Formaldehyde, mg/m^3	*0.0167*	*0.0151*	*0.0179*	*0.0159*
Formaldehyde, ppmv	*0.0134*	*0.0121*	*0.0144*	*0.0127*
Formaldehyde), lb/hr	*0.0022*	*0.0017*	*0.0021*	*0.0019*
Formaldehyde), lb/ton-Glass	*0.00026*	*0.00020*	*0.00025*	*0.00023*

NOTE: All Formaldehyde results are reported at the detection limit and are ***Italic*** .

The post-test leak check for Run 3 was done at 12" while the highest vaccum during testing was 15". Run 3 was not used in the average results.

SOURCE TEST DATA SUMMARY
EPA METHOD 316 - FORMALDEHYDE

Client				Owens IL
Unit / Location				Furnace D
A (stack area), ft^2				4.587
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	7.40	7.40	7.40	7.40
Test number	Run 1	Run 2	Run 3	Average
Date	May 15, 2019	May 15, 2019	May 15, 2019	--
Start / Stop time	0932-1104	1144-1247	1345-1447	--
Meter box number	MB 29	MB 29	MB 29	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9927	0.9927	0.9927	0.9927
Θ (sample time), min	60	60	60	60
Nozzle diameter, in	0.3005	0.3005	0.3005	0.3005
P_{bar} (barometric pressure), in Hg	29.67	29.67	29.67	29.67
V_m (meter box volume), acf	40.073	38.180	38.248	38.834
V_{lc} (impinger liquid), gm	151.7	145.5	143.5	146.9
T_m (meter temperature), °F	78.9	78.5	74.8	77.4
ΔH (meter pressure), in. H_2O	1.461	1.263	1.283	1.336
ΔP (velocity head), in. H_2O	0.4920	0.4308	0.4352	0.4526
P_g (static pressure), in. H_2O	0.08	0.08	0.08	0.08
T_s (stack temperature), °F	713.5	705.8	708.9	709.4
$\%O_2$ (oxygen stack gas), % volume dry	6.703	7.062	6.871	6.879
$\%CO_2$ (carbon dioxide stack gas), % volume dry	9.885	9.730	9.810	9.808
$V_{m(std)}$ (standard sample volume), dscf	38.792	36.970	37.292	37.684
$V_{m(std)}$ (standard sample volume), dscm	1.099	1.047	1.056	1.067
$V_{w(std)}$ (water vapor volume), scf	7.153	6.860	6.766	6.926
B_{ws} (moisture fraction), non-dimensional	0.1557	0.1565	0.1536	0.1553
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.1557	0.1565	0.1536	0.1553
M_d (stack gas molecular weight), dry	29.850	29.839	29.844	29.844
M_s (stack gas molecular weight), wet	28.005	27.986	28.025	28.006
P_s (absolute stack pressure), in Hg	29.676	29.676	29.676	29.676
V_s (stack gas velocity), ft/sec	59.852	55.841	56.164	57.286
Q (stack flow rate), acf/min	16,472	15,368	15,457	15,766
Q_{sw} (stack flow rate), wscf/min	7,351	6,903	6,925	7,060
Q_{sd} (stack flow rate), dscf/min	6,207	5,823	5,862	5,964
I (isokinetic ratio), %	97.0	98.6	98.8	98.1
FORMALDEHYDE				
Formaldehyde, ug	*15.20*	*16.60*	*14.60*	*15.47*
Formaldehyde, mg	*0.0152*	*0.0166*	*0.0146*	*0.0155*
Formaldehyde, mg/m^3	*0.0138*	*0.0159*	*0.0138*	*0.0145*
Formaldehyde, ppmv	*0.0111*	*0.0127*	*0.0111*	*0.0116*
Formaldehyde), lb/hr	*0.00032*	*0.00035*	*0.00030*	*0.00032*
Formaldehyde), lb/ton-Glass	*0.000043*	*0.000047*	*0.000041*	*0.000044*

NOTE: All Formaldehyde results are reported at the detection limit and are ***Italic*** .

Appendix A.4
Multi-Metals Spreadsheets

METALS EMISSIONS SUMMARY
EPA METHOD 29

Client	Owens Illinios
Unit / Location	Furnace A North

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Glass Production, tons/hr	8.42	8.42	8.42	8.42
Glass Production, kg/hr	7,639	7,639	7,639	7,639
O_2, % volume dry	17.52	16.80	16.96	17.09
CO_2, % volume dry	2.65	2.80	2.73	2.73
Stack Temperature, °F	399.8	401.9	411.7	404.5
Moisture Content, fraction	0.0540	0.0550	0.0587	0.0559
Stack Flow Rate, dscfm	36,547	36,246	35,107	35,967
Standard Sample Volume, dscf	164.168	163.029	158.461	161.886
Antimony (Sb)				
µg/dscm	5.82E+00	4.91E+00	5.03E+00	5.25E+00
lb/hr	7.96E-04	6.66E-04	6.60E-04	7.07E-04
gm/kg	4.73E-05	3.95E-05	3.92E-05	4.20E-05
lbs/ton	9.45E-05	7.91E-05	7.84E-05	8.40E-05
Arsenic (As)				
µg/dscm	1.19E+02	1.07E+02	1.07E+02	1.11E+02
lb/hr	1.62E-02	1.45E-02	1.41E-02	1.49E-02
gm/kg	9.62E-04	8.61E-04	8.37E-04	8.87E-04
lbs/ton	1.93E-03	1.72E-03	1.68E-03	1.78E-03
Beryllium (Be)				
µg/dscm	1.56E-02	1.57E-02	1.61E-02	1.58E-02
lb/hr	2.13E-06	2.13E-06	2.12E-06	2.12E-06
gm/kg	1.26E-07	1.26E-07	1.26E-07	1.26E-07
lbs/ton	2.53E-07	2.52E-07	2.52E-07	2.52E-07
Cadmium (Cd)				
µg/dscm	5.02E+00	3.30E+00	3.33E+00	3.88E+00
lb/hr	6.87E-04	4.48E-04	4.38E-04	5.24E-04
gm/kg	4.08E-05	2.66E-05	2.60E-05	3.11E-05
lbs/ton	8.15E-05	5.32E-05	5.20E-05	6.22E-05
Cobalt (Co)				
µg/dscm	4.32E-02	3.91E-02	4.08E-02	4.10E-02
lb/hr	5.91E-06	5.30E-06	5.36E-06	5.52E-06
gm/kg	3.51E-07	3.15E-07	3.18E-07	3.28E-07
lbs/ton	7.02E-07	6.29E-07	6.36E-07	6.56E-07
Copper (Cu)				
µg/dscm	5.88E+00	5.32E+00	5.12E+00	5.44E+00
lb/hr	8.05E-04	7.21E-04	6.72E-04	7.33E-04
gm/kg	4.78E-05	4.28E-05	3.99E-05	4.35E-05
lbs/ton	9.56E-05	8.57E-05	7.98E-05	8.70E-05

METALS EMISSIONS SUMMARY
EPA METHOD 29

Client	Owens Illinios
Unit / Location	Furnace A North

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Glass Production, tons/hr	8.42	8.42	8.42	8.42
Glass Production, kg/hr	7,639	7,639	7,639	7,639
O_2, % volume dry	17.52	16.80	16.96	17.09
CO_2, % volume dry	2.65	2.80	2.73	2.73
Stack Temperature, °F	399.8	401.9	411.7	404.5
Moisture Content, fraction	0.0540	0.0550	0.0587	0.0559
Stack Flow Rate, dscfm	36,547	36,246	35,107	35,967
Standard Sample Volume, dscf	164.168	163.029	158.461	161.886
Lead (Pb)				
µg/dscm	3.23E+02	2.84E+02	2.50E+02	2.86E+02
lb/hr	4.42E-02	3.85E-02	3.28E-02	3.85E-02
gm/kg	2.62E-03	2.29E-03	1.95E-03	2.29E-03
lbs/ton	5.25E-03	4.57E-03	3.90E-03	4.57E-03
Manganese (Mn)				
µg/dscm	5.34E-01	4.55E-01	6.21E+00	2.40E+00
lb/hr	7.31E-05	6.17E-05	8.15E-04	3.17E-04
gm/kg	4.34E-06	3.66E-06	4.84E-05	1.88E-05
lbs/ton	8.68E-06	7.32E-06	9.68E-05	3.76E-05
Mercury (Hg)				
µg/dscm	7.29E-01	3.98E-01	4.81E-01	5.36E-01
lb/hr	9.97E-05	5.40E-05	6.32E-05	7.23E-05
gm/kg	5.92E-06	3.21E-06	3.75E-06	4.29E-06
lbs/ton	1.18E-05	6.41E-06	7.51E-06	8.59E-06
Nickel (Ni)				
µg/dscm	4.90E-01	3.86E-01	5.49E-01	4.75E-01
lb/hr	6.71E-05	5.23E-05	7.22E-05	6.38E-05
gm/kg	3.98E-06	3.11E-06	4.29E-06	3.79E-06
lbs/ton	7.96E-06	6.21E-06	8.57E-06	7.58E-06
Selenium (Se)				
µg/dscm	2.38E+01	2.89E+01	2.07E+01	2.45E+01
lb/hr	3.26E-03	3.92E-03	2.73E-03	3.30E-03
gm/kg	1.94E-04	2.33E-04	1.62E-04	1.96E-04
lbs/ton	3.87E-04	4.65E-04	3.24E-04	3.92E-04

LAB DATA SUMMARY
EPA METHOD 29 - FRONT HALF SAMPLE RESULTS

Client	Owens Illinois
Unit / Location	Furnace A North

Test number	Method	Field Blank		Run 1		Run 2		Run 3		Average	
Date	Detection Limit	--		May 21, 2019		May 22, 2019		May 23, 2019		--	
Start / Stop time	(MDL)	--		0900-1630		0900-1730		0800-1530		--	
	Result	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**
Antimony (Sb), µg	1.25	ND	0		26.5		22.1		22		23.53
Arsenic (As), µg	1.75	ND	0		500		446		444		463.33
Beryllium (Be), µg	0.05	ND	0	ND	0	ND	0	ND	0	ND	0.00
Cadmium (Cd), µg	0.1	ND	0		22.7		15.2		14.9		17.60
Cobalt (Co), µg	0.125	ND	0	ND	0	ND	0	ND	0	ND	0.00
Copper (Cu), µg	1.25	ND	0		26.8		24		22.4		24.40
Lead (Pb), µg	1.25	ND	0		1500		1310		1120		1310.00
Manganese (Mn), µg	0.075		0.816		2.6		2.14		28		10.91
Mercury (Hg)											
Front Half, µg	0.0219	ND	0		0.0312	ND	0	ND	0	DLL	0.010
BH-Impingers (HNO_3/H_2O_2), µg	0.0270		0.0192		1.39		0.66		0.741		0.930
BH-Impinger (Empty), µg	0.0223	ND	0		0.0288		0.0101		0.0124		0.01710
BH-Impingers ($H_2SO_4/KMnO_4$), µg	0.0291	ND	0		1.85		1.13		1.36		1.45
BH-HCl Rinse, µg	0.0214	ND	0		0.107		0.0224		0.0338		0.054
Total Mercury (Hg), µg	**0.1217**		**0.0192**		**3.407**	DDL	**1.8225**	DDL	**2.1472**	DDL	**2.459**
Nickel (Ni), µg	0.75		3.16		4.55		3.22		4.76		4.18
Selenium (Se), µg	3.75	ND	0		9.86		10.4		10.7		10.32

MERCURY		
R1	R2	R3
0.0312	0.0219	0.0219
1.3900	0.6600	0.7410
0.0288	0.0223	0.0223
1.8500	1.1300	1.3600
0.1070	0.0224	0.0338
3.4070	**1.8566**	**2.1790**

LAB DATA SUMMARY
EPA METHOD 29 - BACK HALF SAMPLE RESULTS
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinois
Unit / Location	Furnace A North

Test number	Method	Field Blank		Run 1		Run 2		Run 3		Average	
Date	Detection Limit	--		May 21, 2019		May 22, 2019		May 23, 2019		--	
Start / Stop time	(MDL)	--		0900-1630		0900-1730		0800-1530		--	
	Result	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**
Antimony (Sb), µg	0.555	ND	0.00	ND	0	ND	0	ND	0	ND	0.00
Arsenic (As), µg	0.777	ND	0.00		51.3		48.2		37.8		45.77
Beryllium (Be), µg	0.022	ND	0.00	ND	0	ND	0	ND	0	ND	0.00
Cadmium (Cd), µg	0.045	ND	0.00		0.636	ND	0	ND	0	DDL	0.21
Cobalt (Co), µg	0.055	ND	0.00		0.076	ND	0		0.058	DDL	0.04
Copper (Cu), µg	0.555	ND	0.00	ND	0	ND	0	ND	0	ND	0.00
Lead (Pb), µg	0.555	ND	0.00		2.67	ND	0	ND	0	DDL	0.89
Manganese (Mn), µg	0.033	ND	0.00		0.699		0.775		0.667		0.71
Nickel (Ni), µg	0.333	ND	0.00		0.889		1.03		0.865		0.93
Selenium (Se), µg	1.667	ND	0.00		101		123		82.4		102.13

ND - The result was measured below the RL and could not be approximated by the lab.
DLL - The result was detected in some fractions that contribute to this calculation, but not all.
ADL - The result was above the detection limit. (Unmarked data)
Back half MDL above are the average MDL for each run.

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A North
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Antimony (Sb), µg	**26.5**	**22.1**	**22**	**23.533333**
Antimony (Sb), Mmdl, ug	1.25	1.25	1.25	
Antimony (Sb), Mfhb exceeds A, ug	No	No	No	
Antimony (Sb), I. "A", ug	13.8	13.8	13.8	
Antimony (Sb), II.a Mfhb, ug	0	0	0	
Antimony (Sb), II.b 5% of Mfh, ug	1.33	1.11	1.10	1.18
Antimony (Sb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Antimony (Sb), Greater of I or II, ug	13.80	13.80	13.80	
Antimony (Sb), Mfhb - final, ug	0.00	0.00	0.00	
Antimony (Sb), Mfh - Mfhb, ug	26.50	22.10	22.00	23.53
Antimony (Sb), Mfh, blank corrected final, ug	**26.5**	**22.1**	**22**	**23.533333**
Arsenic (As), µg	**500**	**446**	**444**	**463.33333**
Arsenic (As), Mmdl, ug	1.75	1.75	1.75	
Arsenic (As), Mfhb exceeds A, ug	No	No	No	
Arsenic (As), I. "A", ug	13.8	13.8	13.8	
Arsenic (As), II.a Mfhb, ug	0	0	0	
Arsenic (As), II.b 5% of Mfh, ug	25.00	22.30	22.20	23.17
Arsenic (As), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Arsenic (As), Greater of I or II, ug	13.80	13.80	13.80	
Arsenic (As), Mfhb - final, ug	0.00	0.00	0.00	
Arsenic (As), Mfh - Mfhb, ug	500.00	446.00	444.00	463.33
Arsenic (As), Mfh, blank corrected final, ug	**500**	**446**	**444**	**463.33333**
Beryllium (Be), µg	**0**	**0**	**0**	**0**
Beryllium (Be), Mmdl, ug	0.05	0.05	0.05	
Beryllium (Be), Mfhb exceeds A, ug	No	No	No	
Beryllium (Be), I. "A", ug	13.8	13.8	13.8	
Beryllium (Be), II.a Mfhb, ug	0	0	0	
Beryllium (Be), II.b 5% of Mfh, ug	0.00	0.00	0.00	0.00
Beryllium (Be), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Beryllium (Be), Greater of I or II, ug	13.80	13.80	13.80	
Beryllium (Be), Mfhb - final, ug	0.00	0.00	0.00	
Beryllium (Be), Mfh - Mfhb, ug	0.00	0.00	0.00	0.00
Beryllium (Be), Mfh, blank corrected final, ug	**0.05**	**0.05**	**0.05**	**0.05**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A North
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Lead (Pb), µg	**1500**	**1310**	**1120**	**1310**
Lead (Pb), Mmdl, ug	1.25	1.25	1.25	
Lead (Pb), Mfhb exceeds A, ug	No	No	No	
Lead (Pb), I. "A", ug	13.8	13.8	13.8	
Lead (Pb), II.a Mfhb, ug	0	0	0	
Lead (Pb), II.b 5% of Mfh, ug	75.00	65.50	56.00	65.50
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Greater of I or II, ug	13.80	13.80	13.80	
Lead (Pb), Mfhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mfh - Mfhb, ug	1500.00	1310.00	1120.00	1310.00
Lead (Pb), Mfh, blank corrected final, ug	**1500**	**1310**	**1120**	**1310**
Manganese (Mn), µg	**2.6**	**2.14**	**28**	**10.91**
Manganese (Mn), Mmdl, ug	**0.075**	**0.075**	**0.075**	
Manganese (Mn), Mfhb exceeds A, ug	No	No	No	
Manganese (Mn), I. "A", ug	13.8	13.8	13.8	
Manganese (Mn), II.a Mfhb, ug	0.8	0.8	0.8	
Manganese (Mn), II.b 5% of Mfh, ug	0.13	0.107	1.4	0.55
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.13	0.11	0.82	
Manganese (Mn), Greater of I or II, ug	13.80	13.80	13.80	
Manganese (Mn), Mfhb - final, ug	0.82	0.82	0.82	
Manganese (Mn), Mfh - Mfhb, ug	1.78	1.32	27.18	10.10
Manganese (Mn), Mfh, blank corrected final, ug	**1.78**	**1.32**	**27.18**	10.10
Mercury (Hg), front half, µg	**0.0312**	**0.0219**	**0.0219**	**0.025**
Mercury (Hg), back half, µg	**3.3758**	**1.8225**	**2.1472**	**2.4485**
Mercury (Hg) - FH, Mmdl, ug	0.0219	0.0219	0.0219	
Mercury (Hg) - BH, Mmdl, ug	0.09982917	0.0998292	0.0998292	
Mercury (Hg), (Hgfhb + Hgbhb) exceeds 0.6 ug	No	No	No	
Mercury (Hg), I. 0.60, ug	0.6	0.6	0.6	
Mercury (Hg), II.a.1 Hgfhb, ug	0	0	0	
Mercury (Hg), II.a.2 Hgbhb, ug	0.0192	0.0192	0.0192	
Mercury (Hg), II.a (Hgfhb + Hgbhb), ug	0.02	0.02	0.02	
Mercury (Hg), II.b 5% of (Hgfh+Hgbh), ug	0.17	0.09	0.11	0.12
Mercury (Hg), II final - lesser of II(a) or II(b), ug	0.02	0.02	0.02	
Mercury (Hg), Greater of I or II, ug	0.60	0.60	0.60	
Mercury (Hg), (Hgfhb + Hgbhb) - final, ug	0.02	0.02	0.02	
Mercury (Hg), (Hgfh - Hgfhb) + (Hgbh - Hgbhb), ug	3.39	1.83	2.15	2.45
Mercury (Hg), total, blank corrected final, ug	**3.388**	**1.825**	**2.150**	**2.454**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A North
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Lead (Pb), µg	**1500**	**1310**	**1120**	**1310**
Lead (Pb), Mmdl, ug	1.25	1.25	1.25	
Lead (Pb), Mfhb exceeds A, ug	No	No	No	
Lead (Pb), I. "A", ug	13.8	13.8	13.8	
Lead (Pb), II.a Mfhb, ug	0	0	0	
Lead (Pb), II.b 5% of Mfh, ug	75.00	65.50	56.00	65.50
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Greater of I or II, ug	13.80	13.80	13.80	
Lead (Pb), Mfhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mfh - Mfhb, ug	1500.00	1310.00	1120.00	1310.00
Lead (Pb), Mfh, blank corrected final, ug	**1500**	**1310**	**1120**	**1310**
Manganese (Mn), µg	**2.6**	**2.14**	**28**	**10.91**
Manganese (Mn), Mmdl, ug	**0.075**	**0.075**	**0.075**	
Manganese (Mn), Mfhb exceeds A, ug	No	No	No	
Manganese (Mn), I. "A", ug	13.8	13.8	13.8	
Manganese (Mn), II.a Mfhb, ug	0.8	0.8	0.8	
Manganese (Mn), II.b 5% of Mfh, ug	0.13	0.107	1.4	0.55
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.13	0.11	0.82	
Manganese (Mn), Greater of I or II, ug	13.80	13.80	13.80	
Manganese (Mn), Mfhb - final, ug	0.82	0.82	0.82	
Manganese (Mn), Mfh - Mfhb, ug	1.78	1.32	27.18	10.10
Manganese (Mn), Mfh, blank corrected final, ug	**1.78**	**1.32**	**27.18**	10.10
Mercury (Hg), front half, µg	**0.0312**	**0.0219**	**0.0219**	**0.025**
Mercury (Hg), back half, µg	**3.3758**	**1.8347167**	**2.1571167**	**2.4558778**
Mercury (Hg) - FH, Mmdl, ug	0.0219	0.0219	0.0219	
Mercury (Hg) - BH, Mmdl, ug	0.09982917	0.0998292	0.0998292	
Mercury (Hg), (Hgfhb + Hgbhb) exceeds 0.6 ug	No	No	No	
Mercury (Hg), I. 0.60, ug	0.6	0.6	0.6	
Mercury (Hg), II.a.1 Hgfhb, ug	0	0	0	
Mercury (Hg), II.a.2 Hgbhb, ug	0.0192	0.0192	0.0192	
Mercury (Hg), II.a (Hgfhb + Hgbhb), ug	0.02	0.02	0.02	
Mercury (Hg), II.b 5% of (Hgfh+Hgbh), ug	0.17	0.09	0.11	0.12
Mercury (Hg), II final - lesser of II(a) or II(b), ug	0.02	0.02	0.02	
Mercury (Hg), Greater of I or II, ug	0.60	0.60	0.60	
Mercury (Hg), (Hgfhb + Hgbhb) - final, ug	0.02	0.02	0.02	
Mercury (Hg), (Hgfh - Hgfhb) + (Hgbh - Hgbhb), ug	3.39	1.84	2.16	2.46
Mercury (Hg), total, blank corrected final, ug	**3.388**	**1.837**	**2.160**	**2.462**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A North
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Nickel (Ni), µg	**4.55**	**3.22**	**4.76**	**4.1766667**
Nickel (Ni), Mmdl, ug	0.75	0.75	0.75	
Nickel (Ni), Mfhb exceeds A, ug	No	No	No	
Nickel (Ni), I. "A", ug	13.8	13.8	13.8	
Nickel (Ni), II.a Mfhb, ug	3.16	3.16	3.16	
Nickel (Ni), II.b 5% of Mfh, ug	0.23	0.16	0.24	0.21
Nickel (Ni), II final - lesser of II(a) or II(b), ug	0.23	0.16	0.24	
Nickel (Ni), Greater of I or II, ug	13.80	13.80	13.80	
Nickel (Ni), Mfhb - final, ug	3.16	3.16	3.16	
Nickel (Ni), Mfh - Mfhb, ug	1.39	0.06	1.60	1.02
Nickel (Ni), Mfh, blank corrected final, ug	**1.39**	**0.75**	**1.6**	**1.2466667**
Selenium (Se), µg	**9.86**	**10.4**	**10.7**	**10.32**
Selenium (Se), Mmdl, ug	3.75	3.75	3.75	
Selenium (Se), Mfhb exceeds A, ug	No	No	No	
Selenium (Se), I. "A", ug	13.8	13.8	13.8	
Selenium (Se), II.a Mfhb, ug	0	0	0	
Selenium (Se), II.b 5% of Mfh, ug	0.49	0.52	0.54	0.52
Selenium (Se), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Selenium (Se), Greater of I or II, ug	13.80	13.80	13.80	
Selenium (Se), Mfhb - final, ug	0.00	0.00	0.00	
Selenium (Se), Mfh - Mfhb, ug	9.86	10.40	10.70	10.32
Selenium (Se), Mfh, blank corrected final, ug	**9.86**	**10.4**	**10.7**	**10.32**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A North

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Antimony (Sb), µg	**0**	**0**	**0**	**0**
Antimony (Sb), Mmdl, ug	0.555	0.555	0.555	0.555
Antimony (Sb), If Mbhb exceeds 1, ug	No	No	No	
Antimony (Sb), I. 1 ug	1	1	1	
Antimony (Sb), II.a Mbhb, ug	0.00	0.00	0.00	
Antimony (Sb), II.b 5% of Mbh, ug	0.00	0.00	0.00	0.00
Antimony (Sb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Antimony (Sb), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Antimony (Sb), Mbhb - final, ug	0.00	0.00	0.00	
Antimony (Sb), Mbh - Mfhb, ug	0.00	0.00	0.00	
Antimony (Sb), Mbh, blank corrected final, ug	**0.56**	**0.56**	**0.56**	**0.56**
Arsenic (As), µg	**51.30**	**48.20**	**37.80**	**45.77**
Arsenic (As), Mmdl, ug	0.777	0.777	0.777	0.777
Arsenic (As), If Mbhb exceeds 1, ug	No	No	No	
Arsenic (As), I. 1 ug	1	1	1	
Arsenic (As), II.a Mbhb, ug	0.00	0.00	0.00	
Arsenic (As), II.b 5% of Mbh, ug	2.565	2.41	1.89	2.2883333
Arsenic (As), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Arsenic (As), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Arsenic (As), Mbhb - final, ug	0.00	0.00	0.00	
Arsenic (As), Mbh - Mfhb, ug	51.30	48.20	37.80	
Arsenic (As), Mbh, blank corrected final, ug	**51.3**	**48.2**	**37.8**	**45.766667**
Beryllium (Be), µg	**0.00**	**0.00**	**0.00**	**0.00**
Beryllium (Be), Mmdl, ug	0.022	0.022	0.022	0.022
Beryllium (Be), If Mbhb exceeds 1, ug	No	No	No	
Beryllium (Be), I. 1 ug	1	1	1	
Beryllium (Be), II.a Mbhb, ug	0.00	0.00	0.00	
Beryllium (Be), II.b 5% of Mbh, ug	0	0	0	0
Beryllium (Be), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Beryllium (Be), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Beryllium (Be), Mbhb - final, ug	0.00	0.00	0.00	
Beryllium (Be), Mbh - Mfhb, ug	0.00	0.00	0.00	
Beryllium (Be), Mbh, blank corrected final, ug	**0.02233333**	**0.0223333**	**0.0223333**	**0.0223333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A North

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Cadmium (Cd), µg	**0.636**	**0**	**0**	**0.212**
Cadmium (Cd), Mmdl, ug	0.04466667	0.0446667	0.0446667	0.0446667
Cadmium (Cd), If Mbhb exceeds 1, ug	No	No	No	
Cadmium (Cd), I. 1 ug	1	1	1	
Cadmium (Cd), II.a Mbhb, ug	0.00	0.00	0.00	
Cadmium (Cd), II.b 5% of Mbh, ug	0.0318	0	0	0.0106
Cadmium (Cd), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cadmium (Cd), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Cadmium (Cd), Mbhb - final, ug	0.00	0.00	0.00	
Cadmium (Cd), Mbh - Mfhb, ug	0.64	0.00	0.00	
Cadmium (Cd), Mbh, blank corrected final, ug	**0.636**	**0.0446667**	**0.0446667**	**0.2417778**
Cobalt (Co), µg	**0.076**	**0**	**0.058**	**0.0446667**
Cobalt (Co), Mmdl, ug	0.05533333	0.0553333	0.0553333	0.0553333
Cobalt (Co), If Mbhb exceeds 1, ug	No	No	No	
Cobalt (Co), I. 1 ug	1	1	1	
Cobalt (Co), II.a Mbhb, ug	0.00	0.00	0.00	
Cobalt (Co), II.b 5% of Mbh, ug	0.0038	0	0.0029	0.0022333
Cobalt (Co), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cobalt (Co), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Cobalt (Co), Mbhb - final, ug	0.00	0.00	0.00	
Cobalt (Co), Mbh - Mfhb, ug	0.08	0.00	0.06	
Cobalt (Co), Mbh, blank corrected final, ug	**0.076**	**0.0553333**	**0.058**	**0.0631111**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A North

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Copper (Cu), µg	**0**	**0**	**0**	**0**
Copper (Cu), Mmdl, ug	0.555	0.555	0.555	0.555
Copper (Cu), If Mbhb exceeds 1, ug	No	No	No	
Copper (Cu), I. 1 ug	1	1	1	
Copper (Cu), II.a Mbhb, ug	0.00	0.00	0.00	
Copper (Cu), II.b 5% of Mbh, ug	0	0	0	0
Copper (Cu), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Copper (Cu), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Copper (Cu), Mbhb - final, ug	0.00	0.00	0.00	
Copper (Cu), Mbh - Mfhb, ug	0.00	0.00	0.00	
Copper (Cu), Mbh, blank corrected final, ug	**0.555**	**0.555**	**0.555**	**0.555**
Lead (Pb), µg	**2.67**	**0.00**	**0.00**	**0.89**
Lead (Pb), Mmdl, ug	0.555	0.555	0.555	0.555
Lead (Pb), If Mbhb exceeds 1, ug	No	No	No	
Lead (Pb), I. 1 ug	1	1	1	
Lead (Pb), II.a Mbhb, ug	0.00	0.00	0.00	
Lead (Pb), II.b 5% of Mbh, ug	0.1335	0	0	0.0445
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Lead (Pb), Mbhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mbh - Mfhb, ug	2.67	0.00	0.00	
Lead (Pb), Mbh, blank corrected final, ug	**2.67**	**0.555**	**0.555**	**1.26**
Manganese (Mn), µg	**0.699**	**0.775**	**0.667**	**0.7136667**
Manganese (Mn), Mmdl, ug	0.03333333	0.0333333	0.0333333	0.0333333
Manganese (Mn), If Mbhb exceeds 1, ug	No	No	No	
Manganese (Mn), I. 1 ug	1	1	1	
Manganese (Mn), II.a Mbhb, ug	0.00	0.00	0.00	
Manganese (Mn), II.b 5% of Mbh, ug	0.03495	0.03875	0.03335	0.0356833
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Manganese (Mn), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Manganese (Mn), Mbhb - final, ug	0.00	0.00	0.00	
Manganese (Mn), Mbh - Mfhb, ug	0.70	0.78	0.67	
Manganese (Mn), Mbh, blank corrected final, ug	**0.699**	**0.775**	**0.667**	**0.7136667**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A North

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Nickel (Ni), µg	**0.889**	**1.03**	**0.865**	**0.928**
Nickel (Ni), Mmdl, ug	0.333	0.333	0.333	0.333
Nickel (Ni), If Mbhb exceeds 1, ug	No	No	No	
Nickel (Ni), I. 1 ug	1	1	1	
Nickel (Ni), II.a Mbhb, ug	0.00	0.00	0.00	
Nickel (Ni), II.b 5% of Mbh, ug	0.04445	0.0515	0.04325	0.0464
Nickel (Ni), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Nickel (Ni), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Nickel (Ni), Mbhb - final, ug	0.00	0.00	0.00	
Nickel (Ni), Mbh - Mfhb, ug	0.89	1.03	0.87	
Nickel (Ni), Mbh, blank corrected final, ug	**0.889**	**1.03**	**0.865**	**0.928**
Selenium (Se), µg	**101**	**123**	**82.4**	**102.13333**
Selenium (Se), Mmdl, ug	1.66666667	1.6666667	1.6666667	1.6666667
Selenium (Se), If Mbhb exceeds 1, ug	No	No	No	
Selenium (Se), I. 1 ug	1	1	1	
Selenium (Se), II.a Mbhb, ug	0.00	0.00	0.00	
Selenium (Se), II.b 5% of Mbh, ug	5.05	6.15	4.12	5.1066667
Selenium (Se), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Selenium (Se), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Selenium (Se), Mbhb - final, ug	0.00	0.00	0.00	
Selenium (Se), Mbh - Mfhb, ug	101.00	123.00	82.40	
Selenium (Se), Mbh, blank corrected final, ug	**101**	**123**	**82.4**	**102.13333**

BLANK CORRECTED RESULTS SUMMARY
EPA METHOD 29

Client: Owens Illinois
Unit / Location: Furnace A North

Test number		Run 1		Run 2		Run 3		Average
Date		May 21, 2019		May 22, 2019		May 23, 2019		--
Start / Stop time		0900-1630		0900-1730		0800-1530		--
Antimony (Sb), fh blank corrected, µg		26.50		22.10		22.00		23.53
Antimony (Sb) bh blank corrected, µg	ND	0.555	ND	0.555	ND	0.555	ND	0.555
Antimony (Sb) total, µg	DLL	27.06	DLL	22.66	DLL	22.56	DLL	24.09
Arsenic (As), fh blank corrected, µg		500.00		446.00		444.00		463.33
Arsenic (As) bh blank corrected, µg		51.30		48.20		37.80		45.77
Arsenic (As) total, µg		551.30		494.20		481.80		509.10
Beryllium (Be), fh blank corrected, µg	ND	0.050	ND	0.050	ND	0.050	ND	0.050
Beryllium (Be) bh blank corrected, µg	ND	0.022	ND	0.022	ND	0.022	ND	0.022
Beryllium (Be) total, µg	ND	0.072	ND	0.072	ND	0.072	ND	0.072
Cadmium (Cd), fh blank corrected, µg		22.70		15.20		14.90		17.60
Cadmium (Cd) bh blank corrected, µg		0.636	ND	0.045	ND	0.045	DDL	0.242
Cadmium (Cd) total, µg		23.34	DLL	15.24	DLL	14.94	DLL	17.84
Cobalt (Co), fh blank corrected, µg	ND	0.125	ND	0.125	ND	0.125	ND	0.125
Cobalt (Co) bh blank corrected, µg		0.076	ND	0.055		0.058	DDL	0.063
Cobalt (Co) total, µg	DLL	0.201	ND	0.180	DLL	0.183	DLL	0.188
Copper (Cu), fh blank corrected, µg		26.80		24.00		22.40		24.40
Copper (Cu) bh blank corrected, µg	ND	0.555	ND	0.555	ND	0.555	ND	0.555
Copper (Cu) total, µg	DLL	27.36	DLL	24.56	DLL	22.96	DLL	24.96
Lead (Pb), fh blank corrected, µg		1500.00		1310.00		1120.00		1310.00
Lead (Pb) bh blank corrected, µg		2.67	ND	0.56	ND	0.56	DLL	1.26
Lead (Pb) total, µg		1502.67	DLL	1310.56	DLL	1120.56	DLL	1311.26
Manganese (Mn), fh blank corrected, µg		1.784		1.324		27.184		10.10
Manganese (Mn) bh blank corrected, µg		0.699		0.775		0.667		0.71
Manganese (Mn) total, µg		2.483		2.099		27.851		10.81
Mercury (Hg), total blank corrected, µg	DLL	3.39	DLL	1.84	DLL	2.16	DLL	2.46
Nickel (Ni), fh blank corrected, µg		1.390		0.750		1.600		1.247
Nickel (Ni) bh blank corrected, µg		0.889		1.030		0.865		0.928
Nickel (Ni) total, µg		2.279		1.780		2.465		2.175
Selenium (Se), fh blank corrected, µg		9.86		10.40		10.70		10.32
Selenium (Se) bh blank corrected, µg		101.00		123.00		82.40		102.13
Selenium (Se) total, µg		110.86		133.40		93.10		112.45

SOURCE TEST DATA SUMMARY
EPA METHOD 29 - METALS

Client	Owens Illinios
Unit / Location	Furnace A North
A (stack area), ft^2	10.752
T_{ref} (reference temperature), °F	68

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Meter box number	MB33	MB33	MB33	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	1.0058	1.0058	1.0058	1.0058
Θ (sample time), min	240.00	240.00	240.00	240.00
Nozzle diameter, in	0.1928	0.1928	0.1928	0.1928
P_{bar} (barometric pressure), in Hg	29.60	29.98	29.97	29.85
V_m (meter box volume), acf	168.747	166.249	160.499	165.165
V_{lc} (impinger liquid), gm	198.8	201.2	209.6	203.2
T_m (meter temperature), °F	82.1	84.5	80.6	82.4
ΔH (meter pressure), in. H_2O	1.526	1.430	1.388	1.448
ΔP (velocity head), in. H_2O	1.8552	1.8084	1.7272	1.7969
P_g (static pressure), in. H_2O	-1.10	-0.99	-1.00	-1.03
T_s (stack temperature), °F	399.8	401.9	411.7	404.5
%O_2 (oxygen stack gas), % volume dry	17.52	16.80	16.96	17.09
%CO_2 (carbon dioxide stack gas), % volume dry	2.65	2.80	2.73	2.73
$V_{m(std)}$ (standard sample volume), dscf	164.168	163.029	158.461	161.886
$V_{w(std)}$ (water vapor volume), scf	9.373	9.487	9.883	9.581
B_{ws} (moisture fraction), non-dimensional	0.0540	0.0550	0.0587	0.0559
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.0540	0.0550	0.0587	0.0559
M_d (stack gas molecular weight), dry	29.124	29.120	29.116	29.120
M_s (stack gas molecular weight), wet	28.523	28.508	28.463	28.498
P_s (absolute stack pressure), in Hg	29.519	29.907	29.896	29.774
V_s (stack gas velocity), ft/sec	98.842	97.096	95.518	97.152
Q (stack flow rate), acf/min	63,766	62,639	61,621	62,675
Q_{sw} (stack flow rate), wscf/min	38,634	38,355	37,297	38,095
Q_{sd} (stack flow rate), dscf/min	36,547	36,246	35,107	35,967
I (isokinetic ratio), %	99.3	99.4	99.7	99.5

METALS EMISSIONS SUMMARY
EPA METHOD 29

Client	Owens Illinios
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Glass Production, tons/hr	8.42	8.42	8.42	8.42
Glass Production, kg/hr	7,639	7,639	7,639	7,639
O_2, % volume dry	17.52	16.80	16.96	17.09
CO_2, % volume dry	2.65	2.80	2.73	2.73
Stack Temperature, °F	353.9	354.9	350.1	352.9
Moisture Content, fraction	0.0505	0.0495	0.0503	0.0501
Stack Flow Rate, dscfm	32,481	33,797	35,878	34,052
Standard Sample Volume, dscf	142.022	148.760	159.850	150.211
Antimony (Sb)				
µg/dscm	6.34E+00	5.40E+00	5.34E+00	5.69E+00
lb/hr	7.71E-04	6.83E-04	7.17E-04	7.24E-04
gm/kg	4.58E-05	4.06E-05	4.26E-05	4.30E-05
lbs/ton	9.16E-05	8.12E-05	8.51E-05	8.59E-05
Arsenic (As)				
µg/dscm	1.20E+02	1.14E+02	1.08E+02	1.14E+02
lb/hr	1.45E-02	1.44E-02	1.45E-02	1.45E-02
gm/kg	8.61E-04	8.55E-04	8.61E-04	8.59E-04
lbs/ton	1.73E-03	1.71E-03	1.72E-03	1.72E-03
Beryllium (Be)				
µg/dscm	1.80E-02	1.72E-02	1.60E-02	1.70E-02
lb/hr	2.19E-06	2.17E-06	2.15E-06	2.17E-06
gm/kg	1.30E-07	1.29E-07	1.28E-07	1.29E-07
lbs/ton	2.60E-07	2.58E-07	2.55E-07	2.57E-07
Cadmium (Cd)				
µg/dscm	3.59E+00	2.69E+00	2.51E+00	2.93E+00
lb/hr	4.37E-04	3.41E-04	3.37E-04	3.71E-04
gm/kg	2.59E-05	2.02E-05	2.00E-05	2.21E-05
lbs/ton	5.18E-05	4.05E-05	4.00E-05	4.41E-05
Cobalt (Co)				
µg/dscm	4.60E-02	4.37E-02	4.75E-02	4.57E-02
lb/hr	5.59E-06	5.52E-06	6.38E-06	5.83E-06
gm/kg	3.32E-07	3.28E-07	3.79E-07	3.46E-07
lbs/ton	6.64E-07	6.56E-07	7.57E-07	6.92E-07
Copper (Cu)				
µg/dscm	5.45E+00	5.21E+00	4.92E+00	5.19E+00
lb/hr	6.63E-04	6.59E-04	6.61E-04	6.61E-04
gm/kg	3.94E-05	3.91E-05	3.92E-05	3.92E-05
lbs/ton	7.87E-05	7.82E-05	7.85E-05	7.85E-05

METALS EMISSIONS SUMMARY
EPA METHOD 29

Client	Owens Illinios
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Glass Production, tons/hr	8.42	8.42	8.42	8.42
Glass Production, kg/hr	7,639	7,639	7,639	7,639
O_2, % volume dry	17.52	16.80	16.96	17.09
CO_2, % volume dry	2.65	2.80	2.73	2.73
Stack Temperature, °F	353.9	354.9	350.1	352.9
Moisture Content, fraction	0.0505	0.0495	0.0503	0.0501
Stack Flow Rate, dscfm	32,481	33,797	35,878	34,052
Standard Sample Volume, dscf	142.022	148.760	159.850	150.211
Lead (Pb)				
µg/dscm	2.86E+02	2.30E+02	2.25E+02	2.47E+02
lb/hr	3.48E-02	2.91E-02	3.03E-02	3.14E-02
gm/kg	2.07E-03	1.73E-03	1.80E-03	1.86E-03
lbs/ton	4.13E-03	3.46E-03	3.60E-03	3.73E-03
Manganese (Mn)				
µg/dscm	4.65E-01	4.57E-01	3.19E-01	4.14E-01
lb/hr	5.65E-05	5.79E-05	4.28E-05	5.24E-05
gm/kg	3.35E-06	3.44E-06	2.54E-06	3.11E-06
lbs/ton	6.71E-06	6.87E-06	5.08E-06	6.22E-06
Mercury (Hg)				
µg/dscm	6.45E-01	4.31E-01	3.87E-01	4.88E-01
lb/hr	7.84E-05	5.46E-05	5.20E-05	6.17E-05
gm/kg	4.66E-06	3.24E-06	3.09E-06	3.66E-06
lbs/ton	9.31E-06	6.48E-06	6.18E-06	7.32E-06
Nickel (Ni)				
µg/dscm	4.90E-01	4.63E-01	3.60E-01	4.37E-01
lb/hr	5.95E-05	5.85E-05	4.83E-05	5.55E-05
gm/kg	3.53E-06	3.47E-06	2.87E-06	3.29E-06
lbs/ton	7.07E-06	6.95E-06	5.73E-06	6.59E-06
Selenium (Se)				
µg/dscm	2.38E+01	3.45E+01	2.35E+01	2.73E+01
lb/hr	2.89E-03	4.36E-03	3.16E-03	3.47E-03
gm/kg	1.72E-04	2.59E-04	1.88E-04	2.06E-04
lbs/ton	3.43E-04	5.18E-04	3.76E-04	4.12E-04

LAB DATA SUMMARY
EPA METHOD 29 - FRONT HALF SAMPLE RESULTS

Client.. Owens Illinois
Unit / Location.. Furnace A South

Test number / Date / Start / Stop time	Method Detection Limit (MDL)	Field Blank		Run 1 May 21, 2019 0930-1800		Run 2 May 22, 2019 0830-1643		Run 3 May 23, 2019 0830-1600		Average	
	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result
Antimony (Sb), µg	1.25	ND	0		23.9		22.2		23.6		23.23
Arsenic (As), µg	1.75	ND	0		412		422		454		429.33
Beryllium (Be), µg	0.05	ND	0	ND	0	ND	0	ND	0	ND	0.00
Cadmium (Cd), µg	0.1	ND	0		14.4		10.7		11.3		12.13
Cobalt (Co), µg	0.125	ND	0	ND	0	ND	0	ND	0	ND	0.00
Copper (Cu), µg	1.25	ND	0		21.3		20.9		21.3		21.17
Lead (Pb), µg	1.25	ND	0		1150		968		1020		1046.00
Manganese (Mn), µg	0.075		0.816		2.08		2.15		1.89		2.04
Mercury (Hg)											
Front Half, µg	0.0219	ND	0	ND	0	ND	0	ND	0	ND	0.000
BH-Impingers (HNO_3/H_2O_2), µg	0.0366		0.0192		1.4		0.786		0.714		0.967
BH-Impinger (Empty), µg	0.0092	ND	0		0.0288	ND	0	ND	0	DLL	0.00960
BH-Impingers ($H_2SO_4/KMnO_4$), µg	0.0347	ND	0		1.14		1		0.999		1.05
BH-HCl Rinse, µg	0.0198	ND	0		0.0224	ND	0		0.0282	DLL	0.017
Total Mercury (Hg), µg	**0.1222**		**0.0192**		**2.6131**		**1.8369**		**1.7723**	DLL	**2.074**
Nickel (Ni), µg	0.75		3.16		2.83		2.92		3.51		3.09
Selenium (Se), µg	3.75	ND	0		14.1		13.2		10.6		12.63

MERCURY		
R1	R2	R3
0.0219	0.0219	0.0219
1.4000	0.7860	0.7140
0.0288	0.0092	0.0092
1.1400	1.0000	0.9990
0.0224	0.0198	0.0282
2.6131	**1.8369**	**1.7723**

* MDL used for zero values.

LAB DATA SUMMARY
EPA METHOD 29 - BACK HALF SAMPLE RESULTS
EXCEPT MERCURY (SEE FRONT HALF)

Client.. Owens Illinois
Unit / Location.. Furnace A South

Test number / Date / Start / Stop time	Method Detection Limit (MDL)	Field Blank		Run 1 May 21, 2019 0930-1800		Run 2 May 22, 2019 0830-1643		Run 3 May 23, 2019 0830-1600		Average	
	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result
Antimony (Sb), µg	0.563	ND	0.00		1.61	ND	0	ND	0	ND	0.54
Arsenic (As), µg	0.789	ND	0.00		69.2		57.1		33.4		53.23
Beryllium (Be), µg	0.022	ND	0.00	ND	0	ND	0	ND	0	ND	0.00
Cadmium (Cd), µg	0.045	ND	0.00	ND	0		0.647	ND	0	DLL	0.22
Cobalt (Co), µg	0.057	ND	0.00		0.06		0.059		0.09	DLL	0.07
Copper (Cu), µg	0.563	ND	0.00		0.634		1.04		0.971	ND	0.88
Lead (Pb), µg	0.563	ND	0.00	ND	0		1.81	ND	0	DLL	0.60
Manganese (Mn), µg	0.034	ND	0.00		0.606		0.593		0.368		0.52
Nickel (Ni), µg	0.338	ND	0.00		1.22		1.2		0.878		1.10
Selenium (Se), µg	1.687	ND	0.00		81.5		132		96		103.17

ND - The result was measured below the RL and could not be approximated by the lab.
DLL - The result was detected in some fractions that contribute to this calculation, but not all.
ADL - The result was above the detection limit. (Unmarked data)
Back half MDL above are the average MDL for each run.

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A South
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Antimony (Sb), µg	**23.9**	**22.2**	**23.6**	**23.2333333**
Antimony (Sb), Mmdl, ug	1.25	1.25	1.25	
Antimony (Sb), Mfhb exceeds A, ug	No	No	No	
Antimony (Sb), I. "A", ug	13.8	13.8	13.8	
Antimony (Sb), II.a Mfhb, ug	0	0	0	
Antimony (Sb), II.b 5% of Mfh, ug	1.20	1.11	1.18	1.16
Antimony (Sb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Antimony (Sb), Greater of I or II, ug	13.80	13.80	13.80	
Antimony (Sb), Mfhb - final, ug	0.00	0.00	0.00	
Antimony (Sb), Mfh - Mfhb, ug	23.90	22.20	23.60	23.23
Antimony (Sb), Mfh, blank corrected final, ug	**23.9**	**22.2**	**23.6**	**23.2333333**
Arsenic (As), µg	**412**	**422**	**454**	**429.333333**
Arsenic (As), Mmdl, ug	1.75	1.75	1.75	
Arsenic (As), Mfhb exceeds A, ug	No	No	No	
Arsenic (As), I. "A", ug	13.8	13.8	13.8	
Arsenic (As), II.a Mfhb, ug	0	0	0	
Arsenic (As), II.b 5% of Mfh, ug	20.60	21.10	22.70	21.47
Arsenic (As), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Arsenic (As), Greater of I or II, ug	13.80	13.80	13.80	
Arsenic (As), Mfhb - final, ug	0.00	0.00	0.00	
Arsenic (As), Mfh - Mfhb, ug	412.00	422.00	454.00	429.33
Arsenic (As), Mfh, blank corrected final, ug	**412**	**422**	**454**	**429.333333**
Beryllium (Be), µg	**0**	**0**	**0**	**0**
Beryllium (Be), Mmdl, ug	0.05	0.05	0.05	
Beryllium (Be), Mfhb exceeds A, ug	No	No	No	
Beryllium (Be), I. "A", ug	13.8	13.8	13.8	
Beryllium (Be), II.a Mfhb, ug	0	0	0	
Beryllium (Be), II.b 5% of Mfh, ug	0.00	0.00	0.00	0.00
Beryllium (Be), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Beryllium (Be), Greater of I or II, ug	13.80	13.80	13.80	
Beryllium (Be), Mfhb - final, ug	0.00	0.00	0.00	
Beryllium (Be), Mfh - Mfhb, ug	0.00	0.00	0.00	0.00
Beryllium (Be), Mfh, blank corrected final, ug	**0.05**	**0.05**	**0.05**	**0.05**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A South
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Cadmium (Cd), µg	**14.4**	**10.7**	**11.3**	**12.1333333**
Cadmium (Cd), Mmdl, ug	0.1	0.1	0.1	
Cadmium (Cd), Mfhb exceeds A, ug	No	No	No	
Cadmium (Cd), I. "A", ug	13.8	13.8	13.8	
Cadmium (Cd), II.a Mfhb, ug	0	0	0	
Cadmium (Cd), II.b 5% of Mfh, ug	0.72	0.54	0.57	0.61
Cadmium (Cd), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cadmium (Cd), Greater of I or II, ug	13.80	13.80	13.80	
Cadmium (Cd), Mfhb - final, ug	0.00	0.00	0.00	
Cadmium (Cd), Mfh - Mfhb, ug	14.40	10.70	11.30	12.13
Cadmium (Cd), Mfh, blank corrected final, ug	**14.4**	**10.7**	**11.3**	**12.1333333**
Cobalt (Co), µg	**0**	**0**	**0**	**0**
Cobalt (Co), Mmdl, ug	0.125	0.125	0.125	
Cobalt (Co), Mfhb exceeds A, ug	No	No	No	
Cobalt (Co), I. "A", ug	13.8	13.8	13.8	
Cobalt (Co), II.a Mfhb, ug	0	0	0	
Cobalt (Co), II.b 5% of Mfh, ug	0.00	0.00	0.00	0.00
Cobalt (Co), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cobalt (Co), Greater of I or II, ug	13.80	13.80	13.80	
Cobalt (Co), Mfhb - final, ug	0.00	0.00	0.00	
Cobalt (Co), Mfh - Mfhb, ug	0.00	0.00	0.00	0.00
Cobalt (Co), Mfh, blank corrected final, ug	**0.125**	**0.125**	**0.125**	**0.125**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A South
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Copper (Cu), µg	**21.3**	**20.9**	**21.3**	**21.1666667**
Copper (Cu), Mmdl, ug	1.25	1.25	1.25	
Copper (Cu), Mfhb exceeds A, ug	No	No	No	
Copper (Cu), I. "A", ug	13.8	13.8	13.8	
Copper (Cu), II.a Mfhb, ug	0	0	0	
Copper (Cu), II.b 5% of Mfh, ug	1.07	1.05	1.07	1.06
Copper (Cu), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Copper (Cu), Greater of I or II, ug	13.80	13.80	13.80	
Copper (Cu), Mfhb - final, ug	0.00	0.00	0.00	
Copper (Cu), Mfh - Mfhb, ug	21.30	20.90	21.30	21.17
Copper (Cu), Mfh, blank corrected final, ug	**21.3**	**20.9**	**21.3**	**21.1666667**
Lead (Pb), µg	**1150**	**968**	**1020**	**1046**
Lead (Pb), Mmdl, ug	1.25	1.25	1.25	
Lead (Pb), Mfhb exceeds A, ug	No	No	No	
Lead (Pb), I. "A", ug	13.8	13.8	13.8	
Lead (Pb), II.a Mfhb, ug	0	0	0	
Lead (Pb), II.b 5% of Mfh, ug	57.50	48.40	51.00	52.30
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Greater of I or II, ug	13.80	13.80	13.80	
Lead (Pb), Mfhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mfh - Mfhb, ug	1150.00	968.00	1020.00	1046.00
Lead (Pb), Mfh, blank corrected final, ug	**1150**	**968**	**1020**	**1046**
Manganese (Mn), µg	**2.08**	**2.15**	**1.89**	**2.04**
Manganese (Mn), Mmdl, ug	**0.075**	**0.075**	**0.075**	
Manganese (Mn), Mfhb exceeds A, ug	No	No	No	
Manganese (Mn), I. "A", ug	13.8	13.8	13.8	
Manganese (Mn), II.a Mfhb, ug	0.8	0.8	0.8	
Manganese (Mn), II.b 5% of Mfh, ug	0.104	0.1075	0.0945	0.10
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.10	0.11	0.09	
Manganese (Mn), Greater of I or II, ug	13.80	13.80	13.80	
Manganese (Mn), Mfhb - final, ug	0.82	0.82	0.82	
Manganese (Mn), Mfh - Mfhb, ug	1.26	1.33	1.07	1.22
Manganese (Mn), Mfh, blank corrected final, ug	**1.26**	**1.33**	**1.07**	1.22

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace A South
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Mercury (Hg), front half, µg	**0.0219**	**0.0219**	**0.0219**	**0.0219**
Mercury (Hg), back half, µg	**2.5912**	**1.8150**	**1.7504**	**2.0522**
Mercury (Hg) - FH, Mmdl, ug	0.0219	0.0219	0.0219	
Mercury (Hg) - BH, Mmdl, ug	0.1003	0.1003	0.1003	
Mercury (Hg), (Hgfhb + Hgbhb) exceeds 0.6 ug	No	No	No	
Mercury (Hg), I. 0.60, ug	0.6000	0.6000	0.6000	
Mercury (Hg), II.a.1 Hgfhb, ug	0.0000	0.0000	0.0000	
Mercury (Hg), II.a.2 Hgbhb, ug	0.0192	0.0192	0.0192	
Mercury (Hg), II.a (Hgfhb + Hgbhb), ug	0.0192	0.0192	0.0192	
Mercury (Hg), II.b 5% of (Hgfh+Hgbh), ug	0.1307	0.0918	0.0886	0.1037
Mercury (Hg), II final - lesser of II(a) or II(b), ug	0.0192	0.0192	0.0192	
Mercury (Hg), Greater of I or II, ug	0.6000	0.6000	0.6000	
Mercury (Hg), (Hgfhb + Hgbhb) - final, ug	0.0192	0.0192	0.0192	
Mercury (Hg), (Hgfh - Hgfhb) + (Hgbh - Hgbhb), ug	2.5939	1.8177	1.7531	2.0549
Mercury (Hg), total, blank corrected final, ug	**2.5939**	**1.8177**	**1.7531**	**2.0549**
Nickel (Ni), µg	**2.83**	**2.92**	**3.51**	**3.09**
Nickel (Ni), Mmdl, ug	0.75	0.75	0.75	
Nickel (Ni), Mfhb exceeds A, ug	No	No	No	
Nickel (Ni), I. "A", ug	13.8	13.8	13.8	
Nickel (Ni), II.a Mfhb, ug	3.16	3.16	3.16	
Nickel (Ni), II.b 5% of Mfh, ug	0.14	0.15	0.18	0.15
Nickel (Ni), II final - lesser of II(a) or II(b), ug	0.14	0.15	0.18	
Nickel (Ni), Greater of I or II, ug	13.80	13.80	13.80	
Nickel (Ni), Mfhb - final, ug	3.16	3.16	3.16	
Nickel (Ni), Mfh - Mfhb, ug	-0.33	-0.24	0.35	-0.07
Nickel (Ni), Mfh, blank corrected final, ug	**0.75**	**0.75**	**0.75**	**0.75**
Selenium (Se), µg	**14.1**	**13.2**	**10.6**	**12.633333**
Selenium (Se), Mmdl, ug	3.75	3.75	3.75	
Selenium (Se), Mfhb exceeds A, ug	No	No	No	
Selenium (Se), I. "A", ug	13.8	13.8	13.8	
Selenium (Se), II.a Mfhb, ug	0	0	0	
Selenium (Se), II.b 5% of Mfh, ug	0.71	0.66	0.53	0.63
Selenium (Se), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Selenium (Se), Greater of I or II, ug	13.80	13.80	13.80	
Selenium (Se), Mfhb - final, ug	0.00	0.00	0.00	
Selenium (Se), Mfh - Mfhb, ug	14.10	13.20	10.60	12.63
Selenium (Se), Mfh, blank corrected final, ug	**14.1**	**13.2**	**10.6**	**12.633333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Antimony (Sb), µg	**1.61**	**0**	**0**	**0.53666667**
Antimony (Sb), Mmdl, ug	0.563333333	0.56333333	0.56333333	0.56333333
Antimony (Sb), If Mbhb exceeds 1, ug	No	No	No	
Antimony (Sb), I. 1 ug	1	1	1	
Antimony (Sb), II.a Mbhb, ug	0.00	0.00	0.00	
Antimony (Sb), II.b 5% of Mbh, ug	0.08	0.00	0.00	0.03
Antimony (Sb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Antimony (Sb), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Antimony (Sb), Mbhb - final, ug	0.00	0.00	0.00	
Antimony (Sb), Mbh - Mfhb, ug	1.61	0.00	0.00	
Antimony (Sb), Mbh, blank corrected final, ug	**1.61**	**0.56**	**0.56**	**0.91**
Arsenic (As), µg	**69.20**	**57.10**	**33.40**	**53.23**
Arsenic (As), Mmdl, ug	0.789	0.789	0.789	0.789
Arsenic (As), If Mbhb exceeds 1, ug	No	No	No	
Arsenic (As), I. 1 ug	1	1	1	
Arsenic (As), II.a Mbhb, ug	0.00	0.00	0.00	
Arsenic (As), II.b 5% of Mbh, ug	3.46	2.855	1.67	2.66166667
Arsenic (As), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Arsenic (As), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Arsenic (As), Mbhb - final, ug	0.00	0.00	0.00	
Arsenic (As), Mbh - Mfhb, ug	69.20	57.10	33.40	
Arsenic (As), Mbh, blank corrected final, ug	**69.2**	**57.1**	**33.4**	**53.2333333**
Beryllium (Be), µg	**0.00**	**0.00**	**0.00**	**0.00**
Beryllium (Be), Mmdl, ug	0.022	0.022	0.022	0.022
Beryllium (Be), If Mbhb exceeds 1, ug	No	No	No	
Beryllium (Be), I. 1 ug	1	1	1	
Beryllium (Be), II.a Mbhb, ug	0.00	0.00	0.00	
Beryllium (Be), II.b 5% of Mbh, ug	0	0	0	0
Beryllium (Be), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Beryllium (Be), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Beryllium (Be), Mbhb - final, ug	0.00	0.00	0.00	
Beryllium (Be), Mbh - Mfhb, ug	0.00	0.00	0.00	
Beryllium (Be), Mbh, blank corrected final, ug	**0.022333333**	**0.02233333**	**0.02233333**	**0.02233333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Cadmium (Cd), µg	**0**	**0.647**	**0**	**0.21566667**
Cadmium (Cd), Mmdl, ug	0.044666667	0.04466667	0.04466667	0.04466667
Cadmium (Cd), If Mbhb exceeds 1, ug	No	No	No	
Cadmium (Cd), I. 1 ug	1	1	1	
Cadmium (Cd), II.a Mbhb, ug	0.00	0.00	0.00	
Cadmium (Cd), II.b 5% of Mbh, ug	0	0.03235	0	0.01078333
Cadmium (Cd), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cadmium (Cd), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Cadmium (Cd), Mbhb - final, ug	0.00	0.00	0.00	
Cadmium (Cd), Mbh - Mfhb, ug	0.00	0.65	0.00	
Cadmium (Cd), Mbh, blank corrected final, ug	**0.044666667**	**0.647**	**0.04466667**	**0.24544444**
Cobalt (Co), µg	**0.06**	**0.059**	**0.09**	**0.06966667**
Cobalt (Co), Mmdl, ug	0.056666667	0.05666667	0.05666667	0.05666667
Cobalt (Co), If Mbhb exceeds 1, ug	No	No	No	
Cobalt (Co), I. 1 ug	1	1	1	
Cobalt (Co), II.a Mbhb, ug	0.00	0.00	0.00	
Cobalt (Co), II.b 5% of Mbh, ug	0.003	0.00295	0.0045	0.00348333
Cobalt (Co), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cobalt (Co), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Cobalt (Co), Mbhb - final, ug	0.00	0.00	0.00	
Cobalt (Co), Mbh - Mfhb, ug	0.06	0.06	0.09	
Cobalt (Co), Mbh, blank corrected final, ug	**0.06**	**0.059**	**0.09**	**0.06966667**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Copper (Cu), µg	**0.634**	**1.04**	**0.971**	**0.88166667**
Copper (Cu), Mmdl, ug	0.563333333	0.56333333	0.56333333	0.56333333
Copper (Cu), If Mbhb exceeds 1, ug	No	No	No	
Copper (Cu), I. 1 ug	1	1	1	
Copper (Cu), II.a Mbhb, ug	0.00	0.00	0.00	
Copper (Cu), II.b 5% of Mbh, ug	0.0317	0.052	0.04855	0.04408333
Copper (Cu), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Copper (Cu), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Copper (Cu), Mbhb - final, ug	0.00	0.00	0.00	
Copper (Cu), Mbh - Mfhb, ug	0.63	1.04	0.97	
Copper (Cu), Mbh, blank corrected final, ug	**0.634**	**1.04**	**0.971**	**0.88166667**
Lead (Pb), µg	**0.00**	**1.81**	**0.00**	**0.60**
Lead (Pb), Mmdl, ug	0.563	0.563	0.563	0.563
Lead (Pb), If Mbhb exceeds 1, ug	No	No	No	
Lead (Pb), I. 1 ug	1	1	1	
Lead (Pb), II.a Mbhb, ug	0.00	0.00	0.00	
Lead (Pb), II.b 5% of Mbh, ug	0	0.0905	0	0.03016667
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Lead (Pb), Mbhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mbh - Mfhb, ug	0.00	1.81	0.00	
Lead (Pb), Mbh, blank corrected final, ug	**0.563333333**	**1.81**	**0.56333333**	**0.97888889**
Manganese (Mn), µg	**0.606**	**0.593**	**0.368**	**0.52233333**
Manganese (Mn), Mmdl, ug	0.033666667	0.03366667	0.03366667	0.03366667
Manganese (Mn), If Mbhb exceeds 1, ug	No	No	No	
Manganese (Mn), I. 1 ug	1	1	1	
Manganese (Mn), II.a Mbhb, ug	0.00	0.00	0.00	
Manganese (Mn), II.b 5% of Mbh, ug	0.0303	0.02965	0.0184	0.02611667
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Manganese (Mn), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Manganese (Mn), Mbhb - final, ug	0.00	0.00	0.00	
Manganese (Mn), Mbh - Mfhb, ug	0.61	0.59	0.37	
Manganese (Mn), Mbh, blank corrected final, ug	**0.606**	**0.593**	**0.368**	**0.52233333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace A South

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Nickel (Ni), µg	**1.22**	**1.2**	**0.878**	**1.09933333**
Nickel (Ni), Mmdl, ug	0.338	0.338	0.338	0.338
Nickel (Ni), If Mbhb exceeds 1, ug	No	No	No	
Nickel (Ni), I. 1 ug	1	1	1	
Nickel (Ni), II.a Mbhb, ug	0.00	0.00	0.00	
Nickel (Ni), II.b 5% of Mbh, ug	0.061	0.06	0.0439	0.05496667
Nickel (Ni), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Nickel (Ni), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Nickel (Ni), Mbhb - final, ug	0.00	0.00	0.00	
Nickel (Ni), Mbh - Mfhb, ug	1.22	1.20	0.88	
Nickel (Ni), Mbh, blank corrected final, ug	**1.22**	**1.2**	**0.878**	**1.09933333**
Selenium (Se), µg	**81.5**	**132**	**96**	**103.166667**
Selenium (Se), Mmdl, ug	1.686666667	1.68666667	1.68666667	1.68666667
Selenium (Se), If Mbhb exceeds 1, ug	No	No	No	
Selenium (Se), I. 1 ug	1	1	1	
Selenium (Se), II.a Mbhb, ug	0.00	0.00	0.00	
Selenium (Se), II.b 5% of Mbh, ug	4.075	6.6	4.8	5.15833333
Selenium (Se), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Selenium (Se), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Selenium (Se), Mbhb - final, ug	0.00	0.00	0.00	
Selenium (Se), Mbh - Mfhb, ug	81.50	132.00	96.00	
Selenium (Se), Mbh, blank corrected final, ug	**81.5**	**132**	**96**	**103.166667**

BLANK CORRECTED RESULTS SUMMARY
EPA METHOD 29

Client	Owens Illinois
Unit / Location	Furnace A South

Test number		Run 1		Run 2		Run 3		Average
Date		May 21, 2019		May 22, 2019		May 23, 2019		--
Start / Stop time		0930-1800		0830-1643		0830-1600		--
Antimony (Sb), fh blank corrected, µg		23.90		22.20		23.60		23.23
Antimony (Sb) bh blank corrected, µg		1.61	ND	0.56	ND	0.56	ND	0.91
Antimony (Sb) total, µg		25.51	DLL	22.76	DLL	24.16	DLL	24.15
Arsenic (As), fh blank corrected, µg		412.00		422.00		454.00		429.33
Arsenic (As) bh blank corrected, µg		69.20		57.10		33.40		53.23
Arsenic (As) total, µg		481.20		479.10		487.40		482.57
Beryllium (Be), fh blank corrected, µg	ND	0.05	ND	0.05	ND	0.05	ND	0.05
Beryllium (Be) bh blank corrected, µg	ND	0.02	ND	0.02	ND	0.02	ND	0.02
Beryllium (Be) total, µg	ND	0.07	ND	0.07	ND	0.07	ND	0.07
Cadmium (Cd), fh blank corrected, µg		14.40		10.70		11.30		12.13
Cadmium (Cd) bh blank corrected, µg	ND	0.04		0.65	ND	0.04	DLL	0.25
Cadmium (Cd) total, µg	DDL	14.44		11.35	DLL	11.34	DLL	12.38
Cobalt (Co), fh blank corrected, µg	ND	0.125	ND	0.125	ND	0.125	ND	0.13
Cobalt (Co) bh blank corrected, µg		0.06		0.059		0.09		0.07
Cobalt (Co) total, µg	DLL	0.185	DLL	0.184	DLL	0.215	DLL	0.19
Copper (Cu), fh blank corrected, µg		21.30		20.90		21.30		21.17
Copper (Cu) bh blank corrected, µg		0.63		1.04		0.97		0.88
Copper (Cu) total, µg		21.93		21.94		22.27		22.05
Lead (Pb), fh blank corrected, µg		1150.00		968.00		1020.00		1046.00
Lead (Pb) bh blank corrected, µg	ND	0.56		1.81	ND	0.56	DLL	0.98
Lead (Pb) total, µg	DLL	1150.56		969.81	DLL	1020.56	DLL	1046.98
Manganese (Mn), fh blank corrected, µg		1.264		1.334		1.074		1.224
Manganese (Mn) bh blank corrected, µg		0.606		0.593		0.368		0.522
Manganese (Mn) total, µg		1.870		1.927		1.442		1.746
Mercury (Hg) total blank corrected, µg	DLL	2.59	DLL	1.82	DLL	1.75	DLL	2.05
Nickel (Ni), fh blank corrected, µg		0.75		0.75		0.75		0.75
Nickel (Ni) bh blank corrected, µg		1.22		1.2		0.878		1.10
Nickel (Ni) total, µg		1.97		1.95		1.628		1.85
Selenium (Se), fh blank corrected, µg		14.1		13.2		10.6		12.63
Selenium (Se) bh blank corrected, µg		81.5		132		96		103.17
Selenium (Se) total, µg		95.6		145.2		106.6		115.80

SOURCE TEST DATA SUMMARY
EPA METHOD 29 - METALS

Client	Owens Illinios
Unit / Location	Furnace A South
A (stack area), ft^2	10.679
T_{ref} (reference temperature), °F	68

Test number	Run 1	Run 2	Run 3	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1643	0830-1600	--
Meter box number	MB30	MB30	MB30	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9865	0.9865	0.9865	0.9865
Θ (sample time), min	240	240	240	240
Nozzle diameter, in	0.1948	0.1948	0.1948	0.1948
A_n (cross-sectional area of nozzle), ft^2	0.0002070	0.0002070	0.0002070	0.0002070
P_{bar} (barometric pressure), in Hg	29.60	29.98	29.97	29.85
V_m (meter box volume), acf	149.233	153.866	164.499	155.866
V_{lc} (impinger liquid), gm	160.3	164.3	179.6	168.1
T_m (meter temperature), °F	83.2	81.7	79.0	81.3
ΔH (meter pressure), in. H_2O	1.312	1.388	1.565	1.422
ΔP (velocity head), in. H_2O	1.3981	1.4930	1.6758	1.5223
P_g (static pressure), in. H_2O	-1.20	-1.10	-1.20	-1.17
T_s (stack temperature), °F	353.9	354.9	350.1	352.9
$\%O_2$ (oxygen stack gas), % volume dry	17.52	16.80	16.96	17.09
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.65	2.80	2.73	2.73
$V_{m(std)}$ (standard sample volume), dscf	142.022	148.760	159.850	150.211
$V_{w(std)}$ (water vapor volume), scf	7.558	7.747	8.468	7.924
B_{ws} (moisture fraction), non-dimensional	0.0505	0.0495	0.0503	0.0501
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.0505	0.0495	0.0503	0.0501
M_d (stack gas molecular weight), dry	29.124	29.120	29.116	29.120
M_s (stack gas molecular weight), wet	28.562	28.569	28.556	28.563
P_s (absolute stack pressure), in Hg	29.512	29.899	29.882	29.764
V_s (stack gas velocity), ft/sec	83.435	85.703	90.576	86.571
Q (stack flow rate), acf/min	53,461	54,915	58,037	55,471
Q_{sw} (stack flow rate), wscf/min	34,210	35,557	37,779	35,849
Q_{sd} (stack flow rate), dscf/min	32,481	33,797	35,878	34,052
I (isokinetic ratio), %	94.0	94.6	95.8	94.8

METALS EMISSIONS SUMMARY
EPA METHOD 29

Client	Owens Illinois
Unit / Location	Furnace D

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Glass Production, tons/hr	7.40	7.40	7.40	7.40
Glass Production, kg/hr	6,717	6,717	6,717	6,717
O_2, % volume dry	6.81	7.36	7.31	7.16
CO_2, % volume dry	9.40	9.44	9.59	9.48
Stack Temperature, °F	710.9	718.9	709.6	713.1
Moisture Content, fraction	0.1535	0.1590	0.1580	0.1568
Stack Flow Rate, dscfm	5,485	5,544	5,625	5,551
Standard Sample Volume, dscf	141.236	145.465	148.723	145.141
Antimony (Sb)				
µg/dscm	9.45E+00	1.18E+01	1.04E+01	1.06E+01
lb/hr	1.94E-04	2.46E-04	2.18E-04	2.19E-04
gm/kg	1.31E-05	1.66E-05	1.47E-05	1.48E-05
lbs/ton	2.62E-05	3.32E-05	2.95E-05	2.96E-05
Arsenic (As)				
µg/dscm	1.73E+02	2.22E+02	1.99E+02	1.98E+02
lb/hr	3.55E-03	4.60E-03	4.20E-03	4.12E-03
gm/kg	2.40E-04	3.11E-04	2.84E-04	2.78E-04
lbs/ton	4.79E-04	6.22E-04	5.67E-04	5.56E-04
Beryllium (Be)				
µg/dscm	4.13E-02	4.13E-02	4.35E-02	4.21E-02
lb/hr	8.49E-07	8.58E-07	9.16E-07	8.74E-07
gm/kg	5.73E-08	5.79E-08	6.19E-08	5.90E-08
lbs/ton	1.15E-07	1.16E-07	1.24E-07	1.18E-07
Cadmium (Cd)				
µg/dscm	1.72E+01	2.02E+01	2.00E+01	1.91E+01
lb/hr	3.54E-04	4.18E-04	4.20E-04	3.97E-04
gm/kg	2.39E-05	2.82E-05	2.84E-05	2.68E-05
lbs/ton	4.78E-05	5.65E-05	5.67E-05	5.37E-05
Cobalt (Co)				
µg/dscm	1.65E-01	2.21E-01	1.18E-01	1.68E-01
lb/hr	3.39E-06	4.59E-06	2.48E-06	3.49E-06
gm/kg	2.29E-07	3.10E-07	1.67E-07	2.35E-07
lbs/ton	4.58E-07	6.20E-07	3.35E-07	4.71E-07
Copper (Cu)				
µg/dscm	2.00E+01	2.15E+01	2.04E+01	2.06E+01
lb/hr	4.10E-04	4.45E-04	4.30E-04	4.28E-04
gm/kg	2.77E-05	3.01E-05	2.90E-05	2.89E-05
lbs/ton	5.53E-05	6.01E-05	5.81E-05	5.78E-05

METALS EMISSIONS SUMMARY
EPA METHOD 29

Client	Owens Illinois
Unit / Location	Furnace D

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Glass Production, tons/hr	7.40	7.40	7.40	7.40
Glass Production, kg/hr	6,717	6,717	6,717	6,717
O_2, % volume dry	6.81	7.36	7.31	7.16
CO_2, % volume dry	9.40	9.44	9.59	9.48
Stack Temperature, °F	710.9	718.9	709.6	713.1
Moisture Content, fraction	0.1535	0.1590	0.1580	0.1568
Stack Flow Rate, dscfm	5,485	5,544	5,625	5,551
Standard Sample Volume, dscf	141.236	145.465	148.723	145.141
Lead (Pb)				
µg/dscm	2.25E+03	2.42E+03	2.29E+03	2.32E+03
lb/hr	4.61E-02	5.02E-02	4.83E-02	4.82E-02
gm/kg	3.11E-03	3.39E-03	3.26E-03	3.25E-03
lbs/ton	6.23E-03	6.78E-03	6.52E-03	6.51E-03
Manganese (Mn)				
µg/dscm	7.30E+00	6.03E+00	3.32E+00	5.55E+00
lb/hr	1.50E-04	1.25E-04	6.98E-05	1.15E-04
gm/kg	1.01E-05	8.44E-06	4.71E-06	7.76E-06
lbs/ton	2.02E-05	1.69E-05	9.43E-06	1.55E-05
Mercury (Hg)				
µg/dscm	2.64E+00	2.78E+00	2.17E+00	2.53E+00
lb/hr	5.41E-05	5.78E-05	4.56E-05	5.25E-05
gm/kg	3.65E-06	3.90E-06	3.08E-06	3.55E-06
lbs/ton	7.31E-06	7.80E-06	6.16E-06	7.09E-06
Nickel (Ni)				
µg/dscm	7.65E+00	1.31E+01	7.50E+00	9.42E+00
lb/hr	1.57E-04	2.72E-04	1.58E-04	1.96E-04
gm/kg	1.06E-05	1.84E-05	1.07E-05	1.32E-05
lbs/ton	2.12E-05	3.67E-05	2.13E-05	2.64E-05
Selenium (Se)				
µg/dscm	1.13E+02	1.40E+02	1.35E+02	1.29E+02
lb/hr	2.33E-03	2.90E-03	2.83E-03	2.69E-03
gm/kg	1.57E-04	1.96E-04	1.91E-04	1.81E-04
lbs/ton	3.15E-04	3.91E-04	3.83E-04	3.63E-04

LAB DATA SUMMARY
EPA METHOD 29 - FRONT HALF SAMPLE RESULTS

Client	Owens Illinois
Unit / Location	Furnace D

Test number / Date / Start / Stop time	Method Detection Limit (MDL)	Field Blank		Run 1		Run 2		Run 3		Average	
Test number	Method	Field Blank		Run 1		Run 2		Run 3		Average	
Date	Detection Limit	--		May 16, 2019		May 16, 2019		May 17, 2019		--	
Start / Stop time	(MDL)	--		0850-1352		1507-1933		0751-1216		--	
	Result	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**
Antimony (Sb), µg	1.25	ND	0		35.8		47.6		42.5		41.967
Arsenic (As), µg	1.75	ND	0		628		802		738		722.667
Beryllium (Be), µg	0.05	ND	0		0.144		0.149		0.162		0.152
Cadmium (Cd), µg	0.1	ND	0		68.8		83		84		78.600
Cobalt (Co), µg	0.125	ND	0		0.302		0.708		0.327	ND	0.446
Copper (Cu), µg	1.25	ND	0		78.3		86		84.7		83.000
Lead (Pb), µg	1.25	ND	0		8980		9960		9660		9533.333
Manganese (Mn), µg	0.075		0.816		27.6		16.8		13.4		19.267
Mercury (Hg)											
Front Half, µg	0.0219	ND	0	ND	0	ND	0	ND	0	DLL	0.000
BH-Impingers (HNO_3/H_2O_2), µg	0.0699		0.0192		5.54		6.42		5.26		5.740
BH-Impinger (Empty), µg	0.0101	ND	0		0.0598		0.272		0.0749		0.1356
BH-Impingers ($H_2SO_4/KMnO_4$), µg	0.0346	ND	0		4.78		4.75		3.77		4.43
BH-HCl Rinse, µg	0.0198	ND	0		0.165		0.0285	ND	0		0.0645
Total Mercury (Hg), µg	**0.1563**		**0.0192**		**10.5667**		**11.4924**		**9.1466**		**10.402**
Nickel (Ni), µg	0.75		3.16		30.5		52.4		32.4		38.43
Selenium (Se), µg	3.75	ND	0		59.8		81.2		71.1		70.70

MERCURY		
R1	R2	R3
0.0219	0.0219	0.0219
5.5400	6.4200	5.2600
0.0598	0.2720	0.0749
4.7800	4.7500	3.7700
0.1650	0.0285	0.0198
10.5667	**11.4924**	**9.1466**

LAB DATA SUMMARY
EPA METHOD 29 - BACK HALF SAMPLE RESULTS
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinois
Unit / Location	Furnace D

Test number	Method	Field Blank		Run 1		Run 2		Run 3		Average	
Date	Detection Limit	--		May 16, 2019		May 16, 2019		May 17, 2019		--	
Start / Stop time	(MDL)	--		0850-1352		1507-1933		0751-1216		--	
	Result	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**
Antimony (Sb), µg	0.530	ND	0.00		2.01		1.2		1.17		1.46
Arsenic (As), µg	0.742	ND	0.00		63.1		112		102		92.37
Beryllium (Be), µg	0.021	ND	0.00	ND	0	ND	0	ND	0	ND	0.00
Cadmium (Cd), µg	0.042	ND	0.00		0.096	ND	0	ND	0	DLL	0.03
Cobalt (Co), µg	0.053	ND	0.00		0.358		0.203		0.169	DLL	0.24
Copper (Cu), µg	0.530	ND	0.00		1.52		2.37		1.3	ND	1.73
Lead (Pb), µg	0.530	ND	0.00		9.25		1.46		1.95	DLL	4.22
Manganese (Mn), µg	0.032	ND	0.00		2.41		8.87		1.39		4.22
Nickel (Ni), µg	0.318	ND	0.00		3.26		4.74		2.35		3.45
Selenium (Se), µg	1.593	ND	0.00		394		494		496		461.33

ND - The result was measured below the RL and could not be approximated by the lab.
DLL - The result was detected in some fractions that contribute to this calculation, but not all.
ADL - The result was above the detection limit. (Unmarked data)
Back half MDL above are the average MDL for each run.

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace D
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Antimony (Sb), µg	**35.8**	**47.6**	**42.5**	**41.966667**
Antimony (Sb), Mmdl, ug	1.25	1.25	1.25	
Antimony (Sb), Mfhb exceeds A, ug	No	No	No	
Antimony (Sb), I. "A", ug	13.8	13.8	13.8	
Antimony (Sb), II.a Mfhb, ug	0	0	0	
Antimony (Sb), II.b 5% of Mfh, ug	1.79	2.38	2.13	2.10
Antimony (Sb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Antimony (Sb), Greater of I or II, ug	13.80	13.80	13.80	
Antimony (Sb), Mfhb - final, ug	0.00	0.00	0.00	
Antimony (Sb), Mfh - Mfhb, ug	35.80	47.60	42.50	41.97
Antimony (Sb), Mfh, blank corrected final, ug	**35.8**	**47.6**	**42.5**	**41.966667**
Arsenic (As), µg	**628**	**802**	**738**	**722.66667**
Arsenic (As), Mmdl, ug	1.75	1.75	1.75	
Arsenic (As), Mfhb exceeds A, ug	No	No	No	
Arsenic (As), I. "A", ug	13.8	13.8	13.8	
Arsenic (As), II.a Mfhb, ug	0	0	0	
Arsenic (As), II.b 5% of Mfh, ug	31.40	40.10	36.90	36.13
Arsenic (As), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Arsenic (As), Greater of I or II, ug	13.80	13.80	13.80	
Arsenic (As), Mfhb - final, ug	0.00	0.00	0.00	
Arsenic (As), Mfh - Mfhb, ug	628.00	802.00	738.00	722.67
Arsenic (As), Mfh, blank corrected final, ug	**628**	**802**	**738**	**722.66667**
Beryllium (Be), µg	**0.144**	**0.149**	**0.162**	**0.1516667**
Beryllium (Be), Mmdl, ug	0.05	0.05	0.05	
Beryllium (Be), Mfhb exceeds A, ug	No	No	No	
Beryllium (Be), I. "A", ug	13.8	13.8	13.8	
Beryllium (Be), II.a Mfhb, ug	0	0	0	
Beryllium (Be), II.b 5% of Mfh, ug	0.01	0.01	0.01	0.01
Beryllium (Be), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Beryllium (Be), Greater of I or II, ug	13.80	13.80	13.80	
Beryllium (Be), Mfhb - final, ug	0.00	0.00	0.00	
Beryllium (Be), Mfh - Mfhb, ug	0.14	0.15	0.16	0.15
Beryllium (Be), Mfh, blank corrected final, ug	**0.144**	**0.149**	**0.162**	**0.1516667**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace D
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Cadmium (Cd), µg	**68.8**	**83**	**84**	**78.6**
Cadmium (Cd), Mmdl, ug	0.1	0.1	0.1	
Cadmium (Cd), Mfhb exceeds A, ug	No	No	No	
Cadmium (Cd), I. "A", ug	13.8	13.8	13.8	
Cadmium (Cd), II.a Mfhb, ug	0	0	0	
Cadmium (Cd), II.b 5% of Mfh, ug	3.44	4.15	4.20	3.93
Cadmium (Cd), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cadmium (Cd), Greater of I or II, ug	13.80	13.80	13.80	
Cadmium (Cd), Mfhb - final, ug	0.00	0.00	0.00	
Cadmium (Cd), Mfh - Mfhb, ug	68.80	83.00	84.00	78.60
Cadmium (Cd), Mfh, blank corrected final, ug	**68.8**	**83**	**84**	**78.6**
Cobalt (Co), µg	**0.302**	**0.708**	**0.327**	**0.4456667**
Cobalt (Co), Mmdl, ug	0.125	0.125	0.125	
Cobalt (Co), Mfhb exceeds A, ug	No	No	No	
Cobalt (Co), I. "A", ug	13.8	13.8	13.8	
Cobalt (Co), II.a Mfhb, ug	0	0	0	
Cobalt (Co), II.b 5% of Mfh, ug	0.02	0.04	0.02	0.02
Cobalt (Co), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cobalt (Co), Greater of I or II, ug	13.80	13.80	13.80	
Cobalt (Co), Mfhb - final, ug	0.00	0.00	0.00	
Cobalt (Co), Mfh - Mfhb, ug	0.30	0.71	0.33	0.45
Cobalt (Co), Mfh, blank corrected final, ug	**0.302**	**0.708**	**0.327**	**0.4456667**
Copper (Cu), µg	**78.3**	**86**	**84.7**	**83**
Copper (Cu), Mmdl, ug	1.25	1.25	1.25	
Copper (Cu), Mfhb exceeds A, ug	No	No	No	
Copper (Cu), I. "A", ug	13.8	13.8	13.8	
Copper (Cu), II.a Mfhb, ug	0	0	0	
Copper (Cu), II.b 5% of Mfh, ug	3.92	4.30	4.24	4.15
Copper (Cu), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Copper (Cu), Greater of I or II, ug	13.80	13.80	13.80	
Copper (Cu), Mfhb - final, ug	0.00	0.00	0.00	
Copper (Cu), Mfh - Mfhb, ug	78.30	86.00	84.70	83.00
Copper (Cu), Mfh, blank corrected final, ug	**78.3**	**86**	**84.7**	**83**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client				Owens Illinois
Unit / Location				Furnace D
Filter size, mm				90

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Lead (Pb), µg	**8980**	**9960**	**9660**	**9533.3333**
Lead (Pb), Mmdl, ug	1.25	1.25	1.25	
Lead (Pb), Mfhb exceeds A, ug	No	No	No	
Lead (Pb), I. "A", ug	13.8	13.8	13.8	
Lead (Pb), II.a Mfhb, ug	0	0	0	
Lead (Pb), II.b 5% of Mfh, ug	449.00	498.00	483.00	476.67
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Greater of I or II, ug	13.80	13.80	13.80	
Lead (Pb), Mfhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mfh - Mfhb, ug	8980.00	9960.00	9660.00	9533.33
Lead (Pb), Mfh, blank corrected final, ug	**8980**	**9960**	**9660**	**9533.3333**
Manganese (Mn), µg	**27.6**	**16.8**	**13.4**	**19.27**
Manganese (Mn), Mmdl, ug	**0.075**	**0.075**	**0.075**	
Manganese (Mn), Mfhb exceeds A, ug	No	No	No	
Manganese (Mn), I. "A", ug	13.8	13.8	13.8	
Manganese (Mn), II.a Mfhb, ug	0.8	0.8	0.8	
Manganese (Mn), II.b 5% of Mfh, ug	1.38	0.84	0.67	0.96
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.82	0.82	0.67	
Manganese (Mn), Greater of I or II, ug	13.80	13.80	13.80	
Manganese (Mn), Mfhb - final, ug	0.82	0.82	0.82	
Manganese (Mn), Mfh - Mfhb, ug	26.78	15.98	12.58	18.45
Manganese (Mn), Mfh, blank corrected final, ug	**26.78**	**15.98**	**12.58**	18.45
Mercury (Hg), front half, µg	**0.0219**	**0.0219**	**0.0219**	**0.0219**
Mercury (Hg), back half, µg	**10.5448**	**11.4705**	**9.1247**	**10.38**
Mercury (Hg) - FH, Mmdl, ug	0.0219	0.0219	0.0219	
Mercury (Hg) - BH, Mmdl, ug	0.13437	0.13437	0.13437	
Mercury (Hg), (Hgfhb + Hgbhb) exceeds 0.6 ug	No	No	No	
Mercury (Hg), I. 0.60, ug	0.6	0.6	0.6	
Mercury (Hg), II.a.1 Hgfhb, ug	0	0	0	
Mercury (Hg), II.a.2 Hgbhb, ug	0.0192	0.0192	0.0192	
Mercury (Hg), II.a (Hgfhb + Hgbhb), ug	0.02	0.02	0.02	
Mercury (Hg), II.b 5% of (Hgfh+Hgbh), ug	0.53	0.57	0.46	0.52
Mercury (Hg), II final - lesser of II(a) or II(b), ug	0.02	0.02	0.02	
Mercury (Hg), Greater of I or II, ug	0.60	0.60	0.60	
Mercury (Hg), (Hgfhb + Hgbhb) - final, ug	0.02	0.02	0.02	
Mercury (Hg), (Hgfh - Hgfhb) + (Hgbh - Hgbhb), ug	10.55	11.47	9.13	10.38
Mercury (Hg), total, blank corrected final, ug	**10.548**	**11.473**	**9.127**	**10.383**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - FRONT HALF

Client	Owens Illinois
Unit / Location	Furnace D
Filter size, mm	90

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Nickel (Ni), µg	**30.5**	**52.4**	**32.4**	**38.433333**
Nickel (Ni), Mmdl, ug	0.75	0.75	0.75	
Nickel (Ni), Mfhb exceeds A, ug	No	No	No	
Nickel (Ni), I. "A", ug	13.8	13.8	13.8	
Nickel (Ni), II.a Mfhb, ug	3.16	3.16	3.16	
Nickel (Ni), II.b 5% of Mfh, ug	1.53	2.62	1.62	1.92
Nickel (Ni), II final - lesser of II(a) or II(b), ug	1.53	2.62	1.62	
Nickel (Ni), Greater of I or II, ug	13.80	13.80	13.80	
Nickel (Ni), Mfhb - final, ug	3.16	3.16	3.16	
Nickel (Ni), Mfh - Mfhb, ug	27.34	49.24	29.24	35.27
Nickel (Ni), Mfh, blank corrected final, ug	**27.34**	**49.24**	**29.24**	**35.273333**
Selenium (Se), µg	**59.8**	**81.2**	**71.1**	**70.7**
Selenium (Se), Mmdl, ug	3.75	3.75	3.75	
Selenium (Se), Mfhb exceeds A, ug	No	No	No	
Selenium (Se), I. "A", ug	13.8	13.8	13.8	
Selenium (Se), II.a Mfhb, ug	0	0	0	
Selenium (Se), II.b 5% of Mfh, ug	2.99	4.06	3.56	3.54
Selenium (Se), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Selenium (Se), Greater of I or II, ug	13.80	13.80	13.80	
Selenium (Se), Mfhb - final, ug	0.00	0.00	0.00	
Selenium (Se), Mfh - Mfhb, ug	59.80	81.20	71.10	70.70
Selenium (Se), Mfh, blank corrected final, ug	**59.8**	**81.2**	**71.1**	**70.7**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace D

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Antimony (Sb), µg	**2.01**	**1.2**	**1.17**	**1.46**
Antimony (Sb), Mmdl, ug	0.53	0.53	0.53	0.53
Antimony (Sb), If Mbhb exceeds 1, ug	No	No	No	
Antimony (Sb), I. 1 ug	1	1	1	
Antimony (Sb), II.a Mbhb, ug	0.00	0.00	0.00	
Antimony (Sb), II.b 5% of Mbh, ug	0.10	0.06	0.06	0.07
Antimony (Sb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Antimony (Sb), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Antimony (Sb), Mbhb - final, ug	0.00	0.00	0.00	
Antimony (Sb), Mbh - Mfhb, ug	2.01	1.20	1.17	
Antimony (Sb), Mbh, blank corrected final, ug	**2.01**	**1.20**	**1.17**	**1.46**
Arsenic (As), µg	**63.10**	**112.00**	**102.00**	**92.37**
Arsenic (As), Mmdl, ug	0.742	0.742	0.742	0.742
Arsenic (As), If Mbhb exceeds 1, ug	No	No	No	
Arsenic (As), I. 1 ug	1	1	1	
Arsenic (As), II.a Mbhb, ug	0.00	0.00	0.00	
Arsenic (As), II.b 5% of Mbh, ug	3.155	5.6	5.1	4.6183333
Arsenic (As), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Arsenic (As), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Arsenic (As), Mbhb - final, ug	0.00	0.00	0.00	
Arsenic (As), Mbh - Mfhb, ug	63.10	112.00	102.00	
Arsenic (As), Mbh, blank corrected final, ug	**63.1**	**112**	**102**	**92.366667**
Beryllium (Be), µg	**0.00**	**0.00**	**0.00**	**0.00**
Beryllium (Be), Mmdl, ug	0.021	0.021	0.021	0.021
Beryllium (Be), If Mbhb exceeds 1, ug	No	No	No	
Beryllium (Be), I. 1 ug	1	1	1	
Beryllium (Be), II.a Mbhb, ug	0.00	0.00	0.00	
Beryllium (Be), II.b 5% of Mbh, ug	0	0	0	0
Beryllium (Be), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Beryllium (Be), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Beryllium (Be), Mbhb - final, ug	0.00	0.00	0.00	
Beryllium (Be), Mbh - Mfhb, ug	0.00	0.00	0.00	
Beryllium (Be), Mbh, blank corrected final, ug	**0.02133333**	**0.0213333**	**0.0213333**	**0.0213333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace D

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Cadmium (Cd), µg	**0.096**	**0**	**0**	**0.032**
Cadmium (Cd), Mmdl, ug	0.04233333	0.0423333	0.0423333	0.0423333
Cadmium (Cd), If Mbhb exceeds 1, ug	No	No	No	
Cadmium (Cd), I. 1 ug	1	1	1	
Cadmium (Cd), II.a Mbhb, ug	0.00	0.00	0.00	
Cadmium (Cd), II.b 5% of Mbh, ug	0.0048	0	0	0.0016
Cadmium (Cd), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cadmium (Cd), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Cadmium (Cd), Mbhb - final, ug	0.00	0.00	0.00	
Cadmium (Cd), Mbh - Mfhb, ug	0.10	0.00	0.00	
Cadmium (Cd), Mbh, blank corrected final, ug	**0.096**	**0.0423333**	**0.0423333**	**0.0602222**
Cobalt (Co), µg	**0.358**	**0.203**	**0.169**	**0.2433333**
Cobalt (Co), Mmdl, ug	0.05266667	0.0526667	0.0526667	0.0526667
Cobalt (Co), If Mbhb exceeds 1, ug	No	No	No	
Cobalt (Co), I. 1 ug	1	1	1	
Cobalt (Co), II.a Mbhb, ug	0.00	0.00	0.00	
Cobalt (Co), II.b 5% of Mbh, ug	0.0179	0.01015	0.00845	0.0121667
Cobalt (Co), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Cobalt (Co), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Cobalt (Co), Mbhb - final, ug	0.00	0.00	0.00	
Cobalt (Co), Mbh - Mfhb, ug	0.36	0.20	0.17	
Cobalt (Co), Mbh, blank corrected final, ug	**0.358**	**0.203**	**0.169**	**0.2433333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client				Owens Illinios
Unit / Location				Furnace D
Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Copper (Cu), µg	**1.52**	**2.37**	**1.3**	**1.73**
Copper (Cu), Mmdl, ug	0.53	0.53	0.53	0.53
Copper (Cu), If Mbhb exceeds 1, ug	No	No	No	
Copper (Cu), I. 1 ug	1	1	1	
Copper (Cu), II.a Mbhb, ug	0.00	0.00	0.00	
Copper (Cu), II.b 5% of Mbh, ug	0.076	0.1185	0.065	0.0865
Copper (Cu), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Copper (Cu), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Copper (Cu), Mbhb - final, ug	0.00	0.00	0.00	
Copper (Cu), Mbh - Mfhb, ug	1.52	2.37	1.30	
Copper (Cu), Mbh, blank corrected final, ug	**1.52**	**2.37**	**1.3**	**1.73**
Lead (Pb), µg	**9.25**	**1.46**	**1.95**	**4.22**
Lead (Pb), Mmdl, ug	0.530	0.530	0.530	0.530
Lead (Pb), If Mbhb exceeds 1, ug	No	No	No	
Lead (Pb), I. 1 ug	1	1	1	
Lead (Pb), II.a Mbhb, ug	0.00	0.00	0.00	
Lead (Pb), II.b 5% of Mbh, ug	0.4625	0.073	0.0975	0.211
Lead (Pb), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Lead (Pb), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Lead (Pb), Mbhb - final, ug	0.00	0.00	0.00	
Lead (Pb), Mbh - Mfhb, ug	9.25	1.46	1.95	
Lead (Pb), Mbh, blank corrected final, ug	**9.25**	**1.46**	**1.95**	**4.22**
Manganese (Mn), µg	**2.41**	**8.87**	**1.39**	**4.2233333**
Manganese (Mn), Mmdl, ug	0.032	0.032	0.032	0.032
Manganese (Mn), If Mbhb exceeds 1, ug	No	No	No	
Manganese (Mn), I. 1 ug	1	1	1	
Manganese (Mn), II.a Mbhb, ug	0.00	0.00	0.00	
Manganese (Mn), II.b 5% of Mbh, ug	0.1205	0.4435	0.0695	0.2111667
Manganese (Mn), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Manganese (Mn), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Manganese (Mn), Mbhb - final, ug	0.00	0.00	0.00	
Manganese (Mn), Mbh - Mfhb, ug	2.41	8.87	1.39	
Manganese (Mn), Mbh, blank corrected final, ug	**2.41**	**8.87**	**1.39**	**4.2233333**

BLANK CORRECTION SUMMARY
EPA METHOD 29 - BACK HALF
EXCEPT MERCURY (SEE FRONT HALF)

Client	Owens Illinios
Unit / Location	Furnace D

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Nickel (Ni), µg	**3.26**	**4.74**	**2.35**	**3.45**
Nickel (Ni), Mmdl, ug	0.318	0.318	0.318	0.318
Nickel (Ni), If Mbhb exceeds 1, ug	No	No	No	
Nickel (Ni), I. 1 ug	1	1	1	
Nickel (Ni), II.a Mbhb, ug	0.00	0.00	0.00	
Nickel (Ni), II.b 5% of Mbh, ug	0.163	0.237	0.1175	0.1725
Nickel (Ni), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Nickel (Ni), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Nickel (Ni), Mbhb - final, ug	0.00	0.00	0.00	
Nickel (Ni), Mbh - Mfhb, ug	3.26	4.74	2.35	
Nickel (Ni), Mbh, blank corrected final, ug	**3.26**	**4.74**	**2.35**	**3.45**
Selenium (Se), µg	**394**	**494**	**496**	**461.33333**
Selenium (Se), Mmdl, ug	1.59333333	1.5933333	1.5933333	1.5933333
Selenium (Se), If Mbhb exceeds 1, ug	No	No	No	
Selenium (Se), I. 1 ug	1	1	1	
Selenium (Se), II.a Mbhb, ug	0.00	0.00	0.00	
Selenium (Se), II.b 5% of Mbh, ug	19.7	24.7	24.8	23.066667
Selenium (Se), II final - lesser of II(a) or II(b), ug	0.00	0.00	0.00	
Selenium (Se), Mbhb - greater of I or II, ug	**1.00**	**1.00**	**1.00**	
Selenium (Se), Mbhb - final, ug	0.00	0.00	0.00	
Selenium (Se), Mbh - Mfhb, ug	394.00	494.00	496.00	
Selenium (Se), Mbh, blank corrected final, ug	**394**	**494**	**496**	**461.33333**

BLANK CORRECTED RESULTS SUMMARY
EPA METHOD 29

Client	Owens Illinois
Unit / Location	Furnace D

Test number		Run 1		Run 2		Run 3		Average
Date		May 16, 2019		May 16, 2019		May 17, 2019		--
Start / Stop time		0850-1352		1507-1933		0751-1216		--
Antimony (Sb), fh blank corrected, µg		35.80		47.60		42.50		41.97
Antimony (Sb) bh blank corrected, µg		2.01		1.20		1.17		1.46
Antimony (Sb) total, µg		37.81		48.80		43.67		43.43
Arsenic (As), fh blank corrected, µg		628.00		802.00		738.00		722.67
Arsenic (As) bh blank corrected, µg		63.10		112.00		102.00		92.37
Arsenic (As) total, µg		691.10		914.00		840.00		815.03
Beryllium (Be), fh blank corrected, µg		0.14		0.15		0.16		0.15
Beryllium (Be) bh blank corrected, µg	ND	0.02	ND	0.02	ND	0.02	ND	0.02
Beryllium (Be) total, µg	DLL	0.17	DLL	0.17	DLL	0.18	DLL	0.17
Cadmium (Cd), fh blank corrected, µg		68.80		83.00		84.00		78.60
Cadmium (Cd) bh blank corrected, µg		0.10	ND	0.04	ND	0.04	DLL	0.06
Cadmium (Cd) total, µg		68.90	DLL	83.04	DLL	84.04	DLL	78.66
Cobalt (Co), fh blank corrected, µg		0.302		0.708		0.327		0.446
Cobalt (Co) bh blank corrected, µg		0.358		0.203		0.169		0.243
Cobalt (Co) total, µg		0.660		0.911		0.496		0.689
Copper (Cu), fh blank corrected, µg		78.30		86.00		84.70		83.00
Copper (Cu) bh blank corrected, µg		1.52		2.37		1.30		1.73
Copper (Cu) total, µg		79.82		88.37		86.00		84.73
Lead (Pb), fh blank corrected, µg		8980.00		9960.00		9660.00		9533.33
Lead (Pb) bh blank corrected, µg		9.25		1.46		1.95		4.22
Lead (Pb) total, µg		8989.25		9961.46		9661.95		9537.55
Manganese (Mn), fh blank corrected, µg		26.78		15.98		12.58		18.45
Manganese (Mn) bh blank corrected, µg		2.41		8.87		1.39		4.22
Manganese (Mn) total, µg		29.19		24.85		13.97		22.67
Mercury (Hg), total blank corrected, µg	DLL	10.55	DLL	11.47	DLL	9.13	DLL	10.38
Nickel (Ni), fh blank corrected, µg		27.34		49.24		29.24		35.27
Nickel (Ni) bh blank corrected, µg		3.26		4.74		2.35		3.45
Nickel (Ni) total, µg		30.60		53.98		31.59		38.72
Selenium (Se), fh blank corrected, µg		59.80		81.20		71.10		70.70
Selenium (Se) bh blank corrected, µg		394.00		494.00		496.00		461.33
Selenium (Se) total, µg		453.80		575.20		567.10		532.03

SOURCE TEST DATA SUMMARY
EPA METHOD 29 - METALS

Client	Owens Illinois
Unit / Location	Furnace D
A (stack area), ft^2	4.587
T_{ref} (reference temperature), °F	68

Test number	Run 1	Run 2	Run 3	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1352	1507-1933	0751-1216	--
Meter box number	MB4	MB4	MB4	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9927	0.9927	0.9927	0.9927
Θ (sample time), min	240	240	240	240
Nozzle diameter, in	0.3056	0.3082	0.3080	0.3073
P_{bar} (barometric pressure), in Hg	29.46	29.46	29.81	29.58
V_m (meter box volume), acf	146.175	151.248	153.075	150.166
V_{lc} (impinger liquid), gm	543.3	583.2	591.9	572.8
T_m (meter temperature), °F	75.8	78.3	79.3	77.8
ΔH (meter pressure), in. H_2O	1.243	1.292	1.319	1.285
ΔP (velocity head), in. H_2O	0.3836	0.3992	0.4023	0.3950
P_g (static pressure), in. H_2O	0.08	0.08	0.08	0.08
T_s (stack temperature), °F	710.9	718.9	709.6	713.1
$\%O_2$ (oxygen stack gas), % volume dry	6.81	7.36	7.31	7.16
$\%CO_2$ (carbon dioxide stack gas), % volume dry	9.40	9.44	9.59	9.48
$V_{m(std)}$ (standard sample volume), dscf	141.236	145.465	148.723	145.141
$V_{w(std)}$ (water vapor volume), scf	25.617	27.498	27.908	27.008
B_{ws} (moisture fraction), non-dimensional	0.1535	0.1590	0.1580	0.1568
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	NA
B_{ws} (moisture fraction applicable)), non-dimensional	0.1535	0.1590	0.1580	0.1568
M_d (stack gas molecular weight), dry	29.776	29.805	29.827	29.803
M_s (stack gas molecular weight), wet	27.968	27.928	27.958	27.952
P_s (absolute stack pressure), in Hg	29.466	29.466	29.816	29.583
V_s (stack gas velocity), ft/sec	53.018	54.302	53.954	53.758
Q (stack flow rate), acf/min	14,592	14,945	14,849	14,795
Q_{sw} (stack flow rate), wscf/min	6,480	6,592	6,680	6,584
Q_{sd} (stack flow rate), dscf/min	5,485	5,544	5,625	5,551
I (isokinetic ratio), %	96.6	96.8	97.7	97.0

Appendix A.5
Total and Hexavalent Chromium Spreadsheets

SOURCE TEST DATA SUMMARY
CARB 425

Client	OWENS ILLINOIS			
Unit / Location	FURNACE "A" NORTH			
A (stack area), ft^2	10.752			
T_{ref} (reference temperature), °F	68			
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Production Basis, Kg/hr	7,639	7,639	7,639	7,639
Test number	R1-Cr	R2-Cr	R3-Cr	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0900-1630	0900-1730	0800-1530	--
Meter box number	MB29	MB29	MB29	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9875	0.9875	0.9875	0.9875
Θ (sample time), min	240	240	240	240
Nozzle diameter, in.	0.1685	0.1685	0.1685	0.1685
P_{bar} (barometric pressure), in Hg	29.60	29.98	29.97	29.85
V_m (meter box volume), acf	121.264	128.404	129.221	126.296
V_{lc} (impinger liquid), gm	122.9	163.6	153.0	146.5
T_m (meter temperature), °F	80.0	82.4	77.5	80.0
ΔH (meter pressure), in. H_2O	0.795	0.883	0.898	0.859
ΔP (velocity head), in. H_2O	1.6340	1.8391	1.8901	1.7878
P_g (static pressure), in. H_2O	-1.10	-0.99	-1.00	-1.03
T_s (stack temperature), °F	386.8	393.6	391.2	390.6
$\%O_2$ (oxygen stack gas), % volume dry	17.52	16.80	16.96	17.09
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.65	2.80	2.73	2.73
$V_{m(std)}$ (standard sample volume), dscf	116.055	123.944	125.827	121.942
$V_{m(std)}$ (standard sample volume), dscm	3.286	3.510	3.563	3.453
$V_{w(std)}$ (water vapor volume), scf	5.795	7.714	7.214	6.907
B_{ws} (moisture fraction), non-dimensional	0.0476	0.0586	0.0542	0.0535
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	--
B_{ws} (moisture fraction applicable), non-dimensional	0.0476	0.0586	0.0542	0.0535
M_d (stack gas molecular weight), dry	29.124	29.120	29.116	29.120
M_s (stack gas molecular weight), wet	28.595	28.468	28.513	28.525
P_s (absolute stack pressure), in Hg	29.519	29.907	29.896	29.774
V_s (stack gas velocity), ft/sec	91.945	97.514	98.656	96.038
Q (stack flow rate), acf/min	59,316	62,909	63,646	61,957
Q_{sw} (stack flow rate), wscf/min	36,488	38,895	39,448	38,277
Q_{sd} (stack flow rate), dscf/min	34,753	36,616	37,309	36,226
I (isokinetic ratio), %	96.6	97.9	97.6	97.4
Chromium (Cr)				
Probe Rinse, µg	26.6	34.5	24.1	28.4
Filter, Imp 1&2, µg	99.2	124.0	130.0	117.7
µg	125.8	158.5	154.1	146.1
µg/dscm	3.83E+01	4.52E+01	4.32E+01	4.22E+01
lb/hr	4.98E-03	6.19E-03	6.04E-03	5.74E-03
lb/ton-Glass	5.92E-04	7.36E-04	7.18E-04	6.82E-04
gm/hr	2.26E+00	2.81E+00	2.74E+00	2.60E+00
gm/Kg-Glass	2.96E-04	3.68E-04	3.59E-04	3.41E-04
Chromium (Cr^{+6})				
Probe Rinse, µg	0.2480	0.1720	0.3370	0.2523
Filter, Imp 1&2, µg	0.1160	0.1100	0.0927	0.1062
µg	0.3640	0.2820	0.4297	0.3586
µg/dscm	1.11E-01	8.03E-02	1.21E-01	1.04E-01
lb/hr	1.44E-05	1.10E-05	1.69E-05	1.41E-05
lb/ton-Glass	1.71E-06	1.31E-06	2.00E-06	1.67E-06
gm/hr	6.54E-03	5.00E-03	7.64E-03	6.39E-03
gm/Kg-Glass	8.56E-07	6.54E-07	1.00E-06	8.37E-07
Percent Cr^{6+}	0.29%	0.18%	0.28%	0.25%

SOURCE TEST DATA SUMMARY
CARB 425

Client				OWENS ILLINOIS
Unit / Location				FURNACE "A" SOUTH
A (stack area), ft^2				10.679
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	8.42	8.42	8.42	8.42
Production Basis, Kg/hr	7,639	7,639	7,639	7,639

Test number	R1-Cr	R2-Cr	R3-Cr	Average
Date	May 21, 2019	May 22, 2019	May 23, 2019	--
Start / Stop time	0930-1800	0830-1645	0830-1600	--
Meter box number	MB4	MB4	MB4	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9927	0.9927	0.9927	0.9927
Θ (sample time), min	240	240	240	240
Nozzle diameter, in	0.1597	0.1553	0.1553	0.1568
P_{bar} (barometric pressure), in Hg	29.60	29.98	29.97	29.85
V_m (meter box volume), acf	121.584	102.218	105.025	109.609
V_{lc} (impinger liquid), gm	120.7	121.5	101.7	114.6
T_m (meter temperature), °F	81.3	77.9	77.0	78.7
ΔH (meter pressure), in. H_2O	0.793	0.570	0.651	0.671
ΔP (velocity head), in. H_2O	2.0373	1.6490	1.7387	1.8084
P_g (static pressure), in. H_2O	-1.20	-1.10	-1.20	-1.17
T_s (stack temperature), °F	344.5	350.8	350.5	348.6
$\%O_2$ (oxygen stack gas), % volume dry	17.52	16.80	16.96	17.09
$\%CO_2$ (carbon dioxide stack gas), % volume dry	2.65	2.80	2.73	2.73
$V_{m(std)}$ (standard sample volume), dscf	116.712	99.940	102.838	106.497
$V_{m(std)}$ (standard sample volume), dscm	3.305	2.830	2.912	3.016
$V_{w(std)}$ (water vapor volume), scf	5.691	5.729	4.795	5.405
B_{ws} (moisture fraction), non-dimensional	0.0465	0.0542	0.0446	0.0484
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	--
B_{ws} (moisture fraction applicable), non-dimensional	0.0465	0.0542	0.0446	0.0484
M_d (stack gas molecular weight), dry	29.124	29.120	29.116	29.120
M_s (stack gas molecular weight), wet	28.607	28.517	28.620	28.581
P_s (absolute stack pressure), in Hg	29.512	29.899	29.882	29.764
V_s (stack gas velocity), ft/sec	100.056	89.928	92.185	94.056
Q (stack flow rate), acf/min	64,111	57,622	59,068	60,267
Q_{sw} (stack flow rate), wscf/min	41,505	37,496	38,429	39,143
Q_{sd} (stack flow rate), dscf/min	39,575	35,463	36,717	37,252
I (isokinetic ratio), %	94.3	95.3	94.7	94.8
Chromium (Cr)				
Probe Rinse, µg	18.70	19.20	12.20	16.70
Filter, Imp 1&2, µg	113.00	104.00	84.00	100.33
µg	131.70	123.20	96.20	117.03
µg/dscm	3.98E+01	4.35E+01	3.30E+01	3.88E+01
lb/hr	5.91E-03	5.78E-03	4.54E-03	5.41E-03
lb/ton-Glass	7.01E-04	6.87E-04	5.40E-04	6.43E-04
gm/hr	2.68E+00	2.62E+00	2.06E+00	2.45E+00
gm/Kg-Glass	3.51E-04	3.43E-04	2.70E-04	3.21E-04
Chromium (Cr^{+6})				
Probe Rinse, µg	0.1600	0.2110	0.0909	0.1540
Filter, Imp 1&2, µg	0.1770	0.0833	0.1010	0.1204
µg	0.3370	0.2943	0.1919	0.2744
µg/dscm	1.02E-01	1.04E-01	6.59E-02	9.06E-02
lb/hr	1.51E-05	1.38E-05	9.06E-06	1.27E-05
lb/ton-Glass	1.80E-06	1.64E-06	1.08E-06	1.50E-06
gm/hr	6.86E-03	6.27E-03	4.11E-03	5.74E-03
gm/Kg-Glass	8.98E-07	8.20E-07	5.38E-07	7.52E-07
Percent Cr^{6+}	0.26%	0.24%	0.20%	0.23%

SOURCE TEST DATA SUMMARY

CARB 425

Client				OWENS ILLINOIS
Unit / Location				FURNACE "D"
A (stack area), ft^2				4.587
T_{ref} (reference temperature), °F				68
Production Basis, tons/hr	7.40	7.40	7.40	7.40
Production Basis, Kg/hr	6,717	6,717	6,717	6,717
Test number	R1-Cr	R2-Cr	R3-Cr	Average
Date	May 16, 2019	May 16, 2019	May 17, 2019	--
Start / Stop time	0850-1343	1507-1947	0751-1238	--
Meter box number	MB30	MB30	MB30	--
C_p (pitot coefficient), dimensionless	0.84	0.84	0.84	0.84
Y (meter calibration factor), dimensionless	0.9865	0.9865	0.9865	0.9865
Θ (sample time), min	240	240	240	240
Nozzle diameter, in	0.2842	0.2203	0.2203	0.2416
P_{bar} (barometric pressure), in Hg	29.46	29.46	29.81	29.58
V_m (meter box volume), acf	128.738	77.259	76.486	94.161
V_{lc} (impinger liquid), gm	486.4	259.8	274.2	340.1
T_m (meter temperature), °F	75.0	70.5	74.2	73.2
ΔH (meter pressure), in. H_2O	0.937	0.349	0.348	0.545
ΔP (velocity head), in. H_2O	0.4132	0.4202	0.4102	0.4145
P_g (static pressure), in. H_2O	0.08	0.08	0.08	0.08
T_s (stack temperature), °F	702.9	717.6	698.9	706.5
$\%O_2$ (oxygen stack gas), % volume dry	6.81	7.36	7.31	7.16
$\%CO_2$ (carbon dioxide stack gas), % volume dry	9.40	9.44	9.59	9.48
$V_{m(std)}$ (standard sample volume), dscf	123.710	74.750	74.366	90.942
$V_{m(std)}$ (standard sample volume), dscm	3.503	2.117	2.106	2.575
$V_{w(std)}$ (water vapor volume), scf	22.934	12.250	12.929	16.037
B_{ws} (moisture fraction), non-dimensional	0.1564	0.1408	0.1481	0.1484
B_{ws} (moisture fraction saturated), non-dimensional	NA	NA	NA	--
B_{ws} (moisture fraction applicable), non-dimensional	0.1564	0.1408	0.1481	0.1484
M_d (stack gas molecular weight), dry	29.776	29.805	29.827	29.803
M_s (stack gas molecular weight), wet	27.935	28.143	28.075	28.051
P_s (absolute stack pressure), in Hg	29.466	29.466	29.816	29.583
V_s (stack gas velocity), ft/sec	54.867	55.473	54.116	54.819
Q (stack flow rate), acf/min	15,100	15,267	14,894	15,087
Q_{sw} (stack flow rate), wscf/min	6,752	6,741	6,762	6,752
Q_{sd} (stack flow rate), dscf/min	5,696	5,792	5,761	5,750
I (isokinetic ratio), %	94.2	93.2	93.2	93.5
Chromium (Cr)				
Probe Rinse, µg	98.3	93.6	70.8	87.6
Filter, Imp 1&2, µg	160.0	159.0	245.0	188.0
µg	258.3	252.6	315.8	275.6
µg/dscm	7.37E+01	1.19E+02	1.50E+02	1.14E+02
lb/hr	1.57E-03	2.59E-03	3.24E-03	2.47E-03
lb/ton-Glass	2.12E-04	3.50E-04	4.37E-04	3.33E-04
gm/hr	7.14E-01	1.17E+00	1.47E+00	1.12E+00
gm/Kg-Glass	1.06E-04	1.75E-04	2.19E-04	1.67E-04
Chromium (Cr^{+6})				
Probe Rinse, µg	0.3210	0.1450	0.1620	0.2093
Filter, Imp 1&2, µg	*0.0406*	*0.0292*	*0.0310*	*0.0336*
µg	0.3616	0.1742	0.1930	0.2429
µg/dscm	1.03E-01	8.23E-02	9.17E-02	9.24E-02
lb/hr	2.20E-06	1.79E-06	1.98E-06	1.99E-06
lb/ton-Glass	2.97E-07	2.41E-07	2.67E-07	2.69E-07
gm/hr	9.99E-04	8.10E-04	8.97E-04	9.02E-04
gm/Kg-Glass	1.49E-07	1.21E-07	1.34E-07	1.34E-07
Percent Cr^{6+}	0.14%	0.07%	0.06%	0.09%

NOTES: All Cr+6 Filter and Imp 1&2 are reported at the detection and are ***Italic***.

Appendix A.6
Example Calculations

EXAMPLE CALCULATIONS
STACK GAS VOLUMETRIC FLOW RATE

Project name: OWENS ILL **Project number:** 035AS-596331

Computed by: MWALLACE **Calculation date:** 7/9/19

Run number: FURNACE A - NORTH RUN #2 PM -TESTING

SAMPLE TRAIN DATA

Meter calibration factor, Y_d	1.0058	Y
Stack area, square feet	10.752	A_s
Pitot Coefficient	0.84	C_p
Barometric pressure, in Hg	29.76	P_{bar}
Meter box volume, acf	45.791	V_m
Impinger liquid volume, g	54.7	V_{lc}
Meter temperature, °R	531.9	T_m = (ºF plus 460)
Meter pressure, (delta H) iwg	1.744	ΔH
Velocity head, (delta P) iwg	1.4476	ΔP
Static pressure, iwg	-0.91	P_{sg}
Stack temperature, °R	880.9	T_s = (ºF plus 460)
Stack O_2, % volume dry	17.18	O_2
Stack CO_2, % volume dry	2.761	CO_2
Stack N_2, % volume dry	80.06	N_2 = (100- % O_2 - % CO_2)
Nozzle area, square feet	0.0002478	$A_n = \pi \left(\frac{D_n}{2}\right)^2 \left(\frac{1\,ft}{12\,in}\right)^2$
PM sampling time, minutes	60	Θ
Reference temperature, °R	528	T_{std} (ºF plus 460)

***Note:* The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.**

1. **VOLUMETRIC FLOW RATE**

a. **Standard sample gas volume, dscf**

$$V_{m\,std} = (V_m)(Y)\frac{(T_{std})\left[P_{bar} + \left(\frac{\Delta H}{13.6}\right)\right]}{(T_m)(P_{std})}$$

$$V_{m\,std} = (45.791\ )(1.0058\ )\frac{(528\ )\left[29.76\ + \left(\frac{1.744}{13.6}\right)\right]}{(531.9\ )(29.92)}$$

$V_{m\,std}$ = 45.670 dscf

b. **Water vapor volume, scf**

$$V_{w\,std} = (0.04715)(V_{lc})\left(\frac{T_{std}}{528}\right)$$

$$V_{w\,std} = (0.04715\ )(54.7\ )\left(\frac{\quad}{528}\right)$$

$V_{w\,std}$ = 2.579 scf

c. **Moisture content, non-dimensional**

$$B_{ws} = \left(\frac{V_{w\,std}}{V_{m\,std} + V_{w\,std}}\right)$$

$$B_{ws} = \left(\frac{2.579}{45.67\ + 2.579}\right)$$

B_{ws} = 0.0535 moisture content (multiply by 100 for % by volume)

d. Stack gas molecular weight, lb/lb mole (dry)

$$MW_{dry} = [0.44(\%CO_2)] + [0.32(\%O_2)] + [0.28(\%N_2)]$$

$$MW_{dry} = [0.44(2.761)] + [0.32(17.18)] + [0.28(80.06)]$$

MW_{dry} = 29.129 lb/lb mole

e. Stack gas molecular weight, lb/lb mole (wet)

$$MW_{wet} = [MW_{dry}(1 - B_{ws})] + [18(B_{ws})]$$

$$MW_{wet} = [29.129 (1 - 0.0535)] + [18(0.0535)]$$

MW_{wet} = 28.534 lb/lb mole

f. Absolute stack pressure, in Hg

$$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

$$P_s = 29.76 + \left(\frac{-0.91}{13.6}\right)$$

P_s = 29.693 in. Hg

g. Stack velocity, ft/sec

$$v_s = (85.49)(C_p)(\sqrt{\Delta P})\sqrt{\frac{T_s}{(P_s)(MW_{wet})}}$$

$$v_s = (85.49)(0.84)(\sqrt{1.4476})\sqrt{\frac{880.9}{(29.693)(28.534)}}$$

v_s = 88.100 ft/sec

h. Actual stack flow rate, acfm

$$Q = (v_s)(A_s)(60\ min/hr)$$

$$Q = (88.100\ )(10.752\ )(60\ )$$

Q = 56,835 acfm

i. Standard stack gas flow rate, wscfm

$$Q_{ws} = (v_s)(A_s)(60\ min/hr)\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)$$

$$Q_{ws} = (88.100\ )(10.752\ )(60\ )\left(\frac{528}{880.9}\right)\left(\frac{29.693}{29.92}\right)$$

Q_{ws} = 33,807 wscfm

j. Standard stack gas flow rate, dscfm

$$Q_{ds} = (v_s)(A_s)(60\ min/hr)(1 - B_{ws})\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)$$

$$Q_{ds} = (88.100\ )(10.752\ )(60)(1 - 0.0535)\left(\frac{528}{880.9}\right)\left(\frac{29.693}{29.92}\right)$$

Q_{ds} = 31,999 dscfm

k. Percent Isokinetic, %

$$I = \frac{(T_s)(V_{m\,std})(P_{std})(100)}{(T_{std})(v_s)(\theta)(A_n)(P_s)(60)(1 - B_{ws})}$$

$$I = \frac{(880.9\ )(45.67\ )(29.92\ )(100)}{(528\ )(88.1\ )(\ 60\ )(0.0002478\ )(29.693)(60)(1 - 0.0535)}$$

I = 103.2 %

EXAMPLE CALCULATIONS
PARTICULATE MATTER EMISSIONS

Project name: OWENS ILL **Project number:** 035AS-596331

Computed by: MWALLACE **Calculation date:** 7/9/19

Run number: RUN 2
FURNACE A-NORTH

EMISSIONS DATA

Mass of collected particulate matter, mg	92.66	G_m
Dry stack gas flow rate at standard conditions, dscfm	32002	Q_{ds}
Dry meter volume at standard conditions, dscf	45.673	$V_{m\ std}$
Stack O_2, % volume dry	17.18	O_2
Stack CO_2, % volume dry	2.761	CO_2

1. PARTICULATE MATTER EMISSIONS

a. Grain loading, gr/dscf

$$G = (0.0154)\left(\frac{G_m}{V_{m\ std}}\right)$$

$$G = (0.0154)\left(\frac{92.66}{45.673}\right)$$

G = 0.03124 gr/dscf

***Note:* The results calculated on this page and the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.**

b. Mass emission rate, lb/hr

$$M = (G)(Q_{ds})\left(\frac{60\ min/hr}{7{,}000\ gr/lb}\right)$$

$$M = (0.03124)(32002)\left(\frac{60}{7{,}000}\right)$$

M = 8.569 lb/hr

$$lb/ton = \frac{8.569\ lb/hr}{8.42\ ton/hr\ GLASS}$$

$$= 1.018\ lb/ton$$

$$8.42\ ton/hr \cdot \frac{2000}{2.20462} = 7639\ kg/hr$$

$$8.569 \cdot 453.59 = 3886.8\ gm/hr$$

$$\frac{3886.8\ gm/hr}{7639\ kg/hr} = 0.509\ gm/kg$$

RUN 2 - FURNACE A-NORTH
PM TESTING

$$Q_{SD}\ dscm/hr = Q_{SD}\ dscf/min \cdot 60\frac{min}{hr} \cdot \frac{1}{35.3147}\frac{m^3}{ft^3}$$

$$= 32{,}002 \cdot \frac{60}{35.3147} = 54{,}372$$

$$C_S\ gm/dscm = C_S\ gr/dscf \cdot \frac{1}{15.4324}\frac{gm}{gr} \cdot 35.3147\frac{ft^3}{m^3}$$

$$= 0.0312 \cdot \left(\frac{35.3147}{15.4324}\right)$$

$$= 0.0714$$

PRODUCTION = 7,639 kg/hr

FOR $E\ (g/kg) = \frac{(C_S Q_{SD} - 227\ g/hr)}{P}$

$$= \frac{(0.0714 \cdot 54372 - 227)}{7639}$$

$$= 0.478\ g/kg$$

EXAMPLE CALCULATIONS
STACK GAS VOLUMETRIC FLOW RATE

Project name:	OWENS ILL	**Project number:**	035AS-596331
Computed by:	MWALLACE	**Calculation date:**	8/7/19
Run number:	FURNACE A - SOUTH RUN #2 METALS TESTING		

SAMPLE TRAIN DATA

Meter calibration factor, Y_d	0.9865	Y
Stack area, square feet	10.679	A_s
Pitot Coefficient	0.84	C_p
Barometric pressure, in Hg	29.98	P_{bar}
Meter box volume, acf	153.866	V_m
Impinger liquid volume, g	164.3	V_{lc}
Meter temperature, °R	541.7	T_m = (°F plus 460)
Meter pressure, (delta H) iwg	1.388	ΔH
Velocity head, (delta P) iwg	1.493	ΔP
Static pressure, iwg	-1.10	P_{sg}
Stack temperature, °R	814.9	T_s = (°F plus 460)
Stack O_2, % volume dry	16.80	O_2
Stack CO_2, % volume dry	2.80	CO_2
Stack N_2, % volume dry	80.40	$N_2 = (100 - \% O_2 - \% CO_2)$
Nozzle area, square feet	0.0002070	$A_n = \pi \left(\frac{D_n}{2}\right)^2 \left(\frac{1\,ft}{12\,in}\right)^2$
PM sampling time, minutes	240	Θ
Reference temperature, °R	528	T_{std} (°F plus 460)

***Note:* The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.**

1. **VOLUMETRIC FLOW RATE**

a. **Standard sample gas volume, dscf**

$$V_{m\,std} = (V_m)(Y)\frac{(T_{std})\left[P_{bar} + \left(\frac{\Delta H}{13.6}\right)\right]}{(T_m)(P_{std})}$$

$$V_{m\,std} = (153.866)(0.9865)\frac{(528)\left[29.98 + \left(\frac{1.388}{13.6}\right)\right]}{(541.7)(29.92)}$$

$V_{m\,std}$ = 148.751 dscf

b. **Water vapor volume, scf**

$$V_{w\,std} = (0.04715)(V_{lc})\left(\frac{T_{std}}{528}\right)$$

$$V_{w\,std} = (0.04715)(164.3)\left(\frac{528}{528}\right)$$

$V_{w\,std}$ = 7.747 scf

c. **Moisture content, non-dimensional**

$$B_{ws} = \left(\frac{V_{w\,std}}{V_{m\,std} + V_{w\,std}}\right)$$

$$B_{ws} = \left(\frac{7.747}{148.751 + 7.747}\right)$$

B_{ws} = 0.0495 moisture content (multiply by 100 for % by volume)

d. Stack gas molecular weight, lb/lb mole (dry)

$$MW_{dry} = [0.44(\%CO_2)] + [0.32(\%O_2)] + [0.28(\%N_2)]$$

$$MW_{dry} = [0.44(2.80)] + [0.32(16.80)] + [0.28(80.40)]$$

MW_{dry} = 29.120 lb/lb mole

e. Stack gas molecular weight, lb/lb mole (wet)

$$MW_{wet} = [MW_{dry}(1 - B_{ws})] + [18(B_{ws})]$$

$$MW_{wet} = [29.120(1 - 0.0495)] + [18(0.0495)]$$

MW_{wet} = 28.570 lb/lb mole

f. Absolute stack pressure, in Hg

$$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

$$P_s = 29.98 + \left(\frac{-1.10}{13.6}\right)$$

P_s = 29.899 in. Hg

g. Stack velocity, ft/sec

$$v_s = (85.49)(C_p)(\sqrt{\Delta P})\sqrt{\frac{T_s}{(P_s)(MW_{wet})}}$$

$$v_s = (85.49)(0.84)(\sqrt{1.493})\sqrt{\frac{814.9}{(29.899)(28.570)}}$$

v_s = 85.702 ft/sec

h. Actual stack flow rate, acfm

$$Q = (v_s)(A_s)(60\ min/hr)$$

$$Q = (85.702)(10.679)(60)$$

Q = 54913 acfm

i. Standard stack gas flow rate, wscfm

$$Q_{ws} = (v_s)(A_s)(60\ min/hr)\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)$$

$$Q_{ws} = (85.702)(10.679)(60)\left(\frac{528}{814.9}\right)\left(\frac{29.899}{29.92}\right)$$

Q_{ws} = 35,555 wscfm

j. Standard stack gas flow rate, dscfm

$$Q_{ds} = (v_s)(A_s)(60\ min/hr)(1 - B_{ws})\left(\frac{T_{std}}{T_s}\right)\left(\frac{P_s}{P_{std}}\right)$$

$$Q_{ds} = (85.702)(10.679)(60)(1 - 0.0495)\left(\frac{528}{814.9}\right)\left(\frac{29.899}{29.92}\right)$$

Q_{ds} = 33795 dscfm

k. Percent Isokinetic, %

$$I = \frac{(T_s)(V_{m\,std})(P_{std})(100)}{(T_{std})(v_s)(\theta)(A_n)(P_s)(60)(1 - B_{ws})}$$

$$I = \frac{(814.9)(148.751)(29.92)(100)}{(528)(85.702)(240)(0.0002070)(29.899)(60)(1 - 0.0495)}$$

I = 94.61 %

METALS – RUN #2 FURNACE A-SOUTH

LEAD

FRONT HALF 968 ug
BACK HALF 1.81 ug
TOTAL 969.81 ug

SAMPLE VOLUME 148.760

CONVERT TO dscm

$$148.760\ ft^3 \cdot \frac{1}{35.31} \frac{m^3}{ft^3}$$

$$= 4.2130\ m^3$$

$$ug/m^3 = \frac{969.81\ ug}{4.2130\ m^3} = 230.19\ ug/m^3$$

FLOW RATE 33797 dscf/min
2027820 dscf/hr

$$\left(\frac{ug}{m^3}\right)\left(\frac{1\ gm}{10^6\ ug}\right)\left(\frac{1\ lb}{454\ gm}\right)\left(\frac{1\ m^3}{35.31\ ft^3}\right) = \frac{lb}{ft^3}$$

$$230.19\ ug/m^3 \cdot \frac{1}{10^6} \cdot \frac{1}{454} \cdot \frac{1}{35.31} = 1.4359 \times 10^{-8}\ lb/ft^3$$

$$1.4359 \times 10^{-8} \left(\frac{lb}{ft^3}\right) \cdot 2027820\ (dscf/hr)$$

$$= 0.0291\ (lb/hr) = 2.91 \times 10^{-2}\ (lb/hr)$$

8.42 TONS/hr GLASS

$$\frac{2.91 \times 10^{-2}\ lb/hr}{8.42\ ton/hr} = 3.46 \times 10^{-3}\ lb/ton$$

CARB 425 TESTING
FURNACE "D", RUN 2

$(Cr^{+6}) = 0.1742\ ug$

$Vm_{STD} = 2.117\ dscm$

$$Cr^{+6} = \frac{0.1742\ ug}{2.117\ dscm}$$

$$= 0.0823\ ug/dscm$$

$$\frac{0.0823\ ug}{m3} \cdot \frac{1}{10^6} \cdot \frac{1}{454} \cdot \frac{1}{35.31} \cdot 5792\left(\frac{dscf}{min}\right) \cdot 60$$

$Cr^{+6} = 1.784 \times 10^{-6}\ lb/hr$

$$\frac{1.784 \times 10^{-6}\ lb/hr}{7.40\ TON/hr} = 2.41 \times 10^{-7}\ lb/TON$$

$1.784 \times 10^{-6}\ lb/hr \cdot 453.59\ gm/lb = 8.092 \times 10^{-4}\ gm/hr$

$$\frac{8.092 \times 10^{-4}\ gm/hr}{6717\ kg/hr} = 1.205 \times 10^{-7}\ gm/kg$$

FORMALDHYDE

RUN#2 FURNACE "D"

$Q_{SD} = 5823$ dscf/min

$Vm_{STD} = 36.970$ dscf

FORMALDEHYDE < 16.6 ug

$$V_{mSTD} = 36.970 \text{ dscf} \cdot \frac{1\ m^3}{35.31\ ft^3}$$

$$= 1.047 \text{ dscm}$$

$$< \frac{16.6\ ug}{1.047 \text{ dscm}} = 15.855\ ug/m^3$$

$$15.855\left(\frac{ug}{m^3}\right)\frac{1}{10^6}\frac{1}{454}\cdot\frac{1}{35.31},\ 5823\left(\frac{dscf}{min}\right)\cdot 60$$

$$= < 0.000346\ lb/hr$$

$$ppmv = \frac{15.855\ ug/m^3 \cdot 24.055}{1000 \cdot 30.03} = 0.0127\ ppmv$$

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name: OWEN ILL **Project number:** 03SAS-596331

Computed by: MWALLACE **Calculation date:** 7/9/19

Run number: RUN 2 FURNACE "D" **Gaseous species:** NOx

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	628.5	C ppmvd
Flue gas moisture content, non-dimensional	0.1544	B_{ws}
Dry stack gas flow rate at standard conditions, dscfm	5749	Q_{ds}
Stack O_2, % volume dry	7.06	O_2
Stack CO_2, % volume dry	9.73	CO_2
Molecular weight of gaseous species, lb/lb mole	46.01	MW_s where,

MW_s = 28.01 for CO; 46.01 for NO_X as NO_2; 64.06 for SO_X as SO_2; 17.03 for NH_3; 12.01 for carbon, C; 44.10 for Propane (C_3H_8)

Specific molar volume of an ideal gas at standard conditions, ft³/lb mole — 385.3 — SV where,

SV = 379.5 ft^3/lb *mole for* T_{ref} at 520 °R (60 °F)

SV = 385.3 ft^3/lb *mole for* T_{ref} at 528 °R (68 °F)

SV = 386.8 ft^3/lb *mole for* T_{ref} at530 °R (70 °F)

$$SV = (379.5)\left[\frac{((T_{ref}\ ^\circ R))}{520}\right]$$ at different reference temperatures

Note: The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.

NOx

1. **GASEOUS EMISSIONS**

a. **Mass emissions, lb/hr**

$$M = (C)(10^{-6})\left(\frac{MW_s}{SV}\right)(Q_{ds})(60\ min/hr)$$

$$M = (628.5)(10^{-6})\left(\frac{46.01}{385.3}\right)(5749)(60)$$

M = 25.89 lb/hr

$$\frac{25.89\ \text{lb/hr}}{7.40\ \text{ton/hr}} = 3.50\ \text{lb/ton}$$

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name:	OWEN ILL.	**Project number:**	035AS-596331
Computed by:	MWALLACE	**Calculation date:**	7/9/19
Run number:	RUN 2 FURNACE "D"	**Gaseous species:**	CO

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	<0.549	C @2% SPAN
Flue gas moisture content, non-dimensional	0.1544	B_{ws}
Dry stack gas flow rate at standard conditions, dscfm	5749	Q_{ds}
Stack O_2, % volume dry	7.06	O_2
Stack CO_2, % volume dry	9.73	CO_2
Molecular weight of gaseous species, lb/lb mole	28.01	MW_s where,

MW_s = 28.01 for CO; 46.01 for NO_X as NO_2; 64.06 for SO_X as SO_2; 17.03 for NH_3; 12.01 for carbon, C; 44.10 for Propane (C_3H_8)

Specific molar volume of an ideal gas at standard conditions, ft^3/lb mole — 385.3 — SV where,

SV = 379.5 ft^3/lb *mole for* T_{ref} at 520 °R (60 °F)

SV = 385.3 ft^3/lb *mole for* T_{ref} at 528 °R (68 °F)

SV = 386.8 ft^3/lb *mole for* T_{ref} at530 °R (70 °F)

$$SV = (379.5)\left[\frac{((T_{ref}\ ^{\circ}R))}{520}\right]$$ at different reference temperatures

Note: ***The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.***

2. GASEOUS EMISSIONS

a. Mass emissions, lb/hr

$$M = (C)(10^{-6})\left(\frac{MW_s}{SV}\right)(Q_{ds})(60\ min/hr)$$

$$M = (1{,}134)(10^{-6})\left(\frac{28.01}{385.3}\right)(5749)(60)$$

M = <0.0284 lb/hr

$$\frac{0.0284\ lb/hr}{7.40\ tons/hr} = <0.0038$$

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name: OWENS ILL. **Project number:** 035AS-596331

Computed by: MWALLACE **Calculation date:** 7/9/19

Run number: RUN 2 FURNACE "D" **Gaseous species:** SO_2

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	373.8	C
Flue gas moisture content, non-dimensional	0.1544	B_{ws}
Dry stack gas flow rate at standard conditions, dscfm	5749	Q_{ds}
Stack O_2, % volume dry	7.06	O_2
Stack CO_2, % volume dry	9.73	CO_2
Molecular weight of gaseous species, lb/lb mole	64.06	MW_s where,

MW_s = 28.01 for CO; 17.03 for NH_3; 46.01 for NO_X as NO_2; 12.01 for carbon, C; 64.06 for SO_X as SO_2; 44.10 for Propane (C_3H_8)

Specific molar volume of an ideal gas at standard conditions, ft^3/lb mole — 385.3 — SV where,

SV = 379.5 ft^3/lb mole for T_{ref} at 520 °R (60 °F)

SV = 385.3 ft^3/lb mole for T_{ref} at 528 °R (68 °F)

SV = 386.8 ft^3/lb mole for T_{ref} at530 °R (70 °F)

$$SV = (379.5)\left[\frac{((T_{ref}\ °R))}{520}\right]$$ at different reference temperatures

***Note:* The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.**

SO_2

1. Gaseous Emissions

a. Mass emissions, lb/hr

$$M = (C)\,(10^{-6})\left(\frac{MW_s}{SV}\right)(Q_{ds})(60\ min/hr)$$

$$M = (373.8)\,(10^{-6})\left(\frac{64.06}{385.3}\right)(5749)(60)$$

M = 21.437 lb/hr

$$\frac{21.437\ \text{lb/hr}}{7.40\ \text{ton/hr}} = 2.897\ \text{lb/ton}$$

EXAMPLE CALCULATIONS
GASEOUS EMISSIONS

Project name: OWEN ILL.
Project number: 035AS-596331
Computed by: MWALLACE
Calculation date: 7/9/19
Run number: RUN 2 FURNACE "D"
Gaseous species: THC

EMISSIONS DATA

Reference temperature, °R	528	T_{ref} = (°F plus 460)
Concentration of gaseous species, ppmvd	1,398	C , WET (PROPANE)
Flue gas moisture content, non-dimensional	0.1544	B_{ws}
Dry stack gas flow rate at standard conditions, dscfm	5749	Q_{ds}
Stack O_2, % volume dry	7.06	O_2
Stack CO_2, % volume dry	9.73	CO_2
Molecular weight of gaseous species, lb/lb mole	44.10	MW_s where,

MW_s = 28.01 for CO; 46.01 for NO_X as NO_2; 64.06 for SO_X as SO_2; 17.03 for NH_3; 12.01 for carbon, C; 44.10 for Propane (C_3H_8)

Specific molar volume of an ideal gas at standard conditions, ft^3/lb mole: 385.3 — *SV* where,

SV = 379.5 ft^3/lb mole for T_{ref} at 520 °R (60 °F)
SV = 385.3 ft^3/lb mole for T_{ref} at 528 °R (68 °F)
SV = 386.8 ft^3/lb mole for T_{ref} at530 °R (70 °F)

$$SV = (379.5)\left[\frac{((T_{ref}\ ^\circ R))}{520}\right]$$ at different reference temperatures

***Note:* The results calculated in the pages that follow may differ slightly from the results presented in the final report. This difference can be attributed to "significant digit round-off errors" common when comparing computer spreadsheets results with those derived from using a calculator.**

THC

1. Gaseous Emissions

a. Mass emissions, lb/hr

$$\frac{1,398}{(1-0.1544)} = 1,653 \text{ ppmvd}$$

$$M = (C)(10^{-6})\left(\frac{MW_s}{SV}\right)(Q_{ds})(60\ min/hr)$$

$$M = (1,653)(10^{-6})\left(\frac{44.10}{385.3}\right)(5749)(60)$$

M = 0.0652 lb/hr

$$\frac{0.0652 \text{ lb/hr}}{7.40 \text{ ton/hr}} = 0.00881 \text{ lb/ton}$$

Appendix A.7
General Emissions Calculations

EMISSION CALCULATIONS

1. Volumetric Flow and Isokinetics

   a. Standard sample gas volume, dscf

$$V_{m\,std} = (V_m)(Y)\frac{(T_{std} + 460)\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{(T_m + 460)(P_{std})}$$

   b. Water vapor volume, scf

$$V_{w\,std} = (0.04715)(V_{lc})\left(\frac{T_{std} + 460}{528}\right)$$

   c. Moisture content, non-dimensional

$$B_{ws} = \frac{V_{w\,std}}{(V_{m\,std} + V_{w\,std})}$$

   d. Stack gas molecular weight, lb/lb mole (dry)

$$MW_{dry} = [0.44(\%CO_2)] + [0.32(\%O_2)] + [0.28(\%N_2)]$$

   e. Stack gas molecular weight, lb/lb mole (wet)

$$MW_{wet} = \left[MW_{dry}(1 - B_{ws})\right] + [18(B_{ws})]$$

   f. Absolute stack pressure, in Hg

$$P_s = P_{bar} + \left(\frac{P_{sg}}{13.6}\right)$$

   g. Stack velocity, ft/sec

$$v_s = (85.49)\left(C_p\right)\left(\sqrt{\Delta P}\right)\sqrt{\frac{T_s}{(P_s)(MW_{wet})}}$$

   h. Actual stack flow rate, acfm

$$Q = (v_s)(A_s)(60\,min/hr)$$

   i. Standard stack gas flow rate, wscfm

$$Q_{ws} = (v_s)(A_s)(60\,min/hr)\left(\frac{T_{std} + 460}{T_s + 460}\right)\left(\frac{P_s}{P_{std}}\right)$$

   j. Standard stack gas flow rate, dscfm

$$Q_{ds} = (v_s)(A_s)(60\,min/hr)(1 - B_{ws})\left(\frac{T_{std} + 460}{T_s + 460}\right)\left(\frac{P_s}{P_{std}}\right)$$

   k. Percent isokinetic

$$I = \frac{(T_s)(V_{m\,std})(P_{std})(100)}{(T_{std} + 460)(v_s)(\theta)(A_n)(P_s)(60)(1 - B_{ws})}$$

2. Gaseous Emissions

a. Concentration, ppm volume wet (i.e. to calculate wet ppm from dry ppm)

$$C_w = (C)(1 - B_{ws})$$

b. Concentration, ppm @ 3% O_2 dry

$$C_3 = (C)\left[\frac{(20.9 - 3.0)}{(20.9 - \%\ O_2)}\right]$$

c. Concentration, ppm @ 12% CO_2 dry

$$C_{12} = (C)\left(\frac{12.0}{\%\ CO_2}\right)$$

d. Concentration, ppm volume dry (i.e. to calculate dry ppm from wet ppm)

$$C = \left[\frac{C_w}{(1 - B_{ws})}\right]$$

e. Mass emission rate, lb/hr

$$M = (C)(CF)(Q_{ds})(60\ min/hr)$$

where,

CF = conversion factor from ppm to lb/scf:

$$CF_{NOx} = 1.194 \times 10^{-7}\left(\frac{lb/_{scf}}{ppm}\right)$$

$$CF_{SO2} = 1.660 \times 10^{-7}\left(\frac{lb/_{scf}}{ppm}\right)$$

$CF_X = CF_{NOX}\left(\frac{MW_X}{MW_{NOX}}\right)$ for other compounds (x)

f. Emission rate, lb/MMBtu

$$E = (C)(CF)(F_d)\left(\frac{20.9}{20.9 - \%\ O_2}\right)$$

g. Mass emission rate, grams/bhp-hr

$$M_j = (M)\left(\frac{453.59\ g/lb}{J}\right)$$

3. Particulate Emissions

a. Grain loading, gr/dscf

$$G = (0.0154)\left(\frac{G_m}{V_{m\,std}}\right)$$

b. Grain loading corrected to 12% CO_2, gr/dscf @ 12% CO_2

$$G_{12} = (G)\left(\frac{12.0}{\%\,CO_2}\right)$$

c. Mass emission rate, lb/hr

$$M = (G)(Q_{ds})\left(\frac{60\ min/hr}{7{,}000\ gr/lb}\right)$$

d. Emission rate, lb/MMBtu

$$E = (G)\left(\frac{1\ lb}{7{,}000\ gr}\right)(F_d)\left(\frac{20.9}{20.9 - \%\,O_2}\right)$$

4. Fuel Factor “F”

a. Choice #1 – use the values for F_d provided in Method 19, Table 19-1
Choice #2 – if you have fuel ultimate and proximate analysis, calculate F_d (need fuel weight %CHONS, HHV)
Stoichiometric fuel factor at 68 °F, dscf/MMBtu at 0% O_2:

$$F_d = \frac{(10^6)[3.64(\%\,H) + 1.53(\%\,C) + 0.14(\%\,N) + 0.57(\%\,S) - 0.46(\%\,O)]}{HHV, Btu/lb}$$

b. Fuel factor at 60 °F (use if all your volumes and flows are at 60 °F)

$$F_{d\,60} = F_d\left(\frac{520°R}{528°R}\right)$$

5. Miscellaneous Equations

a. Standard stack gas flow rate, calculated from fuel flow and F factor, dscfm

Note: Q_f and HHV need to be in units of either lb/hr and Btu/lb, or scf/hr and Btu/scf. *Do not mix units!*

(calculation based on stack $\%O_2$)

$$Q_{ds} = (Q_f)(HHV)(10^{-6})(F_d)\left(\frac{20.9}{20.9 - \%\,O_2}\right)/(60\,min/hr)$$

or (calculation based on stack $\%CO_2$ – see EPA Method 19 for values of F_c)

$$Q_{ds} = (Q_f)(HHV)(10^{-6})(F_c)\left(\frac{100}{\%\,CO_2}\right)/(60\,min/hr)$$

b. Destruction efficiency of emission control device, %

$EFF = \left(\frac{C_{in}-C_{out}}{C_{in}}\right)(100\%)$ based on concentrations

or

$EFF = \left(\frac{M_{in}-M_{out}}{M_{in}}\right)(100\%)$ based on mass emission rates

c. Cylinder gas audit, % accuracy

$$A_c = \left(\frac{C_m - C_a}{C_a}\right)(100\%)$$

Nomenclature:

A_c	=	accuracy of CEMS during cylinder gas audit (CGA), % difference
A_n	=	nozzle area, in^2 (πr^2), where π = 3.1416 and r = radius (½ diameter) in inches
A_s	=	stack area, ft^2 (πr^2), where π = 3.1416 and r = radius (½ diameter) in feet
B_{ws}	=	flue gas moisture content (multiply by 100 for % by volume)
C	=	concentration of gaseous species, ppm volume dry
C_a	=	concentration of audit gas, ppm (for CGA, equation 5c)
C_m	=	concentration measured by CEMS, ppm (for CGA, equation 5c)
C_p	=	calibration factor for pitot tube, dimensionless
C_w	=	concentration of gaseous species, ppm volume wet
C_3	=	corrected concentration of gaseous species, ppm @ 3% O_2 dry
C_{12}	=	corrected concentration of gaseous species, ppm @ 12% CO_2 dry
E	=	mass emission rate, lb/MMBtu
EFF	=	destruction or removal efficiency of emission control device, % efficiency
F_c	=	stoichiometric "F" factor of fuel based on CO_2, dscf/MMBtu @ 100% CO_2
F_d	=	stoichiometric "F" factor of fuel based on O_2, dscf/MMBtu @ 0% O_2
G	=	particulate matter grain loading, grains/dscf
G_{12}	=	corrected particulate matter grain loading, grains/dscf @ 12% CO_2
G_m	=	mass of collected particulate matter, mg
HHV	=	higher heating value, Btu/cubic foot
I	=	% isokinetic sampling rate, %
J	=	brake horsepower, bhp
M_j	=	mass emission rate of measured species (s), g/hp-hr
M	=	mass emission rate, lb/hr
MW_{dry}	=	molecular weight of stack gas, dry basis
MW_{wet}	=	molecular weight of stack gas, wet basis
MW_s	=	molecular weight of gaseous species (s), lb/lb mole:

CO:	28.01	(can use 28)	NO_x as NO_2:	46.01	(can use 46)
SO_x as SO_2:	64.06	(can use 64)	Hydrocarbons as C:	12.01	(can use 12)
Hydrocarbons as CH_4:	16.04	(can use 16)	Hydrocarbons as C_3H_8:	44.10	(can use 44)
NH_3:	17.03	(can use 17)			

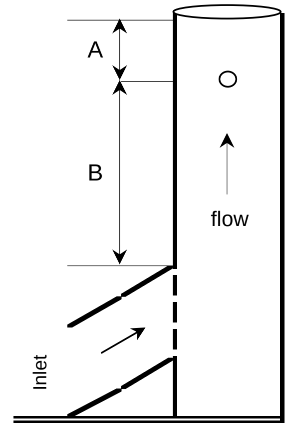
N_2	=	nitrogen content of stack gas, % volume dry
P_{bar}	=	barometric pressure, in. Hg
P_s	=	stack absolute pressure, in. Hg
P_{sg}	=	stack static pressure, inches of water, gauge (iwg)
Q	=	wet stack gas flow rate at actual conditions, acfm
Q_f	=	fuel flow rate, scfh or lb/hr (be careful of units)
Q_{ds}	=	dry stack gas flow rate at standard conditions, dscfm
Q_{ws}	=	wet stack gas flow rate at standard conditions, wscfm
SV	=	specific molar volume of an ideal gas at standard conditions, ft^3/lb mole
T_m	=	meter temperature, °R
T_{std}	=	reference temperature, °R
T_s	=	stack gas temperature, °R
v_s	=	stack gas velocity, ft/sec
V_{lc}	=	volume of liquid collected in impingers, ml
V_m	=	dry meter volume uncorrected, acf
$V_{m\ std}$	=	dry meter volume corrected to standard conditions, dscf
$V_{w\ std}$	=	volume of water vapor at standard conditions, scf
Y	=	meter calibration coefficient, dimensionless
ΔH	=	average pressure differential across meter, inches water
ΔP	=	average velocity head of stack gas, inches water
Θ	=	sampling time, minutes

APPENDIX B
FIELD AND COMPUTER-GENERATED DATA

Appendix B.1
Sampling Locations

OWENS ILLINOIS - FURNACE "A" NORTH
TRAVERSE POINT LAYOUT (PARTICULATE)
<u>CIRCULAR STACKS OVER 24 INCHES</u>

	PORT-A		PORT-B	
Stack diameter:	**44.4**	***inches***		
Upstream diameter (A):	**180.0**	***inches***		
Downstream diameter (B):	**108.0**	***inches***		
Port length:	**4.20**	***inches***	**4.40**	***inches***
Number of ports being used:	**2**	***see note***		
Equivalent upstream diameter (A):	**4.054**	***Pass***		
Equivalent downstream diameter (B):	**2.432**	***Pass***		
All points at least 1.0" from stack wall:	**0.932**	***Adjust to 1 in.***		
Total points:	**24**			
Points per port:	**12**			

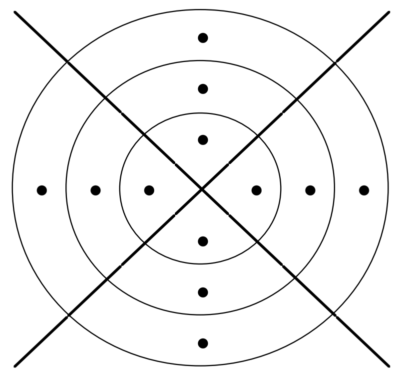


Typical vertical exhaust stack

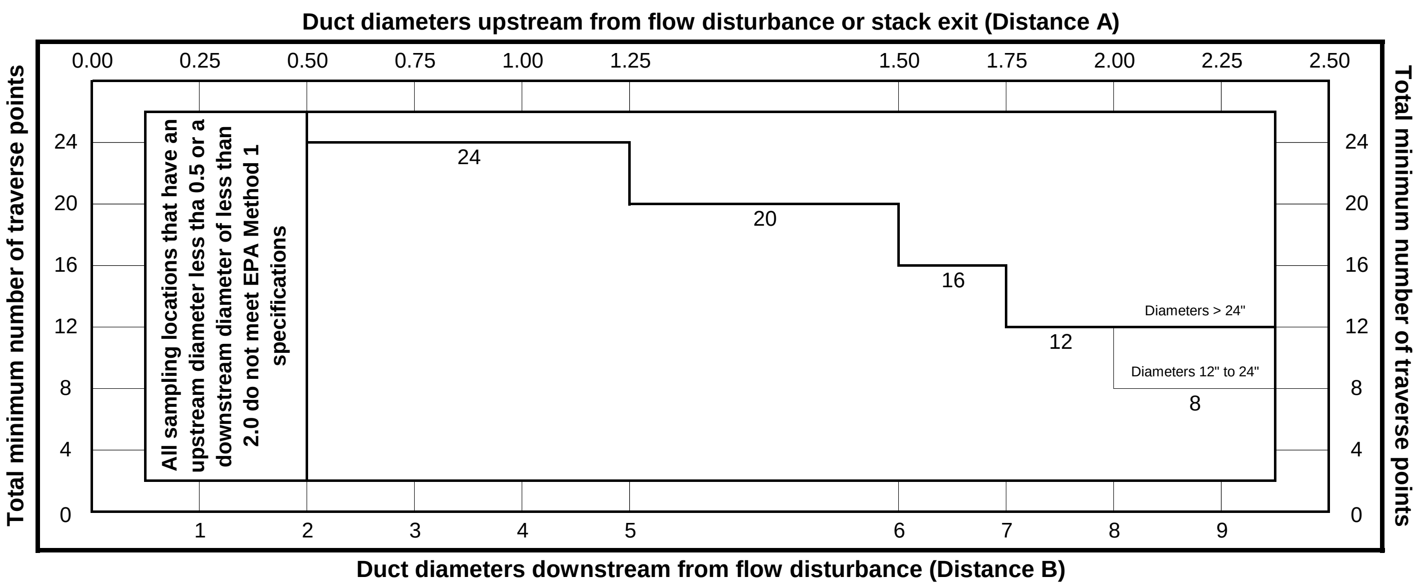
Point	% Diameter	Inside wall Distance (in)	Outside port Distance (in)	Outside port Distance (in)
1	2.1	1.0	5.2	5.4
2	6.7	3.0	7.2	7.4
3	11.8	5.2	9.4	9.6
4	17.7	7.9	12.1	12.3
5	25.0	11.1	15.3	15.5
6	35.6	15.8	20.0	20.2
7	64.4	28.6	32.8	33.0
8	75.0	33.3	37.5	37.7
9	82.3	36.5	40.7	40.9
10	88.2	39.2	43.4	43.6
11	93.3	41.4	45.6	45.8
12	97.9	43.4	47.6	47.8

Note: No traverse point shall be within 1.0" of the stack walls (see Sections 11.3.1)

DUCT AREA = 10.752 ft^2



Example: Location of 12 points



MONTROSE AIR QUALITY SERVICES

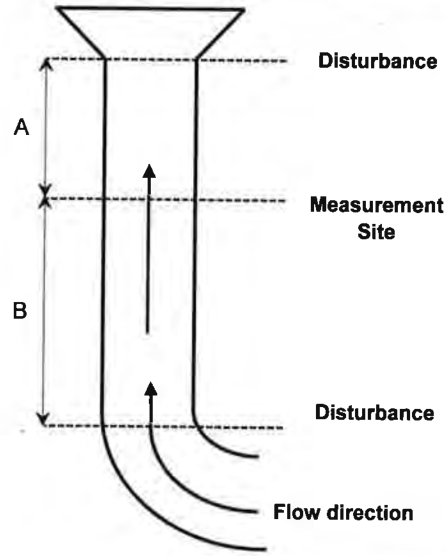
EPA METHOD 1 FIELD DATA

Project Information

Client / Facility	Ottawa IL	Date	5/21/19
Source / Location	Furnace A North	Data taken by	JT

Duct Measurements

Type of duct (circular, rectangular, elliptical)	Circular
Far wall to outside of port distance, in.: M1	48.6/48.8 → 4.2/4.4
Port length, in. (confirm flush with inside wall): M2	
Duct inner diameter, in. (M1 - M2)	44.4
Duct ID using adjacent, 90° port (for elliptical ducts)	—
Upstream distance (A), in.	~180.0"
Downstream distance (B), in.	~108.0"
Number of ports (for circular, must be 90° to each other)	2
Internal width (for rectangular ducts only), in. *	—
Port inner diameter, in.	~3"



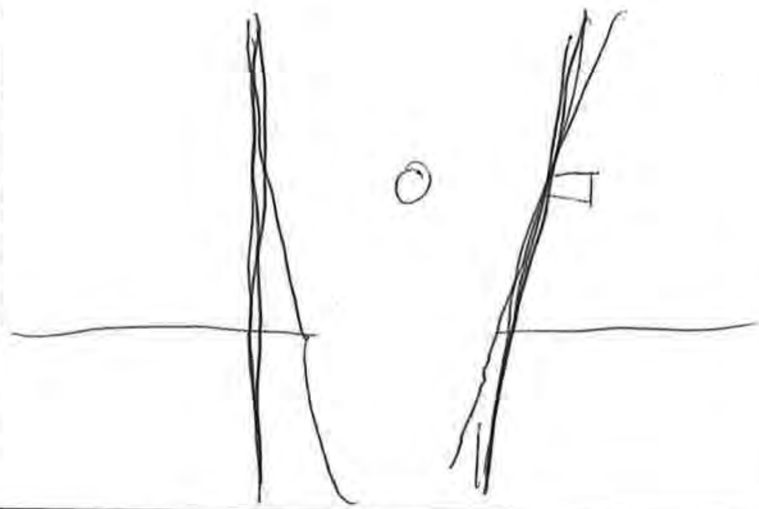
Duct Parameters

Material (steel, fiberglass, PVC)	steel
Type of port (flange, npt nipple, etc.)	NPT Nipple
Orientation (vertical, horizontal, if diagonal specify angle)	vertical
Elevation of ports above ground, ft.	~60'

Cyclonic flow expected?	NO
Pitot ID	65-1
Manometer ID	MB37
Angle finder / protractor ID	740

Traverse point	Inside ~~Outside~~ port distance, in.	Null angle, α
1	1.0	7
2	3.0	8
3	5.2	8
4	7.9	6
5	11.1	5
6	15.8	3
7	28.6	7
8	33.3	9
9	36.5	10
10	39.2	11
11	41.4	11
12	43.4	12
1		5
2		4
3		4
4		3
5		5
6		6
7		6
8		9
9		1
10		3
11		3
12		3
Average of absolute α		

Diagram of duct and sampling location

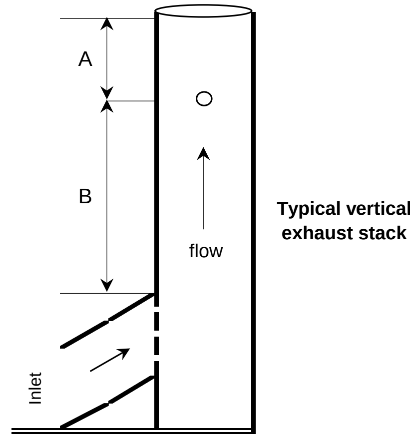


Cross-section sketch showing port locations and numbering
Label the following: port number 1, 2, etc.
north direction or other landmark
flow direction - ⊗ into page ⊙ out of page

*If schematics are unavailable, internal width can be estimated by measuring the portion of the port length not visible on the outside of the duct, which would be an estimate of the insulation thickness. Double this distance and subtract it from the outside width.

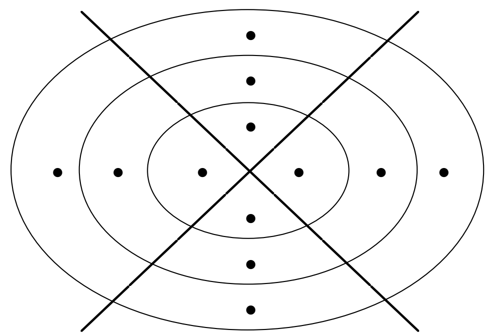
OWENS ILLINOIS - FURNACE "A" SOUTH
TRAVERSE POINT LAYOUT (PARTICULATE)
ELLIPTICAL STACKS OVER 24 INCHES

Longer stack diameter:	**44.5**	***inches***
Shorter stack diameter:	**44.0**	***inches***
Upstream diameter (A):	**180.0**	***inches***
Downstream diameter (B):	**100.0**	***inches***
Port length for longer diameter:	**4.10**	***inches***
Port length for shorter diameter:	**4.20**	***inches***
Number of ports being used:	**2**	***see note***
Equivalent upstream diameter (A):	**4.045**	***Pass***
Equivalent downstream diameter (B):	**2.247**	***Pass***
All points at least 1.0" from stack wall:	**0.924**	***Adjust to 1 in.***
Total points:	**24**	
Points per port:	**12**	



DUCT AREA = 10.679 ft^2

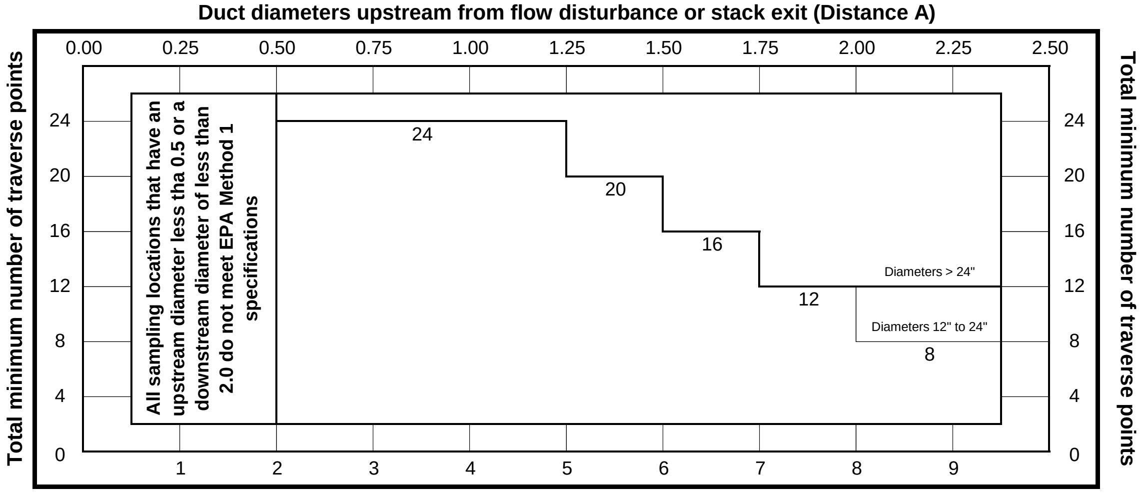
Point	% Diameter	Longer Port Inside wall Distance (in)	Longer Port Outside port Distance (in)	Shorter Port Inside wall Distance (in)	Shorter Port Outside port Distance (in)
1	2.1	1.0	5.1	1.0	5.2
2	6.7	3.0	7.1	2.9	7.1
3	11.8	5.3	9.4	5.2	9.4
4	17.7	7.9	12.0	7.8	12.0
5	25.0	11.1	15.2	11.0	15.2
6	35.6	15.8	19.9	15.7	19.9
7	64.4	28.7	32.8	28.3	32.5
8	75.0	33.4	37.5	33.0	37.2
9	82.3	36.6	40.7	36.2	40.4
10	88.2	39.2	43.3	38.8	43.0
11	93.3	41.5	45.6	41.1	45.3
12	97.9	43.5	47.6	43.0	47.2



Example: Location of 12 points

Note: No traverse point shall be within 1.0" of the stack walls (see Sections 11.3.1). A and B distances based on larger diameter.

Duct diameters upstream from flow disturbance or stack exit (Distance A)



Duct diameters downstream from flow disturbance (Distance B)

MONTROSE AIR QUALITY SERVICES

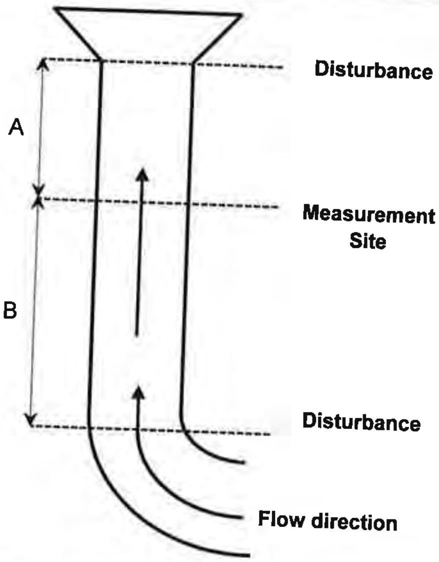
EPA METHOD 1 FIELD DATA

Project Information

Client / Facility	Owens IL Portland OR	Date	5/21/19
Source / Location	Furnace A South	Data taken by	JV

Duct Measurements

Type of duct (circular, rectangular, elliptical)		Circular
Far wall to outside of port distance, in.: M1	48.1	—
Port length, in. (confirm flush with inside wall): M2	48.1	4.1/4.2
Duct inner diameter, in. (M1 - M2)	elliptical	44.0/44.5
Duct ID using adjacent, 90° port (for elliptical ducts)		
Upstream distance (A), in.		~100.0"
Downstream distance (B), in.		~110.0"
Number of ports (for circular, must be 90° to each other)		2
Internal width (for rectangular ducts only), in. *		—
Port inner diameter, in.		~3"



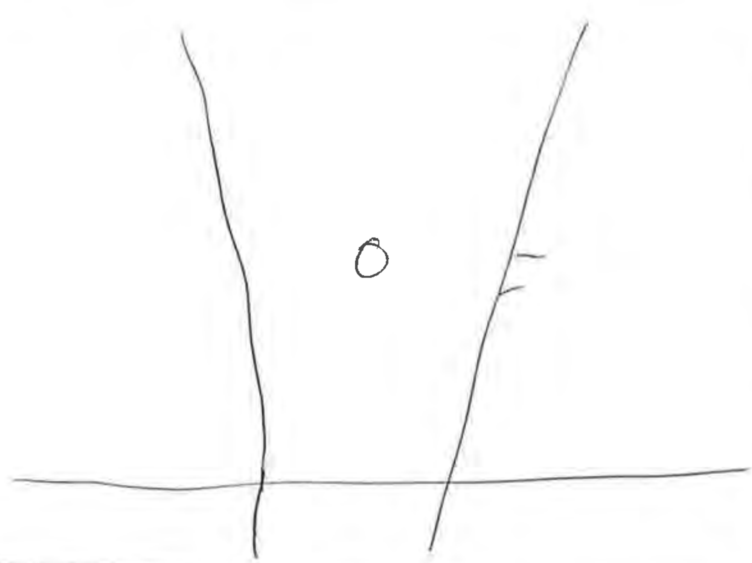
Duct Parameters

Material (steel, fiberglass, PVC)	steel
Type of port (flange, npt nipple, etc.)	npt nipple
Orientation (vertical, horizontal, if diagonal specify angle)	vertical
Elevation of ports above ground, ft.	

Cyclonic flow expected?	NO
Pitot ID	65-1
Manometer ID	MG29
Angle finder / protractor ID	704

Traverse point	Outside port distance, in.	Null angle, α
1	~~2.1~~ 1.0/1.0	6
2	2.9/3.0	4
3	5.2/5.3	4
4	7.5/7.4	0
5	11.0/11.1	2
6	15.7/15.8	0
7	28.3/28.7	1
8	33/33.4	0
9	36.2/36.6	0
10	38.8/39.2	0
11	41.1/41.5	0
12	43/43.5	0
1		6
2		3
3		3
4		3
5		3
6		4
7		1
8		5
9		3
10		3
11		0
12		1
Average of absolute α		

Diagram of duct and sampling location



Cross-section sketch showing port locations and numbering

Label the following: port number 1, 2, etc.

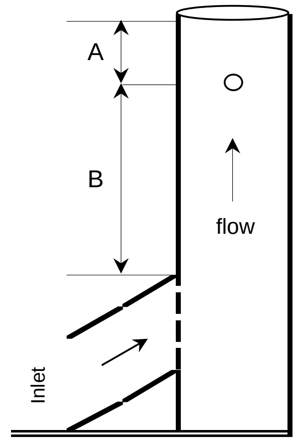
north direction or other landmark

flow direction - ⊗ into page ⊙ out of page

*If schematics are unavailable, internal width can be estimated by measuring the portion of the port length not visible on the outside of the duct, which would be an estimate of the insulation thickness. Double this distance and subtract it from the outside width.

OWENS ILLINOIS / FURNACE "D"
TRAVERSE POINT LAYOUT (PARTICULATE)
CIRCULAR STACKS OVER 24 INCHES

Stack diameter:	**29.0**	***inches***
Upstream diameter (A):	**348.0**	***inches***
Downstream diameter (B):	**18.0**	***inches***
Port length:	**6.50**	***inches***
Number of ports being used:	**2**	***see note***
Equivalent upstream diameter (A):	**12.000**	***Pass***
Equivalent downstream diameter (B):	**0.621**	***Fail***
All points at least 1.0" from stack wall:	**0.609**	***Adjust to 1 in.***
Total points:	**24**	
Points per port:	**12**	

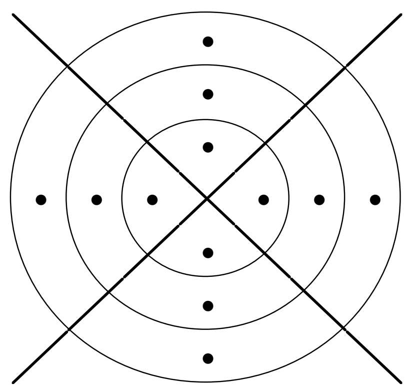


Typical vertical exhaust stack

Point	% Diameter	Inside wall Distance (in)	Outside port Distance (in)
1	2.1	1.0	7.5
2	6.7	1.9	8.4
3	11.8	3.4	9.9
4	17.7	5.1	11.6
5	25.0	7.3	13.8
6	35.6	10.3	16.8
7	64.4	18.7	25.2
8	75.0	21.8	28.3
9	82.3	23.9	30.4
10	88.2	25.6	32.1
11	93.3	27.1	33.6
12	97.9	28.0	34.5

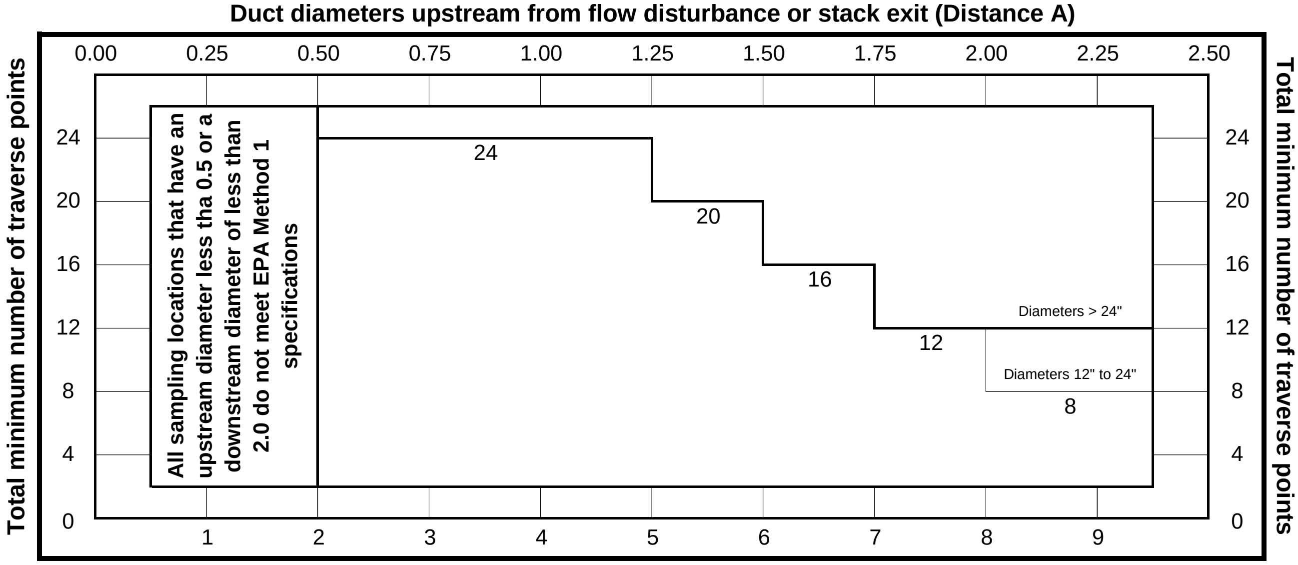
Note: No traverse point shall be within 1.0" of the stack walls (see Sections 11.3.1)

DUCT AREA = 4.587 ft^2



Example: Location of 12 points

Duct diameters upstream from flow disturbance or stack exit (Distance A)



Duct diameters downstream from flow disturbance (Distance B)

MONTROSE AIR QUALITY SERVICES

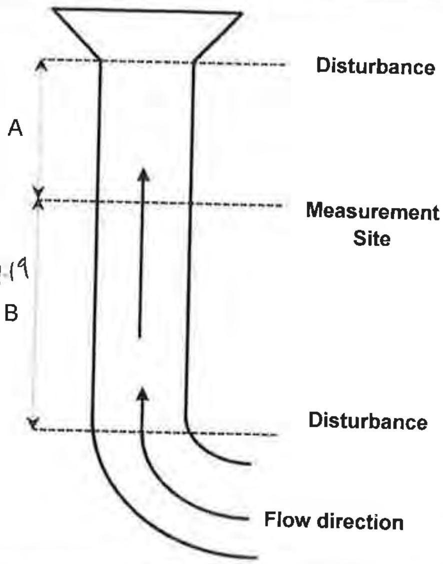
EPA METHOD 1 FIELD DATA

Project Information

Client / Facility	Owens Illinois
Source / Location	Furnace D
Date	5.14.19
Data taken by	A. Krenitz

Duct Measurements

Type of duct (circular, rectangular, elliptical)	Circular
Far wall to outside of port distance, in.: M1	35.5
Port length, in. (confirm flush with inside wall): M2	6.5
Duct inner diameter, in. (M1 - M2)	29
Duct ID using adjacent, 90° port (for elliptical ducts)	NA
Upstream distance (A), in.	348"
Downstream distance (B), in.	18 ~~60"~~ AK
Number of ports (for circular, must be 90° to each other)	2 ~~Circular~~ AK 5-14-19
Internal width (for rectangular ducts only), in. *	Na
Port inner diameter, in.	6"



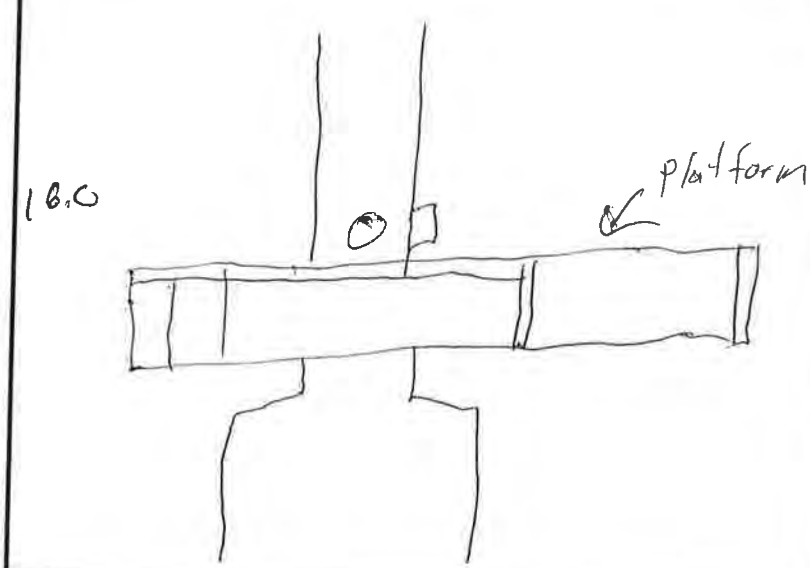
Duct Parameters

Material (steel, fiberglass, PVC)	Steel
Type of port (flange, npt nipple, etc.)	Flang
Orientation (vertical, horizontal, if diagonal specify angle)	Vertical
Elevation of ports above ground, ft.	roof access

Cyclonic flow expected?	NO
Pitot ID	3-9
Manometer ID	MB29
Angle finder / protractor ID	240

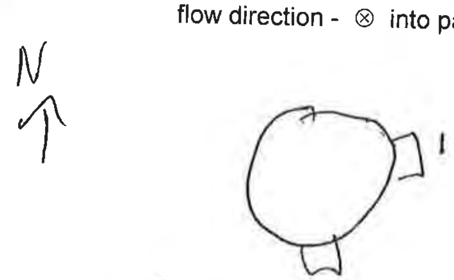
Traverse point	Outside port distance, in.	Null angle, α
1-1	7.5	~~32.6~~ AK
-2	8.4	6.3
-3	9.9	3.4
-4	11.6	3.1
-5	13.8	10.1
-6	16.8	12.0
-7	24.9	11.0
-8	28.3	15.6
-9	30.4	15.3
-10	32.1	14.5
-11	33.6	13.9
-12	34.6	12.3
2-1		1.9
-2		2.7
-3		4.2
-4		3.6
-5		5.1
-6		2.0
-7		11.4
-8		5.5
-9		14.5
-10		12.2
-11		7.5
-12		15.8
Average of absolute α		

Diagram of duct and sampling location



Cross-section sketch showing port locations and numbering

Label the following: port number 1, 2, etc.
north direction or other landmark
flow direction - ⊗ into page ⊙ out of page



port 1 = 6 1/4"   port 2 = 6 1/2"

*If schematics are unavailable, internal width can be estimated by measuring the portion of the port length not visible on the outside of the duct, which would be an estimate of the insulation thickness. Double this distance and subtract it from the outside width.

Appendix B.2
Particulate Matter Data Sheets

MONTROSE AIR QUALITY SERVICES

ODEQ Method 5 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information	
Date	5/20/19
Project #	006AS-596331
Customer/Facility	Owens Glass
Unit ID/Sample Location	Furnace A North
Run #	1
Operator	[illegible]

Sampling Conditions	
Static Pressure, in. H_2O	-.94
Barometric Pressure, in. Hg	29.76
Wind Speed / Direction	9/S
Probe / Filter Temp Range, °F	248 ± 25
Ambient Temp, °F	58
Ref. Barometer ID	weatherstation
Precipitation, Y/N, type	N —

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	SP-3		
Probe	SP-3		
Filter Box	466	M	
Filter Exit	—	See run	
Meter outlet	MB33		
Impinger Exit	GN-7		
Other	—		
Ref. Thermometer ID			

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs	
Meterbox ID	MB33
Umbilical ID	—
Nozzle ID	S-908
Pitot / Probe ID	SP-3
Manometer ID	MB33
Sensitivity	.01

Calibration	
Meterbox Y	1.0058
Meterbox ΔH@, in. H_2O	1.7299
Nozzle diameter, Dn, in.	.2132
Pitot coefficient, Cp	.84
Manometer zero and level	✓ yes
K-Factor	1.14

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 4	☐ @ —	☑ @ 3
Pitot (-), pass @ in. H_2O	☑ @ 3	☐ @ —	☑ @ 4
Pitot visual inspection	☑ pass	☐ pass	☑ pass
Nozzle visual inspection	☑ pass	☐ pass	☑ pass
Meter, cfm @ in. Hg	.003 @ 16	— @ —	.001 @ 18
Intermediate leak check volume, ft^3	—	/ —	/ —

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
0	0	1200	289.414	—	—	—	—	—	—	—	—	—	—	—	—
1	230		~~289.57~~ 290.57	.49	.57	.57	407	254	254	225	56		69		2.5
2	500		291.88	.65	.76	.76	423	254	251	254	52		70		2.5
3	730		293.16	.76	.89	.89	430	252	254	252	50		70		3.5
4	1000		294.75	1.0	1.2	1.2	431	257	255	263	49		70		5
5	1230		296.63	1.3	1.53	1.5	430	253	252	268	49		70		6
6	1500		298.63	1.8	2.12	2.1	418	251	252	270	49		70		8
7	1730		301.25	3.0	3.54	3.5	401	253	256	272	51		70		13.5
8	2000		303.70	2.3	2.71	2.7	412	254	257	272	53		70		12
9	2230		306.09	1.9	2.24	2.2	425	253	254	273	54		71		12
10	2500	1231	307.96	1.4	1.65	1.7	429	253	253	273	54		71		9
11	2730	1301	309.49	1.41	1.65	1.7	371	252	258	273	57		71		8
12	3000	1307	311.735	1.1	1.29	1.3	366	256	257	272	47		71		7
1	3230	1309	313.0	.63	.74	.74	438	250	251	270	55		71		3
2	3500		314.52	.95	1.12	1.1	439	256	253	270	51		71		4.5
3	3730		316.15	1.1	1.29	1.3	438	253	259	272	51		71		5
4	4000		317.87	1.2	1.41	1.4	438	254	257	273	51		72		5
5	4230		319.87	1.6	1.88	1.9	432	255	254	273	51		72		5
6	4500		322.23	2.3	2.71	2.7	427	254	253	273	51		72		11
7	4730		324.91	3.5	4.13	4.1	393	256	255	273	52		73		14
8	5000	1330	327.57	2.5	2.95	3.0	403	253	257	274	52		73		14
9	5230	1400	330.07	1.7	2.0	2.0	414	254	253	274	54		73		14
10	5500		331.98	1.0	1.68	1.9	380	254	250	271	51		73		8
11	5730		333.69	1.0	1.18	1.2	380	255	253	264	51		73		8
12	6000	1411	335.209	.87	1.07	1.0	394	252	252	268	51		72		5
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By AB Team Leader JH

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

ODEQ Method 5 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information
Date 5/20/19 Project # 006AS-596331
Customer/Facility Owens Glass
Unit ID/Sample Location Furnace A North
Run # 2 Operator PB

Sampling Conditions
Static Pressure, in. H_2O ~~-.46~~ -.41 Ambient Temp, °F 60
Barometric Pressure, in. Hg 29.76 Ref. Barometer ID weatherstation
Wind Speed / Direction 9/SW Precipitation, (Y)/N, type Rain
Probe / Filter Temp Range, °F 248±25

ALT 011 TC ID:

	TC ID	Ambient °F	Ref. °F
Stack	SP-3		
Probe	SP-3		
Filter Box	460		
Filter Exit	GN7		
Meter outlet	MB33	see run 3	
Impinger Exit	GN7		
Other	—		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID MB33
Umbilical ID —
Nozzle ID S-905
Pitot / Probe ID SP-3
Manometer ID MB32
Sensitivity .01

Calibration
Meterbox Y 1.0058
Meterbox ΔH@, in. H_2O 1.7299
Nozzle diameter, Dn, in. .2132
Pitot coefficient, Cp .84
Manometer zero and level ✓ yes
K-Factor 1.18

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	~~@~~	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 3	~~@~~	✓ @ 4
Pitot visual inspection	✓ pass	~~pass~~	✓ pass
Nozzle visual inspection	✓ pass	~~pass~~	✓ pass
Meter, cfm @ in. Hg	.003 @ 17	~~@~~	.001 @ 7
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
–	–	1507	336.810	–	–	–	–	–	–	–	–		–		–
1	230		338.61	1.3	1.53	1.5	403	258	254	225	56		71		3
2	500		340.25	.98	1.15	1.2	412	253	251	225	54		71		2.5
3	730		342.03	1.3	1.53	1.5	416	253	252	247	56		71		3
4	1000		343.90	1.4	1.65	1.7	429	254	254	253	56		71		3
5	1230		345.94	1.6	1.88	1.9	422	254	259	257	58		71		3
6	1500		348.05	1.8	2.12	2.1	423	253	252	263	58		71		3
7	1730		350.48	2.1	2.83	2.8	393	255	255	268	60		~~71~~ 72		4
8	2000		352.88	2.2	2.59	2.6	400	252	259	270	60		72		4
9	2230		355.0	1.7	2.0	2.0	408	255	252	272	62		72		4
10	2500		356.78	1.2	1.41	1.4	416	253	253	272	63		72		3.5
11	2730	1530	358.56	1.3	1.53	1.5	419	253	258	270	61		73		3
12	3000	1600	360.160	1.0	1.18	1.2	419	254	257	270	61		74		3
1	3230	1602	361.52	.78	.92	.92	414	253	252	256	50		72		1
2	3500	1606	362.85	.72	.84	.84	413	253	254	260	49		72		1
3	3730		364.42	.91	1.07	1.1	419	255	255	263	48		72		1.5
4	4000		366.14	1.2	1.41	1.4	419	254	257	265	48		72		1.5
5	4230		368.07	1.4	1.65	1.7	421	254	256	268	48		72		1.5
6	4500		370.48	2.2	2.59	2.6	420	254	254	270	48		72		3
7	4730		373.21	3.1	3.65	3.7	397	253	255	271	48		72		5
8	5000		375.72	2.4	2.83	2.8	411	254	257	272	48		72		7.5
9	5230		377.71	1.4	1.65	1.7	415	254	255	272	49		72		5
10	5500	1700	379.37	1.1	1.29	1.3	422	254	252	273	50		72		4
11	5730		380.99	1.10	1.18	1.2	405	255	253	275	51		72		4
12	6000	1706	382.601	.98	1.15	1.2	405	254	254	275	51		72		3
Averages															

1

2

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

ODEQ **Method** 5 **Field Datasheet (Isokinetic)**

Project Information

Date 5/20/19 Project # 006AS-596331

Customer/Facility Owens Glass

Unit ID/Sample Location Furnace A North

Run # 3 Operator PB

Sampling Conditions

Static Pressure, in. H_2O -.91 Ambient Temp, °F 60

Barometric Pressure, in. Hg 29.76 Ref. Barometer ID weatherstation

Wind Speed / Direction 5/SW Precipitation, Y (N) type —

Probe / Filter Temp Range, °F

ALT 011	TC ID	Ambient °F	Ref. °F
Stack	SP-3	68	67.5
Probe	SP-3	68	
Filter Box	466	67	
Filter Exit	—		
Meter outlet	MB33	69	
Impinger Exit	GN-7	68	
Other	—		

Ref. Thermometer ID 160535111

Continuity Check ✓ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB33

Umbilical ID —

Nozzle ID S-908

Pitot / Probe ID SP-3

Manometer ID MB33

Sensitivity .01

Calibration

Meterbox Y 1.0058

Meterbox ΔH@, in. H_2O 1.7290

Nozzle diameter, Dn, in. .2182

Pitot coefficient, Cp .84

Manometer zero and level ✓ yes

K-Factor 1.18

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	~~@~~	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 3	~~@~~	✓ @ 4
Pitot visual inspection	✓ pass	~~pass~~	✓ pass
Nozzle visual inspection	✓ pass	~~pass~~	✓ pass
Meter, cfm @ in. Hg	.003 @ 17	~~@~~	.001 @ 11
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
0	—	1900	382.842	—	—	—	—	—	—	—	—	—		—	—
1	730		383.96	.35	.41	.41	405	253	254	225	53		68		1
2	500		384.49	.41	.48	.48	412	253	255	225	53		68		1
3	730		386.34	.85	1.0	1.0	403	253	256	244	53		68		4
4	1000		388.15	1.3	1.57	1.5	408	253	255	248	53		68		6
5	1230		390.21	2.2	2.59	2.6	399	254	256	267	57		65		10
6	1500		392.59	2.6	3.06	3.1	391	253	257	268	58		68		10
7	1730		394.99	2.7	2.59	2.6	404	252	255	270	58		68		10
8	2000		397.18	1.8	2.12	2.1	406	254	254	270	58		68		11
9	2230		399.04	1.3	1.53	1.5	423	253	255	270	57		68		9
10	2500		400.71	1.0	1.18	1.2	415	254	256	270	58		68		8
11	2730	1831	402.33	.93	1.09	1.1	410	254	257	270	58		68		5.5
12	3000	~~1900~~	403.885	.93	1.09	1.1	405	254	254	270	58		68		5.5
1	3230	1900	405.46	1.0	1.18	1.2	384	253	257	257	54		68		5
2	3500		407.01	.98	1.15	1.2	410	254	257	260	54		68		5
3	3730		408.81	1.2	1.41	1.4	410	254	256	262	54		68		5
4	4000		410.51	1.6	1.88	1.9	406	254	252	267	50		68		5
5	4230		412.68	1.8	2.12	2.1	412	255	250	270	50		68		7
6	4500		414.87	2.0	2.36	2.4	405	254	256	270	50		68		8
7	4730		417.21	2.2	2.59	2.6	348	254	252	270	50		68		9.5
8	5000		419.01	3.3	3.89	3.9	389	254	253	270	50		68		10.5
9	5230		422.41	2.1	2.47	2.5	394	254	257	270	50		68		13.5
10	5500		424.14	1.2	1.41	1.4	406	253	253	270	51		68		10.5
11	5730		425.81	1.0	1.18	1.2	408	254	257	270	51		68		5
12	6000	1930	427.365	.91	1.07	1.1	410	253	255	270	51		68		5
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JA

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MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet

ODEQ 5

Project Information		**Equipment Identification**	
Date	5/17/19	Ref. Thermometer	—
Project #	006AS-596331	Hygrometer	—
Customer / Facility	Owens IL	Field Balance	710
Unit ID / Sample Location	Furnace A North	Check Weights	10641
Run #	1-3	Calipers	39744
Operator	JH		

Balance Audit (Field balance must be within 0.5g of check weight mass)				**Ambient Conditions (Mobile Lab)**	
Date	5/20/19			Relative humidity, %	—
Standard mass, g	500.0			Temperature, °F	—
Field balance mass, g	499.9			Mobile lab #	TU3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout		698.8								
Impinger 1	DI JH	~~676.5~~			734.6	759.2		693.4	711.1	
Impinger 2	DI	677.1			665.4	683.4		676.6	691.1	
Impinger 3	MT	632.9			613.8	614.2		633.6	634.6	
Impinger 4	silica	786.6			843.2	854.4		805.0	814.3	
Impinger 5										
Impinger 6		710.6	745.3							
Impinger 7		679.7	687.6							
Impinger 8	635.3	~~774.2~~	635.8							
Silica Gel		796.1	805.8							
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

414 Nozzle 1 diameters .2490 D1 .2490 D2 .2495 D3 .2492 Average

415 Nozzle 2 diameters .2410 D1 .2405 D2 .2410 D3 .2408 Average

420 Nozzle 3 diameters .2505 D1 .2505 D2 .2515 D3 .2508 Average

Nozzle Material ☐ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☐ quartz ☒ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other

Filter Number: Run 1: U0086 Run 2: U0089 Run 3: U0090 Run

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other N/A

Reagent Information Type	Lot Number	**Sample Observations**
Type1 H2O	C18A02020-00DIWTR	
Acetone	15060260	

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by:____________ Team Leader:____________ 001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

ODEQ **Method** 5 **Field Datasheet (Isokinetic)**

Page 1 of 1

Project Information		Sampling Conditions		ALT 011	TC ID:	Ambient °F	Ref. °F
Date 5-29-19	Project # 006AS-596331	Static Pressure, in. H_2O -0.93	Ambient Temp, °F 56	Stack	117-TP-4		
Customer/Facility Owens Illinois / Portland OR		Barometric Pressure, in. Hg 29.76	Ref. Barometer ID PDX Airport	Probe	117-TP-4		
Unit ID/Sample Location Furnace 2 A - South stack		Wind Speed / Direction 9 / S	Precipitation, Y / N, type N	Filter Box	HB#331		
Run # PM-Run1	Operator TM	Probe / Filter Temp Range, °F 248 ± 25		Filter Exit	TC		

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MB30	Meterbox Y	0.9865	Pitot (+), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 3
Umbilical ID	—	Meterbox ΔH@, in. H_2O	1.8243	Pitot (-), pass @ in. H_2O	☑ @ 5	☐ @	☑ @ 4
Nozzle ID	S-9IL	Nozzle diameter, Dn, in.	0.2117	Pitot visual inspection	☑ pass	☐ pass	☐ pass
Pitot / Probe ID	117 NP-4	Pitot coefficient, Cp	0.84	Nozzle visual inspection	☑ pass	☐ pass	☐ pass
Manometer ID	MB30	Manometer zero and level ✓ yes		Meter, cfm @ in. Hg	0.010 @ 14	@	0.004 @ 18
Sensitivity	0.01	K-Factor		Intermediate leak check volume, ft^3		/	/

Meter outlet	
Impinger Exit	6S-2
Other	
Ref. Thermometer ID	
Continuity Check ☐ Continuity w/ Proper Polarity	
Notes:	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
–	0	11:46	312.644	–	–	–	–	–	–	–	–	–	–	NA	–
1	2.5		313.71	~~.40~~ .43	~~.77~~ .75	~~.77~~ .75	402	244	260	230	58	66	63		3
2	5		314.98	.62	.75	.79	403	250	260	232	57	67	63		4
3	7.5		316.51	.98	1.18	1.2	401	250	260	235	56	69	64		7
4	10		318.32	1.3 ~~1.8~~	1.57	1.6	394	252	260	238	56	70	64		9
5	12.5		320.47	1.9	2.29	2.3	386	249	260	242	58	73	65		14
6	15	~~12:00~~ 12:32	322.74	2.8	3.53	3.5	364	250	260	262	48	70	66		17
7	17.5			3.4	4.6	4.1	317	246	255	228	48	70	66		17
8	20		327.28	2.8	3.53	3.5	331	252	255	234	49	70	66		17
9	22.5		329.54	2.2	~~3.16~~ 2.71	2.9	340	252	255	245	50	71	66		17
10	25		331.95	1.6	2.02	2.0	360	253	255	248	52	72	66		17
11	27.5		334.03	0.81	1.02	1.0	365	252	255	253	53	72	66		6
12	30	~~12:48~~ 13:51	335.479	.64	.82	.82	335	248	255	251	53	72	66		5
1	32.5		337.05	.92	1.14	1.1	372	247	247	237	54	72	66		6
2	35		338.44	.82	1.02	1.0	381	248	255	249	53	73	66		8
3	37.5		340.10	1.1	1.36	1.4	380	252	255	255	53	74	66		7
4	40	~~13:00~~ 13:31	341.854	1.3	1.61	1.6	374	251	255	273	53	74	66		8
5	42.5		344.14	2.0	2.47	2.4	314	251	251	271	52	74	67		12
6	45		346.39	2.5	3.4	3.4	317	252	255	270	51	74	68		17
7	47.5		348.66	2.4	3.14	3.1	348	252	255	265	51	74	68		17
8	50		350.99	1.9	2.42	2.4	367	252	255	265	51	74	69		12
9	52.5		353.26	.82	1.0	1.0	343	250	255	270	52	74	69		~~14~~ 6
10	55		354.68	.84	1.10	1.1	346	248	255	272	55	74	69		6
11	57.5		356.01	.52	.68	.68	380	251	255	259	56	74	70		4
12	60	13:51	356.786	.25	.34	.34	~~267~~ 315	251	255	248	57	74	70		4
Averages															

Port change

QA/QC Check: Completeness ✗ Legibility ✗ Accuracy ✗ Specifications ✗ Checked By AG Team Leader

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MONTROSE AIR QUALITY SERVICES

ODEQ Method 5 Field Datasheet (Isokinetic)

Project Information	
Date	6-20-18
Project #	006AS-
Customer/Facility	Owens Illinois / Portland
Unit ID/Sample Location	Furnace A / South
Run #	PM-Run 2
Operator	JM

Sampling Conditions			
Static Pressure, in. H_2O	-1.2	Ambient Temp, °F	54
Barometric Pressure, in. Hg	29.76	Ref. Barometer ID	PDX Airport
Wind Speed / Direction		Precipitation, Y / N, type	N
Probe / Filter Temp Range, °F	248±25		

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	117-NP-4		
Probe	117-NP4		
Filter Box	531		
Filter Exit	~~6K-2~~		
Meter outlet	MB30 ~~6K-2~~		
Impinger Exit	6K-2		
Other			

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs	
Meterbox ID	MB30
Umbilical ID	—
Nozzle ID	S-914
Pitot / Probe ID	117-NP4
Manometer ID	MB30
Sensitivity	0.01

Calibration	
Meterbox Y	0.9865
Meterbox ΔH@, in. H_2O	1.8243
Nozzle diameter, Dn, in.	.2117
Pitot coefficient, Cp	.84
Manometer zero and level	☑ yes
K-Factor	

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 4
Pitot (-), pass @ in. H_2O	☑ @ 5	☐ @	☑ @ 8
Pitot visual inspection	☑ pass	☐ pass	☑ pass
Nozzle visual inspection	☑ pass	☐ pass	☑ pass
Meter, cfm @ in. Hg	0.001 @ 17	0.002 @ 15	0.006 @ 13
Intermediate leak check volume, ft^3	386.969	387.064	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
—	0	15:31	366.500	—	—	—	—	—	—	—	—	—	—	Ng	—
1	2.5		368.12	.82	1.11	1.1	315	251	253	238	51	72	70		4
2	5		369.76	1.1	1.45	1.5	331	249	257	242	50	73	70		4
3	7.5		371.62	1.3	1.72	1.7	335	244	255	245	51	75	69	—	4
4	10		372.81	1.7	2.25	2.3	341	251	255	248	51	77	69	—	5
5	12.5		375.92	2.2	2.9	2.9	341	251	257	239	52	78	69		7
6	15		378.96	2.6	3.4	3.4	342	250	259	248	54	79	70		6
7	17.5		381.32	2.3	2.9	2.9	369	249	258	258	55	79	70		8
8	20		383.01	1.1	1.4	1.4	373	249	255	257	56	79	70		7
9	22.5		384.25	.70	.89	.89	~~373~~ 381	251	255	252	56	78	70		3
10	25		385.41	.46	.58	.58	387	250	255	249	56	78	70		2
11	27.5	~~16:19~~	386.28	.37	.50	.50	315	249	257	239	56	78	70		2
12	30	~~16:01~~ 16:30	386.969	.29	.41	.41	289	250	255	240	56	78	70		2
1	32.5		388.50	.45	.64	.64	274	250	269	269	54	70	68		2
2	35		389.72	.59	.77	.77	343	250	265	270	52	72	68		2
3	37.5		390.42	1.0	1.3	1.3	347	250	265	264	51	73	68		4
4	40		393.51	1.6	2.0	2.0	359	250	253	261	53	73	68		5
5	42.5		396.09	2.7	3.5 3.5	3.5	346	249	255	257	54	74	68		9
6	45		398.95	3.4	4.5 ~~4.4~~	4.5	338	251	255	254	56	75	68		11
7	47.5		401.64	2.7	3.5	3.5	353	249	259	252	57	76	68		8
8	50		403.75	1.6	2.0	2.0	374	248	255	249	57	75	68		5
9	52.5		405.35	.98	1.2	1.2	395	248	252	245	58	75	68		2
10	55		406.75	.82	1.0	1.0	414	250	255	242	58	75	68		2
11	57.5		408.10	.73	.89	.89	406	250	255	239	57	75	68		2
12	60	17:00	409.397	.70	.85	.85	407	249	255	237	57	75	68		2
Averages															

QA/QC Check: Completeness A Legibility ✓ Accuracy ✓ Specifications ✓ Checked By AG Team Leader

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Leak check at pause/port change

MONTROSE AIR QUALITY SERVICES

ODEQ Method 5 Field Datasheet (Isokinetic)

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Project Information	
Date	5-20-19
Project #	
Customer/Facility	Owens Illinois / Portland, OR
Unit ID/Sample Location	Furnace A / South stack
Run #	PM-Run 3
Operator	JM

Sampling Conditions			
Static Pressure, in. H_2O	-1.2	Ambient Temp, °F	53
Barometric Pressure, in. Hg	29.76	Ref. Barometer ID	PDX Airport
Wind Speed / Direction	SE 10	Precipitation, Y / N, type	N
Probe / Filter Temp Range, °F	248±25		

Sampling Equipment IDs	
Meterbox ID	MB30
Umbilical ID	—
Nozzle ID	S-914
Pitot / Probe ID	117-NP-4
Manometer ID	MB 30
Sensitivity	0.01

Calibration	
Meterbox Y	0.9865
Meterbox ΔH@, in. H_2O	1.8243
Nozzle diameter, Dn, in.	0.2117
Pitot coefficient, Cp	0.84
Manometer zero and level	☑ yes
K-Factor	

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 5	☐ @	☑ @ 5
Pitot (-), pass @ in. H_2O	☑ @ 5	☐ @	☑ @ 5
Pitot visual inspection	☑ pass	☐ pass	☑ pass
Nozzle visual inspection	☑ pass	☐ pass	☑ pass
Meter, cfm @ in. Hg	0.004 @ 12	@	0.002 @ 13
Intermediate leak check volume, ft^3		/	/

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	117-N-P4	61	61.3
Probe	117-NP-4	61	60.9
Filter Box	531	60	61.1
Filter Exit	TC	60	61.3
Meter outlet	M130	60	60.9
Impinger Exit	GN-2	61	61.1
Other			

Ref. Thermometer ID ST-2

Continuity Check ☑ Continuity w/ Proper Polarity

Notes:

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
–	0	17:31	~~409.9~~ 409.840	–	–	–	–	–	–	–	–	–	–	Lg	–
1	2.5		410.55	.46	.47	.47	267	249	268	266	55	69	67		2
2	5		412.08	.56	.74	.74	331	251	269	266	54	70	67		2
3	7.5		413.70	1.1	1.4	1.4	351	250	270	267	53	70	67		3
4	10		415.66	1.5	1.9	1.9	362	252	271	267	53	71	67		4
5	12.5		—	2.4	3.1	3.1	347	253	265	259	53	71	68		7
6	15		421.91	3.2	4.2	4.2	345	250	260	254	53	72	68		11
7	17.5		423.75	3.1	4.0	4.0	347	253	265	265	53	72	67		10
8	20		425.74	1.5	1.9	1.9	374	253	260	269	53	73	67		4
9	22.5		427.73	1.1	1.4	1.4	387	251	265	270	53	74	67		3
10	25		428.84	.84	1.0	1.0	403	251	265	269	53	74	67		2
11	27.5		430.12	.70	.85	.85	408	252	265	266	53	74	67		2
12	30	18:01 / 18:10	431.356	.63	.77	.77	410	249	265	263	51	73	67		2
1	32.5		433.12	1.1	1.5	1.5	335	252	260	244	46	67	66		3
2	35		435.0	1.1	1.4	1.4	360	249	265	248	46	69	66		3
3	37.5		436.67	1.5	1.9	1.9	366	249	265	249	46	70	65		5
4	40		439.16	2.2	2.8	2.8	359	250	265	253	47	71	65		6
5	42.5		441.91	3.0	3.9	3.9	339	250	267	254	47	71	65		9
6	45		445.02	3.9	5.1	5.1	340	251	265	261	47	71	65		13
7	47.5		447.53	2.7	3.5	3.5	343	250	260	250	48	72	65		8
8	50		449.95	2.1	2.7	2.7	353	250	260	251	48	72	65		8
9	52.5		452.12	2.0	2.5	2.5	360	250	260	245	49	72	65		8
10	55		453.84	1.1	1.4	1.4	375	250	260	237	49	72	65		4
11	57.5		455.26	.85	1.0	1.0	386	251	260	255	49	72	65		2
12	60	19:00	456.669	.81	1.0	1.0	388	250	260	256	49	72	65		2
Averages															

QA/QC Check: Completeness X Legibility X Accuracy ✓ Specifications X Checked By AG Team Leader

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MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet ODEQ5

Project Information 20 JT
Date 5/17/19 Project # 006AS-596331
Customer / Facility Opus TL
Unit ID / Sample Location Furnace A south
Run # 1-3 Operator JH

Equipment Identification
Ref. Thermometer —
Hygrometer —
Field Balance 710
Check Weights 10641
Calipers 39744

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/20/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)
Relative humidity, % —
Temperature, °F —
Mobile lab # TU3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1	DI	708.2			706.3	725.4		719.0	744.5	
Impinger 2	DI	578.9			586.2	599.3		698.3	707.0	
Impinger 3	MT	645.2			646.2	648.1		586.6	584.7	
Impinger 4	silica	758.4			~~768.8~~	~~769~~	*	824.1	839.4	
Impinger 5					637.5	647.0				
Impinger 6		716.2	730.1							
Impinger 7		699.0	713.6							
Impinger 8		593.9	584.9							
Silica Gel		971.6	984.6							
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))
903 Nozzle 1 diameters .2130 D1 .2130 D2 .2135 D3 .2132 Average
914 Nozzle 2 diameters .2100 D1 .2130 D2 .2120 D3 Average
Nozzle 3 diameters D1 D2 D3 Average
Nozzle Material ☒ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other
Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other
Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information
Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other
Filter Number: Run 1: U0085 Run 2: U0084 Run 3: U0089 Run
Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other N/A

Reagent Information

Type	Lot Number
type 1 H_2O CIB	

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by:________________ Team Leader:________________ 001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

ODEQ **Method** 5 **Field Datasheet (Isokinetic)**

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Project Information

Date 5/15/19 Project # 006AS - 596331
Customer/Facility Owens Illinois
Unit ID/Sample Location Furnace D
Run # 1 Operator AG

Sampling Conditions

Static Pressure, in. H_2O See Run 3 Ambient Temp, °F 61
Barometric Pressure, in. Hg 29.67 Ref. Barometer ID —
Wind Speed / Direction 6 mph W Precipitation, Y / N, type N
Probe / Filter Temp Range, °F 248 ± 25

ALT 011 TC ID: See Run 3/4

	Ambient °F	Ref. °F
Stack		
Probe		
Filter Box		
Filter Exit		
Meter outlet		
Impinger Exit		
Other		

Ref. Thermometer ID —
Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB30
Umbilical ID —
Nozzle ID 524
Pitot / Probe ID 118-NP-4
Manometer ID MB30
Sensitivity 0.1

Calibration

Meterbox Y .9865
Meterbox ΔH@, in. H_2O 1.8243
Nozzle diameter, Dn, in. .3256
Pitot coefficient, Cp 0.84
Manometer zero and level ☑ yes
K-Factor 3.96

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 3	☐ @ —	☑ @ 3
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ @ —	☑ @ 3
Pitot visual inspection	☑ pass	☑ pass	☐ pass
Nozzle visual inspection	☑ pass	☑ pass	☐ pass
Meter, cfm @ in. Hg	0 @ 10	— @ —	0 @ 12
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	0932	827.962	.5											
2	2:30		829.83	.48	1.98	1.9	734	252	270		58		62		4
3	5:00		831.73	.50	1.9	1.9	736	253	264		56		62		4
4	7:30	~~0939~~ 1003	833.63	.54	1.98	2.0	741	252	251		55		62		5
5	10:00		835.59	.49	2.14	2.1	745	250	246		60		66		5
6	12:30		837.48	.45	1.9	1.9	701	250	248		61		66		5
7	15:00		839.35	.45	1.78	1.8	705	252	265		58		67		5
8	17:30		841.19	.39	1.78	1.8	709	251	260		55		67		5
9	20:00		843.01	.30	1.54	1.5	712	251	263		53		67		4
10	22:30		844.62	.31	1.18	1.2	676	250	264		55		68		3
11	25:00		846.14	.34	1.22	1.2	670	249	248		56		69		3
12	27:30		847.82	.28	1.34	1.3	707	249	249		59		69		3
	30:00	~~1029~~ 1033	849.279		1.10	1.1	710	251	265		60		70		3
1	32:30		851.03	.46									~~71~~		~~4~~
2	35:00		852.88	.45	1.80	1.8	737	249	251		58		71		4
3	37:30		854.81	.50	1.78	1.8	744	252	251		57		71		5
4	40:00		856.68	.48	1.98	2.0	749	253	258		56		71		5
5	42:30		858.57	.40	1.9	1.9	764	252	261		57		72		5
6	45:00		860.35	.55	1.58	1.6	767	250	257		60		72		5
7	47:30		862.21	.54	2.17	2.2	643	249	253		61		72		6
8	50:00		864.19	.56	2.14	2.1	668	250	262		62		73		6
9	52:30		866.21	.48	2.21	2.2	680	250	266		62		73		6
10	55:30		868.24	.51	1.9	1.9	685	250	264		63		75		6
11	57:30		870.35	.50	2.03	2.0	640	250	253		63		75		6
12	60:00	1104	872.19		1.98	2.0	693	250	249		64		75		6
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AG Team Leader ______

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MONTROSE AIR QUALITY SERVICES

ODEQ **Method** 5 **Field Datasheet (Isokinetic)**

Page 1 of 1

Project Information
Date 5/15/19 Project # 006AS-596331
Customer/Facility Owens Illinois
Unit ID/Sample Location Furnace D
Run # 2 Operator AG

Sampling Conditions
Static Pressure, in. H_2O See Run 3 Ambient Temp, °F 63
Barometric Pressure, in. Hg 29.67 Ref. Barometer ID —
Wind Speed / Direction 10 MPH W Precipitation, Y / N, type Y, rain
Probe / Filter Temp Range, °F 248 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	See Run 3		
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID —
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID MB30
Umbilical ID —
Nozzle ID 524
Pitot / Probe ID 118-NP-4
Manometer ID MB30
Sensitivity 0.1

Calibration
Meterbox Y .9865
Meterbox ΔH@, in. H_2O 1.8243
Nozzle diameter, Dn, in. .3256
Pitot coefficient, Cp 0.84
Manometer zero and level ☑ yes
K-Factor 3.96

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 4	☐ @ —	☑ @ 3
Pitot (-), pass @ in. H_2O	☑ @ 3	☐ @ —	☑ @ 5
Pitot visual inspection	☑ pass	☑ pass	☐ pass
Nozzle visual inspection	☑ pass	☑ pass	☐ pass
Meter, cfm @ in. Hg	.001 @ 10	— @ —	0.002 @ 8
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1144	872.956	.35	1.38	1.4	745	254	261		58		70		3
2	2:30		874.66	.37	1.46	1.5	751	252	271		56		70		3
3	5:00		876.33	.45	1.78	1.8	648	250	267		56		70		4
4	7:30		878.13	.42	1.66	1.7	655	249	252		57		70		4
5	10:00		879.93	.45	1.79	1.8	662	249	244		59		70		4
6	12:30		881.78	.35	1.38	1.4	664	249	251		60		69		4
7	15:00		883.47	.38	1.50	1.5	671	251	268		59		69		4
8	17:30		885.12	.38	1.50	1.5	675	251	271		59		69		4
9	20:00		886.78	.40	1.58	1.6	679	250	266		59		69		4
10	22:30		888.47	.40	1.58	1.6	683	249	251		60		69		4
11	25:00		890.14	.35	1.38	1.4	685	250	244		60		69		4
12	27:30		891.78	.40	1.58	1.6	681	249	256		62		69		4
1	30:00	1214/1217	893.39	.35	1.38	1.4	692	247	271		63		68		4
2	32:30		895.01	.45	1.78	1.8	674	250	254		59		69		5
3	35:00		896.79	.48	1.90	1.9	648	250	241		56		69		5
4	37:30		898.64	.45	1.78	1.8	712	251	256		56		69		5
5	40:00		900.56	.38	1.50	1.5	716	251	271		56		69		4
6	42:30		902.28	.48	1.90	1.90	723	251	268		56		69		5
7	45:00		904.01	.45	1.78	1.8	728	250	264		56		69		5
8	47:30		905.93	.50	1.96	2.0	736	250	248		56		70		5
9	50:00		907.82	.48	1.90	1.9	740	252	250		57		69		5
10	52:30		909.71	.46	1.82	1.8	738	250	264		58		70		5
11	55:00		911.63	.40	1.58	1.6	740	248	269		58		69		5
12	57:30		913.38	.45	1.78	1.8	744	250	271		58		70		5
	60:00	1247	915.254												
Averages															

QA/QC Check: Completeness ✓ Legibility X Accuracy X Specifications ✓ Checked By AG Team Leader

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MONTROSE AIR QUALITY SERVICES

ODEQ Method 5 Field Datasheet (Isokinetic)

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Project Information
Date 5/15/19 Project # 006AS-596331
Customer/Facility Owens Illinois
Unit ID/Sample Location Furnace D
Run # 3 Operator AG

Sampling Conditions
Static Pressure, in H_2O +.08
Barometric Pressure, in. Hg 29.67
Wind Speed / Direction 15 MPH W
Probe / Filter Temp Range, °F 248 ± 25
Ambient Temp, °F 63
Ref. Barometer ID —
Precipitation, Y / N, type Y, rain

ALT 011

TC ID:	Ambient °F	Ref. °F
Stack	See Run 4	
Probe		
Filter Box		
Filter Exit —	—	
Meter outlet		
Impinger Exit i-43		
Other		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID ~~AG-A330~~ MB30
Umbilical ID —
Nozzle ID 524
Pitot / Probe ID 118-NP-4
Manometer ID MB30
Sensitivity 0.1

Calibration
Meterbox Y .9865
Meterbox ΔH@, in H_2O 1.8243
Nozzle diameter, Dn, in .3256
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 3.96

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 3	☐ @ —	✓ @ 3.5
Pitot (-), pass @ in. H_2O	✓ @ 3	☐ @ —	✓ @ 4
Pitot visual inspection	✓ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	.002 @ 10	— @ —	0.10 @ 10
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Outlet		Pump Vacuum, in. Hg
1	0:00	1345	916.547	.33	1.31	1.3	755	252	271		56		65		3
2	2:30		918.41	.35	1.38	1.4	758	250	270		54		65		3
3	5:00		920.13	.33	1.31	1.3	645	249	257		53		65		3
4	7:30		921.85	.45	1.78	1.8	660	250	246		54		65		3
5	10:00		923.65	.45	1.78	1.8	673	251	252		55		65		4
6	12:30		925.47	.47	1.86	1.9	684	252	276		59		65		4
7	15:00		927.34	.47	1.86	1.9	688	249	271		60		65		4
8	17:30		929.23	.41	1.62	1.6	640	250	257		60		66		4
9	20:00		931.02	.43	1.70	1.7	692	248	244		60		66		4
10	22:30		932.78	.50	1.98	2.0	698	251	248		61		66		4
11	25:00		934.66	.50	1.98	2.0	696	251	266		61		66		4
12	27:30		935.98	.45	1.78	1.8	701	252	261		62		66		4
1	30:00	1415/1418	938.53	.33	1.31	1.3	634	250	250		62		66		3
2	32:30		940.38	.35	1.38	1.4	672	251	245		62		67		3
3	35:00		942.05	.35	1.38	1.4	687	250	249		62		68		3
4	37:30		943.76	.40	1.58	1.6	712	250	268		62		68		3
5	40:00		945.51	.45	1.78	1.8	722	251	265		62		67		3
6	42:30		947.34	.45	1.78	1.8	726	250	263		62		66		4
7	45:00		949.26	.52	2.05	2.1	730	249	250		62		65		5
8	47:30		951.25	.50	1.98	2.0	731	250	246		62		65		5
9	50:00		953.19	.47	1.86	1.9	734	252	257		63		65		5
10	52:30		955.09	.50	1.98	2.0	740	251	263		63		67		5
11	55:00		956.98	.47	1.86	1.9	746	250	265		64		69		5
12	57:30		958.79	.50	1.98	2.0	748	249	265		65		69		5
	END	1447	960.609												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AG Team Leader

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Failed post leak check

MONTROSE AIR QUALITY SERVICES

ODEQ Method 5 Field Datasheet (Isokinetic)

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Project Information

Date 5-15-19 Project # 0064S-596331
Customer/Facility Owens Illinois
Unit ID/Sample Location Furnace D
Run # 4 Operator AG

Sampling Conditions

Static Pressure, in. H_2O .08
Barometric Pressure, in. Hg 29.67
Wind Speed / Direction 15 MPH W
Probe / Filter Temp Range, °F 248 ± 25
Ambient Temp, °F 63
Ref. Barometer ID —
Precipitation, Y / N, type Y, rain

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	118	86	86.4
Probe	118-NP-4	79	77.8
Filter Box	531	90	90.1
Filter Exit		—	—
Meter outlet	MB30	67	67.3
Impinger Exit	1-43	63	62.1
Other			

Ref. Thermometer ID ST-2
Continuity Check ✓ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs

Meterbox ID MB30
Umbilical ID —
Nozzle ID 524
Pitot / Probe ID 118-NP-4
Manometer ID MB30
Sensitivity 0.1

Calibration

Meterbox Y .9865
Meterbox ΔH@, in. H_2O 1.8243
Nozzle diameter, Dn, in. .3256
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 3.96

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	@	✓ @ 3
Pitot (-), pass @ in. H_2O	✓ @ 4	@	✓ @ 4
Pitot visual inspection	✓ pass	✓ pass	✓ pass
Nozzle visual inspection	✓ pass	✓ pass	✓ pass
Meter, cfm @ in. Hg	0.00 @ 10	– @ –	0.002 @ 10
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0:00	1526	961.000	.54	2.13	2.1	720	250	260		59		66		5
2	2:30		963.12	.50	1.98	1.98	731	252	254		61		66		5
3	5:00		964.75	.50	1.98	1.90	741	249	253		61		67		5
4	7:30		966.93	.45	1.78	1.80	746	244	248		61		67		5
5	10:00		968.75	.55	2.17	2.2	750	247	255		61		67		5
6	12:30		970.65	.50	1.98	1.90	752	255	261		62		67		5
7	15:00		972.63	.50	1.98	1.90	760	254	243		62		67		5
8	17:30		974.50	.48	1.90	1.90	767	250	265		62		68		5
9	20:00		976.38	.45	1.78	1.8	769	251	271		62		68		5
10	22:30		978.26	.45	1.78	1.8	616	249	262		62		68		5
11	25:00		980.13	.40	1.58	1.6	668	248	247		62		68		5
12	27:30		981.98	.44	1.74	1.7	677	250	247		62		68		5
1	30:00	1556/1557	983.83	.46	1.82	1.8	684	247	267		63		68		5
2	32:30		985.66	.44	1.74	1.7	693	247	265		63		68		5
3	35:00		987.49	.47	1.86	1.9	697	253	266		63		68		5
4	37:30		989.39	.45	1.78	1.8	701	250	256		64		69		5
5	40:00		991.26	.51	2.02	2.0	707	252	256		64		69		5
6	42:30		993.17	.55	2.17	2.2	710	252	259		64		69		6
7	45:00		995.16	.50	1.98	2.0	712	249	262		64		69		6
8	47:30		996.96	.45	1.78	1.78	716	251	266		64		69		6
9	50:00		998.87	.45	1.78	1.8	663	250	259		65		70		6
10	52:30		1000.83	.42	1.66	1.7	683	253	256		65		70		5
11	55:30		1002.65	.35	1.38	1.4	700	248	255		65		70		5
12	57:30		1004.29	.30	1.18	1.2	711	250	250		66		70		5
	60:00	1627	1005.354												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AG Team Leader

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MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 6DEQ 5 Page 1 of 1

Project Information		**Equipment Identification**	
Date	5/14/19	Ref. Thermometer	–
Project #	006AS-596331	Hygrometer	–
Customer / Facility	Owens IL Portland	Field Balance	710
Unit ID / Sample Location	Furnace D Exit	Check Weights	10641
Run #	1-3	Calipers	39744
Operator	TH		

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/15/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, %	~~60~~ 56
Temperature, °F	~~60~~ 58
Mobile lab #	+U3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout									801	
Impinger 1	DI	695.3	765.8		733.6	831.4		796.4	~~771.1~~	
Impinger 2	DI	688.1	744.5		677.1	718.9		687.7	~~847~~ 715.5	
Impinger 3	MT	643.6	663.7		652.3	660.8		648.1	649.1	
Impinger 4	silica	891.8	915.3		831.6	844.0		915.1	934.3	
Impinger 5										
Impinger 6								735.4	835.4	
Impinger 7								677.1	714.3	
Impinger 8								657.5	660.2	
Silica Gel								844.1	856.5	
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

516

		D1	D2	D3	Average
Nozzle 1 diameters	.3015	.2995	.3005	.3005	3/16
Nozzle 2 diameters					
Nozzle 3 diameters					

Nozzle Material ☐ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☐ quartz ☒ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other

Filter Number: Run 1: U0082 Run 2: U0089 Run 3: U0092 Run 4: U0094

Back Half: NA quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other

Reagent Information

Type	Lot Number	
Absolu	15060260	Acetone
Water type I	C18A02020-00	DIWTR

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____________ Team Leader: ____________

001AS-QMS-FM-226

Appendix B.3
Formaldehyde Data Sheets

MONTROSE AIR QUALITY SERVICES

EPA Method 316 Field Datasheet (Isokinetic)

Project Information

Date 5-20-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace A North
Run # 1 Operator SH

Sampling Conditions

Static Pressure, in. H_2O — Ambient Temp, °F —
Barometric Pressure, in. Hg 29.76 Ref. Barometer ID —
Wind Speed / Direction — Precipitation, Y (N) type —
Probe / Filter Temp Range, °F 248 525

ALT 011 TC ID: See Bag

	TC ID	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID —
Continuity Check ~~Continuity w/ Proper Polarity~~
Notes: * SH 5-20-19

Sampling Equipment IDs

Meterbox ID ~~MB4~~ MB29
Umbilical ID — ✓
Nozzle ID ~~5-3TT~~ T-6 SH 5-20
Pitot / Probe ID 4-14
Manometer ID ~~MB4~~ MB29
Sensitivity 0.01 ✓

Calibration

Meterbox Y 0.9875
Meterbox ΔH@, in. H_2O 1.8038
Nozzle diameter, Dn, in. ~~0.1783~~ 0.1778 SH 5-20
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 0.58

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 3.7	@ —	✓ @ 4.1
Pitot (-), pass @ in. H_2O	✓ @ 3.5	@ —	✓ @ 4.1
Pitot visual inspection	✓ pass	~~pass~~	✓ pass
Nozzle visual inspection	✓ pass	pass	✓ pass
Meter, cfm @ in. Hg	0.007 @ 12	— @	0.006 @ 10
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0:00	12:05	545.634	1.9	.8120	.81	369	262	267	267	60		69		2
2	2:30		546.48	.85	.4930	.49	360	273	265	265	59		71		2
3	5:00		548.02	.95	.5510	.55	383	271	266	266	56		71		2
4	7:30		548.90	0.95	0.55	0.55	385	263	261	261	55		75		2
5	10:00		550.23	2.2	1.27	1.3	392	270	263	263	54		72		2
6	12:30		551.78	2.3	1.33	1.3	388	269	265	265	54		72		2
7	15:00		553.40	2.8	1.62	1.6	381	261	263	263	54		74		2
8	17:30		555.20	2.1	1.21	1.2	400	272	266	266	54		73		2
9	20:00		556.95	1.9	1.10	1.1	406	268	264	264	53		73		2
10	22:30	~~1231~~	558.35	2.0	1.16	1.2	409	265	267	267	54		74		2
11	25:00	1301	560.00	1.6	0.92	0.92	377	263	267	267	51		72		2
12	27:30		561.26	0.85	0.49	0.49	399	263	267	267	51		73		2
1	30:00	~~1307~~ 1309	562.298	0.97	0.56	0.56	391	267	268	268	52		73		2
2	32:30		563.68	2.3	1.33	1.33	398	265	267	267	52		73		2
3	35:00		565.29	2.9	1.68	1.7	397	264	266	266	52		73		2
4	37:30		567.12	3.0	1.74	1.7	398	267	265	265	53		73		2
5	40:00		569.01	3.0	1.74	1.7	395	269	263	263	52		73		2
6	42:30		570.85	3.0	1.74	1.7	394	265	268	268	52		73		2
7	45:00		572.70	1.6	0.93	0.93	415	266	265	265	52		74		2
8	47:30		574.21	1.1	0.64	0.64	429	266	265	265	52		74		2
9	50:00	1330	575.39	0.85	0.49	0.49	437	264	269	269	52		74		2
10	52:30	1400	576.63	0.80 ~~0.6~~	* 0.46	0.46 ~~0.38~~	385	265	267	267	55		74		2
11	55:00		577.59	0.95	0.55	0.55	384	266	264	264	55		75		2
12	57:30		578.63	1.0	0.58	0.58	388	269	266	266	55		75		2
	60:00	1411	579.736	—	—	—	—	—	—	—	—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

EPA Method 316 Field Datasheet (Isokinetic)

Project Information
Date 5-20-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace A North
Run # 2 Operator SH

Sampling Conditions
Static Pressure, in. H_2O -0.41 Ambient Temp, °F 60
Barometric Pressure, in. Hg 29.76 Ref. Barometer ID —
Wind Speed / Direction 6 SW Precipitation Y/N, type rain on/off
Probe / Filter Temp Range, °F 248 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	See Run 3		
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID —
Continuity Check — Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID ~~MB4~~ MB29
Umbilical ID —
Nozzle ID 8-65
Pitot / Probe ID 4-14
Manometer ID ~~MB4~~ MB29
Sensitivity 0.1

Calibration
Meterbox Y 0.9875
Meterbox ΔH@, in. H_2O 1.8038
Nozzle diameter, Dn, in. 0.1778
Pitot coefficient, Cp 0.84
Manometer zero and level yes
K-Factor 0.58

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.1	—	0 @ 3.8
Pitot (-), pass @ in. H_2O	0 @ 3.5	—	0 @ 3.6
Pitot visual inspection	pass	~~pass~~	pass
Nozzle visual inspection	pass	~~pass~~	pass
Meter, cfm @ in. Hg	0.004 @ 11	—	0.009 @ 10
Intermediate leak check volume, ft^3	/	/	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
2-1	0	1503	579.880	1.8	1.04	1.00	278	267	268	~~268~~	60		70		2
2	2.5		581.35	1.3	0.75	0.75	287	261	265	SH	58		71		2
3	5		582.62	2.4	1.39	1.4	392	271	266	5-20-19	57		71		3
4	7.5		584.27	3.0	1.74	1.7	395	270	260		54		71		3
5	10		586.09	3.0	1.74	1.7	377	264	262		54		71		3
6	12.5		587.94	2.8	1.62	1.6	382	265	263		54		71		3
7	15		589.73	1.9	1.10	1.1	392	269	269		54		71		2
8	17.5		591.29	1.4	0.81	0.81	408	264	264		56		72		2
9	20		592.61	0.87	0.50	0.50	420	272	265		58		72		2
10	22.5		593.67	0.55	0.32	0.32	433	266	264		59		72		2
11	25		594.48	0.58	0.34	0.34	436	266	265		60		72		2
12	27.5	1530	595.29	0.51	0.29	0.29	432	267	265		60		72		2
1-1	30	1600	596.360	0.60	0.35	0.35	334	268	264		58		69		2
2	32.5	1602	597.11	0.92	0.53	0.53	342	263	265		57		68		2
3	35	1606	598.21	1.00	0.58	0.58	345	265	267		52		68		2
4	37.5		599.27	1.2	0.70	0.70	380	266	265		51		68		2
5	40		600.47	1.8	1.04	1.00	405	262	263		50		68		2
6	42.5		602.20	2.2	1.27	1.3	403	272	268		50		68		2
7	45		603.43	2.5	1.45	1.5	398	266	266		50		69		2
8	47.5		604.83	2.2	1.27	1.3	387	262	263		51		69		2
9	50		606.79	2.5	1.45	1.5	388	272	267		51		68		2
10	52.5	1700	608.41	1.3	0.75	0.75	418	263	261		51		68		2
11	55		609.73	1.8	1.04	1.0	369	265	264		52		69		2
12	57.5		611.12	1.6	0.93	0.93	373	269	269		52		69		2
	60	1706	612.528		—	—		—			—				—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By RB Team Leader JH

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

EPA Method 316 Field Datasheet (Isokinetic)

Project Information

Date: 5-20-19 | Project #: 00GAS-596331
Customer/Facility: Owens
Unit ID/Sample Location: Furnace A North
Run #: 3 | Operator: SH

Sampling Conditions

Static Pressure, in. H_2O: -0.91 | Ambient Temp, °F: 60
Barometric Pressure, in. Hg: 29.76 | Ref. Barometer ID: —
Wind Speed / Direction: 5 SW | Precipitation, Y/N, type: N —
Probe / Filter Temp Range, °F: 248 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	4-14	88	87.4
Probe	4-14	89	88.3
Filter Box	SCG-05	69	69.4
Filter Exit	—	—	—
Meter outlet	MB4	69	69.1
Impinger Exit	1-43	55	55.5
Other	—	—	—

Ref. Thermometer ID: 572
Continuity Check ☐ Continuity w/ Proper Polarity
Notes: * SH 5-20-19

Sampling Equipment IDs

Meterbox ID: ~~MB4~~ MB29
Umbilical ID: —
Nozzle ID: T-65
Pitot / Probe ID: 4-14
Manometer ID: ~~MB4~~ MB29
Sensitivity: 0.1

Calibration

Meterbox Y: 0.9875
Meterbox ΔH@, in. H_2O: 1.8038
Nozzle diameter, Dn, in.: 0.1778
Pitot coefficient, Cp: 0.84
Manometer zero and level: ✓ yes
K-Factor: 0.58

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 4.1	—	0 @ 3.7
Pitot (-), pass @ in. H_2O	0 @ 4.0	—	0 @ 3.9
Pitot visual inspection	pass	—	pass
Nozzle visual inspection	pass	—	pass
Meter, cfm @ in. Hg	0.007 @ 10	—	0.008 @ 10
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1-1	0	~~1800~~* 1801	612.776	1.7	0.98	0.98	353	265	266		60		66		2
2	2.5		614.18	1.1	0.64	0.64	375	269	263		58		65		2
3	5		615.34	1.3	0.75	0.75	387	270	266		54		65		2
4	7.5		616.58	2.2	1.27	1.3	379	254	265		50		66		2
5	10		618.15	2.8	1.62	1.6	377	249	266		49		65		2
6	12.5		619.94	2.6	1.51	1.5	381	266	264		50		65		2
7	15		621.61	2.8	1.62	1.6	377	258	267		50		65		3
8	17.5		623.37	2.4	1.39	1.4	387	261	265		50		65		3
9	20	624.97	~~624.97~~*	1.8	1.04	1.0	400	256	265		50		65		3
10	22.5		626.66	1.5	0.87	0.87	413	266	267		50		65		3
11	25		628.02	1.1	0.64	0.64	426	257	266		50		65		3
12	27.5		629.11	1.1	0.64	0.64	435	258	269		50		66		3
2-1	30	~~1834~~ 1900	630.353	1.9	1.10	1.1	410	260	267		50		66		3
2	32.5		631.86	1.8	1.04	1.0	412	267	268		50		65		3
3	35		633.08	1.5	0.87	~~0.87~~ 0.87	406	265	268		50		64		3
4	37.5		634.74	2.8	1.62	1.6	408	261	269		52		64		3
5	40		636.44	2.0	1.16	1.2	393	258	266		53		64		3
6	42.5		638.02	2.4	1.39	1.4	379	256	269		55		65		3
7	45		639.69	~~*2.4~~ 1.6	0.93	0.93	403	262	270		55		66		3
8	47.5		641.21	1.5	0.87	0.87	407	255	271		55		65		2
9	50		642.55	0.81	0.47	0.47	430	259	268		55		65		2
10	52.5		643.61	0.60	0.35	0.35	435	263	268		55		65		2
11	55	end	644.44	0.50	0.29	0.29	440	255	269		56		65		2
12	57.5	1930*	645.21	0.55	0.32	0.32	442	257	265		56		65		2
	60	~~2000~~	646.004		—	—			—		—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 316

Project Information

Date 5/17/19 Project # 006AS-596331

Customer / Facility Owens IL North

Unit ID / Sample Location Furnace A North

Run # 1 - 3 Operator JCF

Equipment Identification

Ref. Thermometer —

Hygrometer —

Field Balance 710

Check Weights 10641

Calipers 39744

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/20/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F —

Mobile lab # +U3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1	DI	625.7			744.7	761.4		623.5	644.1	
Impinger 2	DI	699.9			708.4	726.0		702.6	710.7	
Impinger 3	MT	656.1			593.5	597.1		657.4	660.3	
Impinger 4	Silica	701.7			819.0	825.8	JCF	~~824.1~~	776.4	
Impinger 5					~~804.5~~ JCF			768.8	~~814.3~~	JCF
Impinger 6		628.6	650.9							
Impinger 7		714.4	723.3							
Impinger 8		659.3	659.6							
Silica Gel		713	717.1							
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

T-62	Nozzle 1 diameters	.2430	D1	.2435	D2	.2425	D3	.2430 Average
T-65	Nozzle 2 diameters	.1765	D1	.1755	D2	.1785	D3	.1778 Average
311	Nozzle 3 diameters	.1785	D1	.1780	D2	.1785	D3	.1783 Average

Nozzle Material ☐ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other ~~NA~~

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Filter Number: Run 1: NA Run 2: NA Run 3: NA Run :

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Reagent Information Type	Lot Number	**Sample Observations**

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by:______________ Team Leader:______________ 001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

EPA Method 316 Field Datasheet (Isokinetic)

Project Information

Date 5-20-18 Project # DOGAS - 596331
Customer/Facility Owens - Illinois
Unit ID/Sample Location Furnace A South
Run # 2 Operator AG

Sampling Conditions

Static Pressure, in. H_2O -1.2 Ambient Temp, °F 56
Barometric Pressure, in. Hg 29.76 Ref. Barometer ID —
Wind Speed / Direction Precipitation, Y / N, type N
Probe / Filter Temp Range, °F 244 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

See Run 3

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs

Meterbox ID ~~MB27~~ MB4
Umbilical ID —
Nozzle ID S-311
Pitot / Probe ID 118-NP-4
Manometer ID ~~MB29~~ MB4
Sensitivity 0.01

Calibration

Meterbox Y .9927
Meterbox ΔH@, in. H_2O 1.7773
Nozzle diameter, Dn, in. .1783
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 0.59

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 3	☐ @	✓ @ 4
Pitot (-), pass @ in. H_2O	✓ @ 3	☐ @	✓ @ 5
Pitot visual inspection	✓ pass	☐ pass	☐ pass
Nozzle visual inspection	✓ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0 @ 10	@	0 @ 15
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0:00	1146	308.151	.45	~~.31~~ .26	~~.31~~ .26	295	252	230	230	66		65		2
2	2:30		309.08	.48	.2832	.28	353	250	225	225	65		65		2
3	5:00		309.74	.45	.2655	.27	348	253	230	230	65		66		2
4	7:30		310.44	.75	.4425	.44	385	251	225	225	65		67		2
5	10:00		311.38	1.1	.649	.65	386	251	228	228	65		69		2
6	12:30		312.52	2.0	1.18	1.2	378	252	230	230	66		69		5
7	15:00	1200 / 1232	314.07	2.5	1.475	1.48	320	250	225	225	66		68		5
8	17:30		315.83	2.3	1.357	1.36	330	249	226	226	66		70		6
9	20:00		317.49	1.7	1.003	1.0	340	251	228	228	65		69		5
10	22:30		318.93	1.9	1.121	1.1	343	252	230	230	65		69		5
11	25:00		320.45	1.5	.885	.89	350	249	233	233	65		70		4
12	27:30		321.85	1.3	.767	.77	356	252	233	233	64		71		4
1	30:00	1245 / 1257	323.11	1.1	.649	.65	320	248	230	230	64		69		3
2	32:30		324.28	2.5	1.475	1.48	356	250	232	232	65		71		7
3	35:00		325.55	3.0	1.77	1.7	354	251	225	225	65		71		8
4	37:30		326.87	4.5	2.65	2.7	342	252	231	231	65		71		11
5	40:00	1300 / 1331	329.91	3.0	1.77	1.8	330	248	220	220	66		71		8
6	42:30		331.86	4.0	2.36	2.4	320	253	220	220	66		72		12
7	45:00		333.92	3.0	1.77	1.8	331	248	225	225	65		72		10
8	47:30		335.77	1.5	.885	.89	359	253	220	220	65		71		6
9	50:00		337.09	1.3	.767	.77	375	249	222	222	65		71		5
10	52:30		338.21	.75	.4425	.44	388	252	220	220	65		71		3
11	55:00		339.27	.50	.295	.30	401	249	225	225	66		73		3
12	57:30		340.08	.50	.295	.30	410	254	218	218	66		71		3
	60:00	1351	340.986												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By AG Team Leader

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

EPA Method 316 Field Datasheet (Isokinetic)

Project Information
Date 5-20-19 Project # 006AS-596331
Customer/Facility Owens-Illinois
Unit ID/Sample Location Furnace A Smith
Run # 2 Operator AG

Sampling Conditions
Static Pressure, in. H_2O -1.2
Ambient Temp, °F 56
Barometric Pressure, in. Hg 29.76
Ref. Barometer ID —
Wind Speed / Direction
Precipitation, Y / N, type N
Probe / Filter Temp Range, °F 248±25

ALT 011

	TC ID:	Ambient °F	Ref. °F
Stack			
Probe	See		
Filter Box		Run	
Filter Exit			3
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID ~~MB24~~ MB4
Umbilical ID —
Nozzle ID S-311
Pitot / Probe ID 118-NP-4
Manometer ID ~~MB24~~ MB4
Sensitivity 0.01

Calibration
Meterbox Y .9927
Meterbox ΔH@, in. H_2O 1.7773
Nozzle diameter, Dn, in. .1783
Pitot coefficient, Cp 0.84
Manometer zero and level ☑ yes
K-Factor 0.59

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 3	☐ @	☑ @ 3
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 3
Pitot visual inspection	☑ pass	☐ pass	☑ pass
Nozzle visual inspection	☑ pass	☐ pass	☑ pass
Meter, cfm @ in. Hg	0 @ 12	@	0 @ 12
Intermediate leak check volume, ft^3	/		/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temp, °F Inlet	Dry Gas Meter Temp, °F Outlet		Pump Vacuum, in. Hg
1	0:00	1531	341.620	.50	.295	.30	315	247	225	225	66		70		2
2	2:30		342.48	.87	~~.87~~ .51	.50	346	250	220	220	66		71		2
3	5:00		343.94	1.5	.885	.90	354	248	222	222	66		70		2
4	7:30		344.77	2.7	1.593	1.6	341	250	223	223	65		70		3
5	10:00		346.61	3.3	1.947	1.9	338	250	222	222	65		70		4
6	12:30		348.61	3.7	2.183	2.2	340	248	224	224	65		70		4
7	15:00		350.75	2.5	1.475	1.5	359	249	224	224	64		70		3
8	17:30		352.39	1.5	.885	.90	378	248	220	220	64		70		2
9	20:00		353.80	1.1	.649	.70	391	248	228	228	69		70		2
10	22:30		354.87	.85	.5015	.50	405	252	233	233	65		70		2
11	25:00		355.85	.75	.4425	.50	411	248	225	225	65		69		2
12	27:30	~~1601~~ 1630	356.89	.60	.354	.40	410	250	220	220	65		70		2
1	30:00		357.91	.60	.354	.40	325	247	225	225	65		70		2
2	32:30		359.08	.90	.531	.53	328	250	220	220	64		70		2
3	35:00		360.44	1.1	.649	.65	335	247	215	215	65		70		2
4	37:30		361.32	1.5	.885	.89	339	250	220	220	65		70		2
5	40:00		362.89	1.5	.885	.89	344	247	220	220	65		71		2
6	42:30		364.48	2.2	1.298	1.3	343	248	225	225	65		71		3
7	45:00		366.15	2.2	1.298	1.3	367	250	218	218	66		70		3
8	47:30		367.79	1.1	.649	.65	376	248	215	215	66		70		2
9	50:00		368.87	.75	.4425	.44	358	250	220	220	66		70		2
10	52:30		369.76	.45	.2655	.27	360	252	221	221	65		70		2
11	55:00		370.51	.55	.3245	.32	378	250	219	219	65		70		2
12	57:30		371.27	.48	.2832	.28	380	248	215	215	65		70		2
	60:00	1701	371.953												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AGM Team Leader

001AS-QMS-FM-225

E2A Method 316 Field Datasheet (Isokinetic)

MONTROSE AIR QUALITY SERVICES

Project Information	
Date	5-20-19
Project #	ODGAS-596331
Customer/Facility	Owens-Illinois
Unit ID/Sample Location	Furnace A South
Run #	3
Operator	AG

Sampling Conditions	
Static Pressure, in. H_2O	-1.7
Ambient Temp, °F	58
Barometric Pressure, in. Hg	29.76
Ref. Barometer ID	—
Wind Speed / Direction	SE 10 MPH
Precipitation, Y / N, type	N
Probe / Filter Temp Range, °F	248±25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	118	73	732.1
Probe	118	91	90.5
Filter Box	530	86	84.8
Filter Exit	—	—	—
Meter outlet	MB29	71	71.6
Impinger Exit	1-45	66	65.7
Other			

Ref. Thermometer ID ST-2
Continuity Check ✓ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs	
Meterbox ID	MB294
Umbilical ID	—
Nozzle ID	S-311
Pitot / Probe ID	118-NP-4
Manometer ID	MB294
Sensitivity	0.01

Calibration	
Meterbox Y	.9927
Meterbox ΔH@, in. H_2O	1.7773
Nozzle diameter, Dn, in.	.1783
Pitot coefficient, Cp	0.84
Manometer zero and level	✓ yes
K-Factor	0.59

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 3
Pitot visual inspection	✓ pass	☐ pass	✓ pass
Nozzle visual inspection	✓ pass	☐ pass	✓ pass
Meter, cfm @ in. Hg	0 @ 12	@	0 @ 12
Intermediate leak check volume, ft^3	/		/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0:00	1730	372.156	1.2	.708	.70	320	250	220	220	66		68		4
2	2:30		373.32	1.5	.885	.89	331	251	218	218	66		68		6
3	5:00		374.71	1.7	1.003	1.0	338	250	221	221	66		68		7
4	7:30		376.16	1.8	1.062	1.1	341	248	223	223	65		68		7
5	10:00		377.65	2.1	1.239	1.2	340	248	218	218	65		68		7
6	12:30		379.20	2.5	1.475	1.5	339	247	220	220	65		67		8
7	15:00		380.91	2.5	1.475	1.5	368	249	222	222	65		68		8
8	17:30		382.60	1.2	.708	.70	388	250	217	217	66		68		5
9	20:00		383.76	.90	.531	.53	394	252	215	215	66		69		4
10	22:30		384.77	.55	.3245	.32	367	251	220	220	66		68		3
11	25:00		385.54	.45	.2655	.27	340	250	222	222	65		68		2
12	27:30		386.15	.45	.2655	.27	344	251	219	219	65		68		2
1	30:00	1800/1832	386.75	.42	.2478	.25	332	248	220	220	65		67		2
2	32:30		387.53	.50	.295	.30	354	250	225	225	64		66		2
3	35:00		388.25	.74	.4366	.44	357	251	218	218	63		66		3
4	37:30		389.21	.90	.531	.53	360	250	220	220	64		66		4
5	40:00		390.37	1.5	.885	~~.44~~ .89	360	252	216	216	64		67		5
6	42:30		391.77	3.0	~~2.77~~	~~2.7~~	349	253	218	218	64		66		15
7	45:00		393.21	3.3	1.947	1.95	344	250	220	220	64		66		7
8	47:30		395.39	1.5	.885	.89	366	250	222	222	65		66		5
9	50:00		396.74	1.8	1.062	1.1	371	248	221	221	65		67		5
10	52:30		398.02	1.0	.59	.60	362	248	219	219	64		66		4
11	55:00		399.13	.95	.5605	.56	351	251	215	215	64		68		5
12	57:30		400.6	1.0	.59	.70	320	249	218	218	63		65		6
	60:00	1900	402.576												
Averages															

*AG
*AG 1.77 1.8

QA/QC Check: Completeness ✗ Legibility ✗ Accuracy ✗ Specifications ✗ Checked By AG Team Leader

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 3/6

Project Information		**Equipment Identification**	
Date	5/20/19	Ref. Thermometer	—
Project #	U06AS-596331	Hygrometer	—
Customer / Facility	Owens IL portland OR	Field Balance	710
Unit ID / Sample Location	Furnace A south	Check Weights	10641
Run #	1-3	Calipers	39744
Operator	JH		

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/20/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F —

Mobile lab # TU3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1	DI	726.4			725.1	744.0		707.5	731.2	
Impinger 2	DI	756.2			757.7	764.3		657.3	661.6	
Impinger 3	MT	557.3			560.4	562		595.9	599.5	
Impinger 4	silica	837.0			751.1	765.8		955.2	960.9	
Impinger 5										
Impinger 6		699.2	719.6							
Impinger 7		647.2	655.5							
Impinger 8		594.2	596.2							
Silica Gel		989.3	955.3							
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle 2 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle 3 diameters ____ D1 ____ D2 ____ D3 ____ Average

Nozzle Material ☐ quartz ☐ glass ☒ steel ☐ titanium ☐ inconel ☐ other ____

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other ____

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other ____

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other N/A

Filter Number: Run 1: — Run 2: — Run 3: — Run ____

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other N/A

Reagent Information

Type	Lot Number

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____ Team Leader: ____

001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

EPA Method 316 Field Datasheet (Isokinetic)

Project Information
Date 5-15-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace D
Run # 1 Operator SH

Sampling Conditions
Static Pressure, in. H_2O: See Run 3
Ambient Temp, °F: 61
Barometric Pressure, in. Hg: 29.67
Ref. Barometer ID: —
Wind Speed / Direction: 6 mph W
Precipitation, Y/N type: N —
Probe / Filter Temp Range, °F: 248 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	See Run 3		
Probe			
Filter Box			
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID —
Continuity Check ~~□~~ Continuity w/ Proper Polarity
Notes: —

Sampling Equipment IDs
Meterbox ID ~~MB29~~ 4
Umbilical ID —
Nozzle ID 0.3005
Pitot / Probe ID 117
Manometer ID MB29 4
Sensitivity 0.1

Calibration
Meterbox Y 0.9927
Meterbox ΔH@, in. H_2O 1.7773
Nozzle diameter, Dn, in. .3005
Pitot coefficient, Cp 0.84
Manometer zero and level yes
K-Factor SH 5.13519 ~~2.64~~ 2.92

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	@ 3.4	—	@ 4.1
Pitot (-), pass @ in. H_2O	@ 3.4	—	@ 4.1
Pitot visual inspection	pass	—	pass
Nozzle visual inspection	pass	—	pass
Meter, cfm @ in. Hg	0.0 @ 16	—	0.0 @ 10
Intermediate leak check volume, ft^3	—	—	—

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	0932	716.571	0.40	1.16	1.2	720	248	247		66		69		2
2	2.5		718.08	0.38	1.10	1.1	736	250	239		66		70		2
3	5		719.53	0.44	1.28	1.3	745	247	230		66		72		2
4	7.5	Paused run	721.06	0.50	1.46	1.5	688	249	239		66		78		2
5	10	0939 1008	722.76	0.45	1.31	1.3	702	249	246		64		77		2
6	12.5		724.37	0.50	1.46	1.5	705	249	246		63		77		3
7	15		726.03	0.50	1.46	1.5	707	249	246		62		76		3
8	17.5		727.72	0.50	1.46	1.5	691	247	247		60		78		3
9	20		729.44	0.55	1.60	1.6	687	247	247		60		79		3
10	22.5		731.28	0.57	1.66	1.7	705	249	249		60		79		3
11	25		732.99	0.55	1.60	1.6	714	250	249		59		79		3
12	27.5		734.80	0.55	1.60	1.6	721	250	250		59		80		3
1	30	1030 1033	736.661	0.33	0.96	0.96	739	250	250		61		80		3
2	32.5		738.00	0.38	~~1.10~~ ~~0.38~~	1.1	750	250	250		61		81		3
3	35		739.43	0.40	1.16	1.2	754	249	251		61		80		3
4	37.5		741.04	0.40	1.16	1.2	763	249	251		60		80		3
5	40		742.42	0.50	1.46	1.5	770	250	251		60		80		3
6	42.5		744.04	0.50	1.46	1.5	770	251	250		60		81		3
7	45		745.77	0.52	1.51	1.5	660	251	251		59		81		3
8	47.5		747.65	0.59	1.72	1.7	673	251	251		59		82		3
9	50		749.26	0.64	1.86	1.9	677	252	249		58		84		3
10	52.5		751.17	0.64	1.86	1.9	680	252	249		58		85		3
11	55		753.13	0.55	1.60	1.6	678	249	249		58		83		3
12	57.5		754.99	0.55	1.60	1.6	688	249	249		59		82		3
	60	1104	756.644	—	—	—	—	—	—		—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

MONTROSE AIR QUALITY SERVICES

EPA Method 3/6 Field Datasheet (Isokinetic)

Project Information
Date 5-15-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace D
Run # 2 Operator SH

Sampling Conditions
Static Pressure, in. H_2O: See Run 3 — Ambient Temp, °F: 63
Barometric Pressure, in. Hg: 29.67 — Ref. Barometer ID: —
Wind Speed / Direction: 10 mph W — Precipitation (Y)/N, type: Rain
Probe / Filter Temp Range, °F: 248 ± 25

ALT 011 — TC ID / Ambient °F / Ref. °F
Stack, Probe, Filter Box, Filter Exit, Meter outlet, Impinger Exit, Other: See Run 3
Ref. Thermometer ID: —
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID: MB294
Umbilical ID: —
Nozzle ID: 0.3005
Pitot / Probe ID: 117
Manometer ID: MB294
Sensitivity: 0.1

Calibration
Meterbox Y: 0.9927
Meterbox ΔH@, in. H_2O: 1.7773
Nozzle diameter, Dn, in.: 0.3005
Pitot coefficient, Cp: 0.84
Manometer zero and level ☑ yes
K-Factor: 2.92

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 4.3	— @ —	0 @ 3.9
Pitot (-), pass @ in. H_2O	0 @ 4.3	@	0 @ 3.9
Pitot visual inspection	☑ pass	~~pass~~	☑ pass
Nozzle visual inspection	☑ pass	~~pass~~	☑ pass
Meter, cfm @ in. Hg	0.001 @ 12	— @ —	0.002 @ 10 (SH 5-15-19)
Intermediate leak check volume, ft^3		/	0.021

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice ΔH Target	Orifice ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp Box, °F	Filter Temp Exit, °F	Impinger Exit Temp, °F	DGM Inlet, °F	DGM Outlet, °F		Pump Vacuum, in. Hg
1	0	1144	756.769	0.46	1.34	1.3	742	246	239		66		80		4
2	2.5		758.32	0.46	1.34	1.3	756	247	239		65		80		4
3	5		759.91	0.50	1.46	1.5	653	247	240		65		82		5
4	7.5		761.63	0.41	1.19	1.2	666	246	241		65		77		5
5	10		763.21	0.41	1.19	1.2	665	246	242		65		78		5
6	12.5		764.78	0.37	1.08	1.1	670	245	241		64		77		5
7	15		766.36	0.40	1.16	1.2	673	248	245		64		78		5
8	17.5		767.89	0.41	1.19	1.2	680	246	249		64		80		5
9	20		769.49	0.46	1.34	1.3	682	246	249		64		76		5
10	22.5		771.12	0.40	1.16	1.2	687	246	249		64		78		5
11	25		772.59	0.33	0.96	0.96	677	248	248		64		77		5
12	27.5		774.06	0.33	0.96	0.96	693	250	250		64		79		5
1	30	1214 / 1217	775.448	0.41	1.19	1.2	691	250	250		66		75		5
2	32.5		776.98	0.45	1.31	1.3	667	250	250		65		80		5
3	35		778.53	0.50	1.46	1.5	690	250	251		64		79		5
4	37.5		780.24	0.50	1.46	1.5	706	251	251		64		76		5
5	40		781.95	0.50	1.46	1.5	720	249	249		64		80		5
6	42.5		783.67	0.45	1.31	1.3	746	245	249		64		77		5
7	45		785.38	0.45	1.31	1.3	734	250	250		65		80		5
8	47.5		786.98	0.45	1.31	1.3	740	250	250		65		76		5
9	50		788.63	0.45	~~1.43~~ 1.31	~~1.4~~ 1.3	751	250	249		65		80		5
10	52.5		790.42	0.40	1.16	1.2	749	250	249		65		80		5
11	55		791.81	0.41	1.19	1.2	753	251	250		66		81		5
12	57.5		793.38	0.46	1.34	1.3	754	251	251		66		77		5
	60	1247	794.949	—	—	—			—		—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader SH

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MONTROSE AIR QUALITY SERVICES

EPA Method 3/6 Field Datasheet (Isokinetic)

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Project Information

Date 5-15-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace D
Run # 3 Operator SH

Sampling Conditions

Static Pressure, in. H_2O + 0.08 Ambient Temp, °F 63
Barometric Pressure, in. Hg 29.67 Ref. Barometer ID —
Wind Speed / Direction 15 mph W Precipitation (Y)/ N, type Rain
Probe / Filter Temp Range, °F 248±25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	117	76	76.1
Probe	117	82	82.8
Filter Box	530	97	97.2
Filter Exit	—	—	—
Meter outlet	MB29	73	73.2
Impinger Exit	T35	70	71.1
Other			

Ref. Thermometer ID STZ
Continuity Check ✓ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs

Meterbox ID MB294
Umbilical ID — W
Nozzle ID 0.3005
Pitot / Probe ID 117
Manometer ID MB294
Sensitivity 0.1 W

Calibration

Meterbox Y 0.9927
Meterbox ΔH@, in. H_2O 1.7773
Nozzle diameter, Dn, in. 0.3005
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 2.92

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.5	@	0 @ 4.0
Pitot (-), pass @ in. H_2O	0 @ 3.5	@	0 @ 4.0
Pitot visual inspection	✓ pass	pass	✓ pass
Nozzle visual inspection	✓ pass	pass	✓ pass
Meter, cfm @ in. Hg	0.003 @ 10	@	0.005 @ 11
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1345	796.658	0.50	1.46	1.5	765	239	240		66	76			2
2	2.5		798.35	0.54	1.57	1.6	772	241	242		66	72			2
3	5		800.06	0.50	1.46	1.5	658	241	245		65	77			2
4	7.5		801.78	0.50	1.46	1.5	670	247	250		65	72			2
5	10		803.52	0.50	1.46	1.5	678	248	251		65	76			2
6	12.5		805.23	0.48	1.40	1.4	683	247	249		65	73			2
7	15		806.89	0.47	1.37	1.4	690	249	251		64	72			2
8	17.5		808.54	0.45	1.31	1.3	693	249	251		64	72			2
9	20		810.19	0.30	0.876	0.88	693	248	250		64	72			2
10	22.5		811.71	0.39	1.13	1.1	700	248	250		64	72			2
11	25		813.14	0.39	1.13	1.1	700	251	251		64	78			2
12	27.5		814.60	0.40	1.16	1.2	704	251	250		64	75			2
1	30	~~1415~~ 1418	816.125	0.50	1.46	1.5	706	249	251		65	78			2
2	32.5		817.84	0.48	1.25	1.3	674	248	250		65	75			2
3	35		819.51	0.45	1.31	1.3	699	249	251		65	75			2
4	37.5		821.06	0.45	1.31	1.3	708	246	249		65	75			2
5	40		822.64	0.45	1.31	1.3	719	249	250		64	76			2
6	42.5		824.41	0.45	1.13	1.3	729	246	249		64	76			2
7	45		825.73	0.48	1.40	1.4	741	248	250		64	76			2
8	47.5		827.38	0.40	1.16	1.2	744	250	248		64	70			2
9	50		828.99	0.37	1.08	1.1	743	249	247		63	75			2
10	52.5		830.56	0.37	1.08	1.1	749	248	246		64	76			2
11	55		832.07	0.34	0.99	1.0	746	247	247		64	75			2
12	57.5		833.59	0.34	0.99	1.0	650	249	249		64	75			2
	60	1447	834.906	—	—	—	—	—	—		—	—			—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By RS Team Leader SH

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MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 316

Project Information		Equipment Identification	
Date	5/14/19	Ref. Thermometer	–
Project #	006AS-	Hygrometer	~
Customer / Facility	Owens IL Portland	Field Balance	710
Unit ID / Sample Location	Furnace D exit	Check Weights	10641
Run #	1-3	Calipers	39744
Operator	JT		

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/14/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, %

Temperature, °F

Mobile lab # TV3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout										
Impinger 1	DI	723.3	517.7		708.7	793.2		726.1	772.1	
Impinger 2	DI	659.0	724.6		695.7	732.5	754.3	~~696.2~~	910.7	
Impinger 3	empty	555.3	561.9		517.6	526.7		556.8	578.2	
Impinger 4	silica	865.0	550.2		916.0	931.1		880.2	899.9	
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

		D1	D2	D3	Average
423 Nozzle 1 diameters	.2715	.2705	.2720	.2713	
Nozzle 2 diameters	.2445	.2475	.2460	.2460	
524 Nozzle 3 diameters	.3270	.3255	.3245	.3256	PM

Nozzle Material ☒ quartz ☒ glass ☒ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Filter Number: Run 1: — Run 2: — Run 3: — Run

Back Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Reagent Information

Type	Lot Number
H2O Type 1	C18A02040-00D1WTR

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____________ Team Leader: ____________

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Appendix B.4
Multi-Metals Data Sheets

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Project Information

Date 5-21-19 Project # 006AS-596331

Customer/Facility Owens Illinois / Portland

Unit ID/Sample Location Furnace A North

Run # Metals-Run 1 Operator JM/AG/SH

Sampling Conditions

Static Pressure, in. H_2O -1.1 Ambient Temp, °F —

Barometric Pressure, in. Hg 29.60 Ref. Barometer ID PDX Airport

Wind Speed / Direction — Precipitation, Y / N, type N

Probe / Filter Temp Range, °F 248±25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	SP-3		
Probe	SP-3		
Filter Box	486		
Filter Exit	TC		
Meter outlet	MB33		
Impinger Exit	I-43		
Other			

See run 3

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB33

Umbilical ID —

Nozzle ID G905

Pitot / Probe ID SP-3

Manometer ID MB32

Sensitivity 0.01

Calibration

Meterbox Y 1.0058

Meterbox ΔH@, in. H_2O 1.7299

Nozzle diameter, Dn, in. 0.1928

Pitot coefficient, Cp .84

Manometer zero and level ☑ yes

K-Factor 0.79

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 5	☐ @ —	☑ @ 5
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ @ —	☑ @ 4
Pitot visual inspection	☑ pass	☑ pass	☑ pass
Nozzle visual inspection	☑ pass	☑ pass	☑ pass
Meter, cfm @ in. Hg	0.002 @ 11	0.002 @ 7	0.003 @ 10

Intermediate leak check volume, ft³ 510.792 - 510.945

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft³	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
—	0	9:00	427.686	—	—	—	—	—	—	—	—	—	—	Ng	—
1	10		432.47	.90	.71	.71	331	253	246	238	61	71	70		2
2	20		436.67	.67	.53	.53	386	254	252	253	58	73	70		2
3	30	9:45 / 1000	442.791	1.4	1.1	1.1	407	254	258	261	58	79	72		2
4	40		449.89	2.0	1.58	1.6	356	254	256	257	61	82	80		2
5	50		456.78	1.8	1.422	1.4	388	254	260	262	59	88	81		2
6	60	10:30 / 11:00	465.330	2.7	2.133	2.1	394	254	259	259	63	92	83		3
7	70		474.44	3.1	2.5	2.5	368	250	253	260	62	90	87		3
8	80		482.78	2.6	2.0	2.0	405	254	248	265	56	96	88		3
9	90	1130 / 12:00	489.404	1.7	1.3	1.3	439	253	243	270	67	91	88		3
10	100		497.61	2.5	2.0	2.0	392	253	244	262	58	79	81		3
11	110		504.09	1.5	1.185	1.2	425	255	244	253	58	83	83		2
12	120	12:30 / 13:00	510.792	1.7	1.3	1.3	433	254	247	251	59	85	82		2
1	130		517.36	1.7	1.3	1.3	386	254	246	251	61	79	82		2
2	140		523.64	1.4	1.1	1.1	418	264	258	271	59	83	81		2
3	150	13:30 / 14:00	532.090	2.6	2.1	2.1	408	253	238	270	60	88	81		3
4	160		541.69	3.4	2.7	2.7	364	254	260	261	60	79	80		3
5	170		550.81	3.0	2.4	2.4	391	254	252	268	63	83	80		3
6	180	14:30 / 15:00	560.379	3.4	2.7	2.7	390	254	249	271	58	86	79		3
7	190		568.18	2.3	1.8	1.8	381	253	263	265	54	80	80		2
8	200		574.84	1.6	1.3	1.3	407	253	258	271	56	85	80		2
9	210	15:30 / 16:00	580.414	1.1	.87	.87	446	254	262	272	59	88	83		2
10	220		585.34	.94	.74	.74	409	252	254	242	60	79	80		2
11	230		591.14	1.3	1.02	1.0	427	254	248	244	59	82	81		2
12	240	16:30	596.586	1.1	.87	.87	440	253	249	271	61	85	82		2
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

△ Leak check at port change

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MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

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Project Information
Date 5/22/10 Project # 006AS-596331
Customer/Facility Owens 91055
Unit ID/Sample Location Furnace A North
Run # X 2 JH Operator PB

Sampling Conditions
Static Pressure, in. H_2O -.99 Ambient Temp, °F 70
Barometric Pressure, in. Hg 29.98 Ref. Barometer ID WeatherStation
Wind Speed / Direction — Precipitation, Y/(N) type —
Probe / Filter Temp Range, °F 248±25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	SP-3		
Probe	SP-3		
Filter Box	466		
Filter Exit			
Meter outlet	MB33		
Impinger Exit	1-43		
Other	—		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID MB33
Umbilical ID —
Nozzle ID G-605
Pitot / Probe ID SP-3
Manometer ID MB33
Sensitivity .01

Calibration
Meterbox Y 1.0058
Meterbox ΔH@, in. H_2O 1.7249
Nozzle diameter, Dn, in. .1928
Pitot coefficient, Cp .84
Manometer zero and level ☑ yes
K-Factor .77

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 3	☐ @ —	☑ @ 4
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ @ —	☑ @ 5
Pitot visual inspection	☑ pass	☐ pass	☑ pass
Nozzle visual inspection	☑ pass	☐ pass	☑ pass
Meter, cfm @ in. Hg	.001 @ 10	— @ —	.001 @ 7

Intermediate leak check volume, ft^3 677.446 / 677.523 /

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Outlet		Pump Vacuum, in. Hg
0	0	0900	598.159	—			—	—	—	—	—	—		—	—
1	10		603.01	.87	.67	.67	406	254	253	225	50		65		.5
2	20		607.99	1.0	.77	.77	417	254	251	250	50		66		1
3	30	1030/1100	613.205	1.1	.84	.84	441	256	251	255	51		66		1
4	40		619.41	1.4	1.07	1.1	571	255	257	230	54		74		1.5
5	50		628.74	3.3	2.54	2.5	377	254	251	262	51		76		5
6	60	1130/1200	637.708	3.0	2.31	2.3	348	254	253	260	57		79		5
7	70		646.67	3.0	2.31	2.3	346	254	257	255	62		85		4.5
8	80		653.26	1.6	1.23	1.2	416	255	259	270	61		87		3
9	90	1230/1240	659.538	1.4	1.07	1.1	424	255	260	272	57		87		3
10	100		666.44	2.1	1.61	1.6	428	254	256	250	56		88		3
11	110		671.80	.90	.69	.69	428	253	262	270	54		88		2
12	120	1330/1400	677.395	1.1	.84	.84	444	254	262	272	57		89		2.5
1	130		683.36	1.3	1.0	1.0	396	254	254	253	60		91		2
2	140		690.82	2.1	1.61	1.6	409	254	258	265	56		93		3.5
3	150	1430/1500	698.389	2.2	1.69	1.7	423	254	258	270	58		93		4
4	160		705.59	1.8	1.38	1.4	381	254	253	250	62		94		4.5
5	170		714.36	2.8	2.15	2.2	389	254	257	262	57		95		4.5
6	180	1530/1600	723.250	2.9	2.23	2.2	393	254	257	270	55		96		4.5
7	190		731.91	2.8	2.15	2.2	378	253	257	248	58		87		3
8	200		739.25	2.0	1.54	1.5	393	253	244	267	57		86		3
9	210	1630/1700	745.972	1.6	1.23	1.2	413	252	250	270	58		86		3
10	220		752.53	1.6	1.23	1.2	348	253	248	241	61		85		3
11	230		758.51	1.4	1.07	1.1	410	254	252	263	59		86		3
12	240	1730	764.485	1.4	1.07	1.1	413	254	256	270	61		84		3
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

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MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

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Project Information		Sampling Conditions		ALT 011	TC ID:	Ambient °F	Ref. °F
Date 5/22/19	Project # 006AS-596331	Static Pressure, in. H_2O -1.0	Ambient Temp, °F 57	Stack	SP-7	68	67.5
Customer/Facility Owens Corning		Barometric Pressure, in. Hg 29.97	Ref. Barometer ID weatherstation	Probe	SP-3	68	
Unit ID/Sample Location Furnace A North		Wind Speed / Direction 5/WNW	Precipitation, Y (N) type —	Filter Box	466	67	
Run # 3	Operator PB	Probe / Filter Temp Range, °F 248 ± 25		Filter Exit			

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MB33	Meterbox Y	1.0058	Pitot (+), pass @ in. H_2O	✓ @ 4	@ —	✓ @ 3
Umbilical ID	—	Meterbox ΔH@, in. H_2O	1.7229	Pitot (-), pass @ in. H_2O	✓ @ 3	@ —	✓ @ 5
Nozzle ID	G-605	Nozzle diameter, Dn, in.	.1928	Pitot visual inspection	✓ pass	~~pass~~	✓ pass
Pitot / Probe ID	SP-3	Pitot coefficient, Cp	.84	Nozzle visual inspection	✓ pass	~~pass~~	✓ pass
Manometer ID	MB33	Manometer zero and level	✓ yes	Meter, cfm @ in. Hg	.003 @ 9	@ —	.003 @ 7
Sensitivity	.01	K-Factor	.77	Intermediate leak check volume, ft^3	807.159 / 830.900 / 853.380		

Meter outlet	MB33 — 69
Impinger Exit	1-43 — 68
Other	—
Ref. Thermometer ID	160535111
Continuity Check	✓ Continuity w/ Proper Polarity
Notes:	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
0	0	800	764.897	—	—	—	—	—		—		—	—		—
1	10		769.77	.96	.73	.73	399	254	249	225	60		65		1
2	20		775.29	1.2	.92	.92	418	254	256	231	56		66		1
3	30	~~830~~ 900	782.011	1.8	1.38	1.4	420	255	256	261	55		67		1.5
4	40		789.33	2.0	1.54	1.5	384	254	258	258	54		67		2
5	50		797.97	2.9	2.23	2.2	408	254	260	260	53		68		3
6	60	~~930~~ 1000	806.957	3.1	2.38	2.4	410	253	249	262	57		~~57~~ 69		3.5
7	70		~~8~~816.634	3.2	2.46	2.5	392	254	255	255	58		71		3.5
8	80		823.16	2.0	1.54	1.5	357	255	251	270	60		73		3
9	90	~~1030~~ 1100	830.806	2.2	1.69	1.7	410	253	254	272	61		74		3
10	100		838.48	2.1	1.61	1.6	395	254	250	260	53		78		2.5
11	110		846.05	2.2	1.69	1.7	412	254	252	270	54		77		2.5
12	120	~~1130~~ 1200	853.246	1.9	1.46	1.5	415	253	256	272	55		78		3
1	130		857.55	.61	.46	.5	391	259	260	241	58		77		~~2~~ 1
2	140		862.75	1.1	.84	.84	410	255	248	260	58		78		1.5
3	150	~~1230~~ 1300	869.395	1.5	1.15	1.2	415	254	247	270	58		78		2
4	160		874.73	.90	.69	.7	387	254	247	270	65		89		1
5	170		881.46	2.0	1.54	1.5	409	255	251	270	58		89		1
6	180	~~1330~~ 1400	890.990	2.9	2.23	2.2	412	255	252	273	56		91		4
7	190		898.06	2.5	1.92	1.9	404	255	249	269	61		95		4
8	200		903.83	1.2	.92	.92	429	254	256	272	62		96		3
9	210	~~1430~~ 1500	909.229	1.1	.84	.84	448	254	263	272	66		95		3
10	220		916.45	2.1	1.61	1.6	437	254	257	264	66		99		1
11	230		921.35	.96	.73	.73	440	255	255	270	62		98		2
12	240	1530	926.096	.96	.73	.73	448	255	254	272	63		99		2
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JH

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MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet

2 G

Project Information		**Equipment Identification**	
Date	5/21/19	Ref. Thermometer	—
Project #	006AS-596331	Hygrometer	—
Customer / Facility	Owens IL Portland North	Field Balance	710
Unit ID / Sample Location	Furnace A	Check Weights	10641
Run #	1-3	Calipers	39744
Operator	JCH		

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/21/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, %	—
Temperature, °F	—
Mobile lab #	TU3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout		611.9	692.9		611.7	691.3		611.8	691.4	
Impinger 1	772.6	~~769.2~~	837.6		768.3	828		771.4	837.9	
Impinger 2	753.1	~~644.5~~	771.3		737.1	750.6		744.2	762.2	
Impinger 3	626.6	637.5	628.2		629.1	630.3		626.5	632.2	
Impinger 4		709.2	714.9		704.6	722.6		709.4	722.3	
Impinger 5		736.2	734.7		727.2	729.9		744.0	744.9	
Impinger 6		821.1	849.9		835.0	861.5		825.7	854.9	
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

		D1	D2	D3	Average
312 Nozzle 1 diameters					
309 Nozzle 2 diameters	.1685	.1685	.1685	.1685	
302 Nozzle 3 diameters	.1595	.1595	.1600	.1597	

Nozzle Material ☐ quartz ☒ glass ☐ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other

Filter Number: Run 1: — Run 2: — Run 3: — Run ___:

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Reagent Information

Type	Lot Number
.1N HNO3	6339
10% H2SO4	7032
DI	C191240200DIWTR
5%/10%	210-67-8

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____________ Team Leader: ____________

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MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Project Information
Date 5-21-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace A - South Stack
Run # 1 Operator AG/SM/SH

Sampling Conditions
Static Pressure, in. H_2O -1.2
Barometric Pressure, in. Hg 29.6
Wind Speed / Direction —
Probe / Filter Temp Range, °F 248 ± 25
Ambient Temp, °F —
Ref. Barometer ID PDX Airport
Precipitation, Y / N, type N

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	117-UP-4	See Run 3	
Probe	117-UP-4		
Filter Box	531		
Filter Exit	MB30		
Meter outlet	MB30		
Impinger Exit	GS-2		
Other			

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID MB30
Umbilical ID —
Nozzle ID G902
Pitot / Probe ID 117
Manometer ID MB30
Sensitivity 0.1

Calibration
Meterbox Y 0.9863
Meterbox ΔH@, in. H_2O 1.8243
Nozzle diameter, Dn, in. 0.1948
Pitot coefficient, Cp 0.84
Manometer zero and level ☑ yes
K-Factor 0.87

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 4.2	☐ @ —	☑ @ 4
Pitot (-), pass @ in. H_2O	0 @ 3.7	☐ @ —	☑ @ 5
Pitot visual inspection	☑ pass	☑ pass	☑ pass
Nozzle visual inspection	☑ pass	☑ pass	☑ pass
Meter, cfm @ in. Hg	0.004 @ 10	0.002 @ 14	0.001 @ 9

Intermediate leak check volume, ft^3 537.142 to 537.153

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1-1	0	9:30	462.743	—	—	—	—	—	—	—	—	—	—		—
1-2	10		467.38	.76	.66	.66	347	251	265	~~246~~ 249	59	75	74	N/A	2
2 3	20		472.93	.76	.66	.66	367	251	265	249	57	77	74		2
3 4	30	10:00 10:30	476.158	.66	.57	.57	378	248	265	259	59	81	76		2
4 5	40		481.13	.96	.87	.87	362	253	265	271	57	80	79		2
5 6	50		487.74	1.4	1.2	1.2	383	249	264	269	57	~~79~~ 84	79		2
6 7	60	11:00 11:30	495.135	2.0	1.7	1.7	366	249	265	256	58	86	81		3
7 8	70		504.21	2.5	2.2	2.2	346	253	265	232	58	82	81		3
8 9	80		510.53	1.4	~~2.6~~ 1.6	~~2.2~~ [illegible]	366	247	266	246	62	87	81		3
9 10	90	12:00 12:30	517.469	1.7	1.5	1.5	372	252	265	270	55	90	81		3
10 11	100		523.99	1.5	1.3	1.3	329	249	268	237	50	85	83		2
11 12	110		530.09	1.7	1.5	1.5	343	250	238	239	52	86	83		2
12	120	13:00 14:30	537.142	1.5	1.3	1.3	366	249	264	239	53	90	83		2
1	130		542.16	.84	.73	.73	343	249	265	229	54	81	81		2
2	140		547.56	1.0	.87	.87	370	250	265	288	52	83	81		2
3	150	15:00 15:30	554.930	2.3	2.01	2.0	354	251	253	248	53	88	82		3
4	160		562.48	2.1	1.8	1.8	322	251	265	272	52	85	83		3
5	170		572.35	3.4	3.0	3.0	341	249	265	269	55	88	84		4
6	180	16:00 16:30	582.466	3.6	3.1	3.1	343	248	265	261	55	91	84		4
7	190		589.34	1.7	1.5	1.5	332	252	265	242	56	88	85		3
8	200		594.99	1.1	.96	.96	359	251	265	265	59	86	85		2
9	210	17:00 17:30	600.426	1.1	.966	.96	387	249	265	242	60	89	84		2
10	220		604.72	.60	.52	.44	313	249	265	271	65	86	84		2
11	230		608.33	.51	.44	.44	350	250	265	270	64	86	84		2
12	240	18:00	612.067	.51	.44	.44	351	251	265	228	63	87	84		2
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By AG Team Leader

✓ Leak check at port change

001AS

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information	
Date	5-22-19
Project #	006AS-596331
Customer/Facility	Owens Illinois
Unit ID/Sample Location	Furnace A / South Stack
Run #	Metals-Ru 2
Operator	JM / AG / PB / SH

Sampling Conditions			
Static Pressure, in. H_2O	-1.1	Ambient Temp, °F	—
Barometric Pressure, in. Hg	29.98	Ref. Barometer ID	PDX Airport
Wind Speed / Direction	—	Precipitation, Y / N, type	N
Probe / Filter Temp Range, °F	248±25		

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	117-NP-4	See Run	
Probe	117-NP-4		
Filter Box	531		
Filter Exit	TC		
Meter outlet	MB30		
Impinger Exit	GB-2	3	
Other			
Ref. Thermometer ID			
Continuity Check ☐ Continuity w/ Proper Polarity			
Notes:			

Sampling Equipment IDs	
Meterbox ID	MB30
Umbilical ID	—
Nozzle ID	G902
Pitot / Probe ID	117-NP-4
Manometer ID	MB30
Sensitivity	0.01

Calibration	
Meterbox Y	0.9865
Meterbox ΔH@, in. H_2O	1.8243
Nozzle diameter, Dn, in.	.1948
Pitot coefficient, Cp	0.84
Manometer zero and level	✓ yes
K-Factor	.87

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 4	☐ ~~@~~	☑ @ 3
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ ~~@~~	☑ @ 4
Pitot visual inspection	✓ pass	✓ pass	✓ pass
Nozzle visual inspection	✓ pass	✓ pass	✓ pass
Meter, cfm @ in. Hg	0.002 @ 10	0.002 @ 9	0.002 @ 10
Intermediate leak check volume, ft^3	~~702.70~~ 1.975 to 702.125		

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
—	0	8:30	612.306	—	—	—	—	—	—	—	—	—	—	N_2	—
1	10		617.83	1.1	.96	.96	334	251	265	237	49	64	63		2
2	20		623.49	1.2	1.0	1.0	375	252	265	271	51	70	64		2
3	30	~~9:00~~ 9:30	629.293	1.3	1.1	1.1	384	250	265	249	52	72	65		2
4	40		635.66	1.5	1.3	1.3	337	250	265	267	50	70	66		2
5	50	~~9:47~~ 10:20	664.19	2.5	2.2	2.2	341	250	265	260	51	73	67		4
6	60	~~[illegible]~~	653.28	3.2	2.8	2.8	314	251	265	268	53	77	71		5
7	70		661.42	2.4	2.1	2.1	353	250	260	247	55	79	72		4
8	80	~~11:00~~ 11:30	669.38	2.3	2.0	2.0	358	257	260	261	59	86	76		4
9	90	~~[illegible]~~	676.96	2.1	1.8	1.8	331	245	255	261	55	85	80		3
10	100		682.57	1.1	~~1.1~~ .96	.96	374	249	260	265	55	87	81		3
11	110	~~12:00~~	686.68	.68	.59	.59	364	250	260	243	56	89	83		2
12	120	~~12:30~~	689.88	.37	.32	.32	333	246	255	249	63	88	87		2
1	130		696.82	1.7	1.5	1.5	349	252	255	256	54	86	87		3
2	140	~~13:30~~	704.29	2.0	1.4	1.7	353	249	255	251	~~62~~	88	87		3
3	150	~~13:30~~	711.73	2.0	1.7	1.7	322	247	255	241	51	82	89		3
4	160		719.02	1.8	1.6	1.6	344	249	255	249	54	90	89		3
5	170	~~14:00~~ 14:30	728.50	3.2	2.8	2.8	346	251	265	266	54	94	89		5
6	180		731.43	2.2	1.9	1.9	336	247	245	247	55	87	87		4
7	190		743.99	2.1	1.8	1.8	373	250	243	251	58	90	88		3
8	200	~~15:00~~ 15:30	749.52	1.1	.96	.96	409	251	252	253	60	91	89		2
9	210		754.38	.94	.73	.73	354	251	264	267	61	87	90		2
10	220		759.01	.77	.67	.67	399	257	265	262	61	85	88		2
11	230	~~16:00~~ 16:30	763.18	.62	.54	.54	398	248	255	297	60	84	88		2
12	240	16:43	766.522	.39	.34	.34	397	249	265	269	66	82	83		2
Averages															

QA/QC Check: Completeness x Legibility x Accuracy x Specifications x Checked By AG Team Leader

001AS-QMS-FM-225

☐ pause - South campaign box lost power - paused to match up with port change
Leak check at port change

JM 5-22-19

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

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Project Information

Date 5-23-19 Project # 0GGAS-596331
Customer/Facility Owens Illinois, Portland, OR
Unit ID/Sample Location Furnace A / South Stack
Run # Metals-Run 3 Operator JM

Sampling Conditions

Static Pressure, in. H_2O -1.2 Ambient Temp, °F -
Barometric Pressure, in. Hg 29.97 Ref Barometer ID PDX Airport
Wind Speed / Direction Precipitation, Y / N, type N
Probe / Filter Temp Range, °F 248±25

ALT 011	TC ID:	Ambient °F	Ref °F
Stack	117-NP-4	68	69.3
Probe	117-NP-4	67	67.8
Filter Box	531	68	68.1
Filter Exit	TC	68	68.1
Meter outlet	MB30	66	67.6
Impinger Exit	LS-2	67	67.9
Other			

Ref. Thermometer ID ST-2
Continuity Check ☑ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs

Meterbox ID MB30
Umbilical ID -
Nozzle ID 6902
Pitot / Probe ID 117-NP-4
Manometer ID MB30
Sensitivity 0.01

Calibration

Meterbox Y 0.9865
Meterbox ΔH@, in. H_2O 1.8243
Nozzle diameter, Dn, in. 0.1948
Pitot coefficient, Cp 0.84
Manometer zero and level ☑ yes
K-Factor .87

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 4
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 4
Pitot visual inspection	☑ pass	☑ pass	☑ pass
Nozzle visual inspection	☑ pass	☑ pass	☑ pass
Meter, cfm @ in. Hg	0.002 @ 12	0.002 @ 10	0.004 @ 12

Intermediate leak check volume, ft^3 852.429 → 852.620

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
-	0	8:30	766.07	-	-	-	-	-	-	-	-	-	-	Ng	-
1	10		772.88	1.3	1.1	1.1	321	252	255	295	47	65	64		2
2	20		779.99	1.8	1.6	1.6	336	247	255	258	51	66	64		2
3	30	9:00 / 9:30	787.492	2.1	1.8	1.8	342	250	251	248	53	70	65		3
4	40		794.69	1.9	1.7	1.7	314	248	250	243	53	66	64		3
5	50		803.57	2.7	2.4	2.4	327	249	255	246	54	66	64		5
6	60	10:00 / 10:30	813.286	3.5	3.0	3.0	338	249	255	240	54	70	65		6
7	70		822.44	3.1	2.7	2.7	357	251	258	248	56	76	73		5
8	80		830.99	2.7	2.3	2.3	359	251	255	262	56	77	73		5
9	90	11:00 / 11:30	838.698	1.8	1.6	1.6	386	248	255	236	58	81	75		4
10	100		844.3	1.2	1.0	1.0	353	250	255	257	58	72	71		2
11	110		849.10	.81	.70	.70	374	252	255	261	58	73	71		2
12	120	12:00 / 12:30	852.429	.43	.37	.37	359	244	255	244	60	73	~~72~~ 71 QM		2
1	130		857.87	.98	.85	.85	350	248	255	261	65	81	81		2
2	140		864.05	1.4	1.2	1.2	365	248	255	260	64	84	84		2
3	150	13:00 / 13:30	871.820	2.2	1.9	1.9	367	250	255	243	59	85	82		4
4	160		879.65	2.3	2.0	2.0	391	255	269	260	59	86	84		4
5	170		888.60	3.5	3.0	3.0	397	251	255	272	57	87	85		6
6	180	14:00 / 14:30	898.008	3.1	2.7	2.7	360	254	245	272	60	89	86		5
7	190		904.46	1.9	1.7	1.7	335	242	244	250	61	89	89		4
8	200		911.75	1.4	1.2	1.2	372	251	250	265	62	94	91		3
9	210	15:00 / 15:30	917.871	1.3	1.1	1.1	371	249	255	299	64	96	95		3
10	220		923.31	.96	.84	.84	338	251	255	270	66	94	96		2
11	230		926.86	.51	.44	.44	339	251	255	266	64	92	92		2
12	240	16:00	930.260	.42	.37	.37	348	250	255	261	66	93	92		2
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AG Team Leader

R ~~Leack~~ Leak Check at port change

001AS-QMS-FM-225

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet

29

Project Information		**Equipment Identification**	
Date	5/21/19	Ref. Thermometer	–
Project #	006AS-596331	Hygrometer	–
Customer / Facility	Owens IL Portland South	Field Balance	710
Unit ID / Sample Location	Furnace A South	Check Weights	10604
Run #	1-3	Calipers	39744
Operator	JH		

Balance Audit (Field balance must be within 0.5g of check weight mass)			
Date	5/21/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)	
Relative humidity, %	–
Temperature, °F	–
Mobile lab #	TU3

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout	MT	614.9	680.1		616.2	646.6	5A	~~445.9~~	615.9	663.1
Impinger 1	5%10%	710.4	764.5		709.5	759.8	5A	~~543.8~~	710.6	708.5
Impinger 2	5%10%	713.9	725.6		713.5	731.9	5A	~~544.0~~	711.5	729.0
Impinger 3	MT	620.7	624.4		621.1	623.7	5A	~~453.2~~	620.1	622.3
Impinger 4	Knock	734.1	736.1		730.1	767.6		745.7		773.9
Impinger 5	Knock	736.3	737.9		731.4	770.5		765.8		731.2
Impinger 6	Silica	939.1	861.1		767.7	785.7		~~565.6~~	732.4	753.5
Impinger 7									5A	
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

		D1		D2		D3		Average
311	Nozzle 1 diameters	.1555	.1555		.1550		.1553	
307	Nozzle 2 diameters	.1545	.1545		.1545		.1545	
301	Nozzle 3 diameters	.1550	.1545		.1545		.1546	

Nozzle Material ☐ quartz ☒ glass ☐ steel ☐ titanium ☐ inconel ☐ other ____

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other ____

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other ____

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other ____

Filter Number: Run 1: N/A Run 2: N/A Run 3: N/A Run ____

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other N/A

Reagent Information		**Sample Observations**
Type	**Lot Number**	
See 5/21/19		
FA North		

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by:____ Team Leader:____

001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Project Information

Date 5-16-19 Project # 006AS-596331

Customer/Facility Owens

Unit ID/Sample Location Furnace D

Run # 1 Operator SH

Sampling Equipment IDs MB4

Meterbox ID ~~MB29~~ MB4

Umbilical ID —

Nozzle ID 504

Pitot / Probe ID 118

Manometer ID MB29

Sensitivity 0.1

Calibration

Meterbox Y 0.9927

Meterbox ΔH@, in. H_2O 1.7773

Nozzle diameter, Dn, in. 0.3056

Pitot coefficient, Cp 0.84

Manometer zero and level ☐ yes

K-Factor 3.23

Sampling Conditions

Static Pressure, in. H_2O -0.08

Barometric Pressure, in. Hg 29.46

Wind Speed / Direction 6 mph SE

Probe / Filter Temp Range, °F 248 ± 25

Ambient Temp, °F 57

Ref. Barometer ID —

Precipitation, Y / N, type Rain

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.2	0 @ 3.0	0 @ 3.4
Pitot (-), pass @ in. H_2O	0 @ 3.2	0 @ 3.0	0 @ 3.2
Pitot visual inspection	pass	pass	pass
Nozzle visual inspection	pass	pass	pass
Meter, cfm @ in. Hg	0.004 @ 11	0.00 @ 9	0.012 @ 11
Intermediate leak check volume, ft^3		1 0.0910	*0.39

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	See		
Probe			
Filter Box	Run 2		
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID —

Continuity Check ☑ Continuity w/ Proper Polarity

Notes: Port change restart at 909.933 vm ft3 after leak check filter change

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
2-1	0	0850	835.479	0.45	1.45	1.5	668	249	254	254	65		72		3
2	10		842.34	0.40	1.29	1.3	651	257	251	251	65		72		3
3	20		848.67	0.40	1.29	1.3	691	251	255	255	64		72		3
4	30		855.01	0.45	1.45	1.5	683	249	260	260	64		73		3
5	40		861.74	0.42	~~6~~ 1.35 5-16-19	1.4	733	249	260	260	64		73		3
6	50		868.40	0.40	1.29	1.3	754	247	259	259	64		75		3
7	60		874.93	0.38	1.22	1.2	657	250	251	251	64		74		3
8	70		881.13	0.35	1.13	1.1	690	247	249	249	63		75		3
9	80		887.15	0.30	.9690	.97	699	253	240	240	64		75		3
10	90		892.77	0.34	1.09	1.1	694	250	241	241	65		75		3
11	100		898.65	0.34	1.09	1.1	736	249	248	248	65		76		3
12	110		904.43	0.30	0.97	0.97	754	249	247	247	65		77		3
1-1	120	1050 1130	909.842	0.50 5-16-19	~~9~~ 1.61	1.6	744	248	243	243	66		78		5
2	130		914.78	0.40	1.29	1.3	761	248	239	239	64		74		~~5~~ 6
3	140		920.71	0.35	1.13	1.1	659	249	239	239	63		75		6
4	150		926.39	0.38	1.22	1.2	674	248	237	237	61		76		7
5	160		932.47	0.41	1.32	1.3	691	248	238	238	61		76		7
6	170	1255	938.65	0.40	1.29	1.3	770	247	239	239	61		77		3
7	180	1242	945.23	0.38	1.22	1.2	676	249	237	237	60		78		3
8	190		951.28	0.35	1.12	1.1	695	248	240	240	61		77		3
9	200		957.27	0.38	1.22	1.2	712	244	250	250	62		77		3
10	210		963.31	0.42	1.35	1.4	715	247	244	244	62		81		3
11	220		969.99	0.40	1.29	1.3	756	250	229	239	61		80		3
12	230		976.55	0.34	1.09	1.1	769	251	239	239	62		81		3
	240	1352	982.525	—	—	—	—	—	—	—	—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By VB Team Leader JH

001AS-QMS-FM-225

*See back of sheet for filter change

Furnace D EPA 29 5-16-19
Run 1

Filter Change

Stop Time	Stop Vm	Pre Leak ✓	Post Leak ✓	Restart Volume	Restart Time
1225	939.536	0.003 @ 10	0.018 @ 10	939.926	1244

Volume
Leak check
0.390

MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Project Information		Sampling Conditions		ALT 011	TC ID:	Ambient °F	Ref. °F
Date: 5-16-19	Project #: OOGAS-596331	Static Pressure, in. H_2O: +0.08	Ambient Temp, °F: 58	Stack	118	61	61.4
Customer/Facility: Owens		Barometric Pressure, in. Hg: 29.46	Ref. Barometer ID: —	Probe	118	61	61.3
Unit ID/Sample Location: Furnace D		Wind Speed / Direction: 7 mph SE	Precipitation, Y (N) type: —	Filter Box	530	58	58.1
Run #: 2	Operator: SH	Probe / Filter Temp Range, °F: 248 ± 25		Filter Exit	FE	56	55.8
				Meter outlet	MB29	65	65.4
				Impinger Exit	GS2	59	58.7
				Other	—	—	—

Sampling Equipment IDs	MB4	Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	~~MB29~~	Meterbox Y	0.9927	Pitot (+), pass @ in. H_2O	@ 3.1	—	@ 3.4
Umbilical ID	—	Meterbox ΔH@, in. H_2O	1.7773	Pitot (-), pass @ in. H_2O	@ 3.3	—	@ 3.5
Nozzle ID	~~5046503~~ SH 5-16-19	Nozzle diameter, Dn, in.	0.3082	Pitot visual inspection	pass	pass	pass
Pitot / Probe ID	118	Pitot coefficient, Cp	0.84	Nozzle visual inspection	pass	pass	pass
Manometer ID	MB29	Manometer zero and level	yes	Meter, cfm @ in. Hg	0.006 @ 11	0.005 @ 10	0.008 @ 11
Sensitivity	0.1	K-Factor	3.20	Intermediate leak check volume, ft^3		10.1280	

Ref. Thermometer ID: ST 2

Continuity Check: Continuity w/ Proper Polarity

Notes: Changed filter at port change restart at 1060.794 vm ft3

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	1507	983.899	0.50	1.60	1.6	703	248	233	233	66		78		3
2	10		991.01	0.51	1.63	1.6	712	249	237	237	65		79		3
3	20		998.18	0.51	1.63	1.6	742	249	239	239	64		76		3
4	30		1005.13	0.49	1.56	1.6	767	247	240	240	63		76		3
5	40		1012.26	0.49	1.56	1.6	784	250	241	241	61		78		3
6	50		1019.38	0.45	1.44	1.4	689	249	238	238	60		79		3
7	60		1026.14	0.39	1.25	1.3	702	247	239	239	59		78		3
8	70		1032.56	0.38	1.24	1.3	718	247	240	240	56		81		3
9	80		1038.94	0.36	1.15	1.2	732	251	238	238	56		80		3
10	90		1045.18	0.35	1.12	1.1	756	249	239	239	56		80		3
11	100		1050.90	0.35	1.12	1.1	775	250	240	240	56		79		4
12	110		1055.64	0.35	1.12	1.1	690	250	241	241	56		80		7
1	120	1707/1733	1060.666	0.33	1.05	1.1	712	249	244	244	58		74		3
2	130		1066.76	0.36	1.15	1.2	737	248	239	239	56		74		3
3	140		1072.83	0.40	1.28	1.3	664	249	237	237	55		75		3
4	150		1079.24	0.40	1.28	1.3	684	249	238	238	54		74		3
5	160		1085.67	0.40	1.28	1.3	702	248	243	243	54		79		3
6	170		1092.13	0.45	1.44	1.4	708	250	249	249	54		78		3
7	180	SH 5-16-19	1098.73	0.40	1.28	1.3	741	248	251	251	55		79		3
8	190	1105.23	~~1150.23~~	0.38	1.24	1.2	760	251	255	255	55		78		4
9	200		1111.78	0.35	1.12	1.1	671	250	249	249	56		80		3
10	210		1117.39	0.35	1.12	1.1	694	249	250	250	56		81		4
11	220		1123.18	0.33	1.05	1.1	705	248	250	250	56		82		4
12	230		1129.27	0.35	1.12	1.1	705	249	253	253	57		82		4
	240	1933	1135.275	—	—	—	—	—	—	—	—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By: PB Team Leader: SH

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MONTROSE AIR QUALITY SERVICES

EPA Method 29 Field Datasheet (Isokinetic)

Project Information		Sampling Conditions	
Date	5-17-19	Static Pressure, in. H_2O	+0.08
Project #	00GAS-596331	Ambient Temp, °F	53
Customer/Facility	Owens	Barometric Pressure, in. Hg	29.81
Unit ID/Sample Location	Furnace D	Ref Barometer ID	—
Run #	3	Wind Speed / Direction	4 SE
Operator	SH	Precipitation, Y (N) type	—
		Probe / Filter Temp Range, °F	248 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	118	67	66.8
Probe	118	68	67.5
Filter Box	530	60	59.9
Filter Exit	530	60	59.9
Meter outlet	MB29	61	61.1
Impinger Exit	65-2	55	55.3
Other	—	—	—

Ref. Thermometer ID: 572

Continuity Check ✓ Continuity w/ Proper Polarity

Notes: filter change at port change restart at 212.790 cuft³

Sampling Equipment IDs	
Meterbox ID	MB24 MB24
Umbilical ID	—
Nozzle ID	60
Pitot / Probe ID	118
Manometer ID	MB29
Sensitivity	0.1

Calibration	
Meterbox Y	0.9927
Meterbox ΔH@, in. H_2O	1.7773
Nozzle diameter, Dn, in.	~~0.3082~~ 0.3082
Pitot coefficient, Cp	0.84
Manometer zero and level	✓ yes
K-Factor	3.20

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.4	@ —	0 @ 3
Pitot (-), pass @ in. H_2O	0 @ 3.7	@ —	0 @ 4
Pitot visual inspection	✓ pass	✓ pass	✓ pass
Nozzle visual inspection	✓ pass	✓ pass	✓ pass
Meter, cfm @ in. Hg	0.014 @ 11	0.004 @ 10	0.00 @ 10
Intermediate leak check volume, ft³		0.1240	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft³	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
2-1	0	0751	135.398	0.44	1.40	1.4	666	250	235	235	66		64		3
-2	10		141.94	0.45	1.44	1.4	684	248	236	236	65		67		3
3	20		148.39	0.45	1.44	1.4	695	248	238	238	62		71		3
4	30		155.05	0.46	1.47	1.5	696	249	238	238	59		70		3
5	40		161.77	0.46	1.47	1.5	738	251	244	244	58		74		3
6	50		168.64	0.44	1.40	1.4	760	248	245	245	57		76		3
7	60		175.31	0.40	1.28	1.3	666	247	250	250	58		77		3
8	70		181.73	0.39	1.21	1.2	690	248	253	253	58		78		3
9	80		187.88	0.35	1.12	1.1	701	249	252	252	58		79		3
10	90		193.84	0.40	1.28	1.3	686	248	252	252	57		84		3
11	100		200.26	0.40	1.28	1.3	734	248	253	253	57		85		3
12	110		206.64	0.38	1.21	1.2	757	247	247	247	57		85		3
1-1	120	0951 / 1012	212.666	0.50	1.60	1.6	708	249	248	248	58		85		3
-2	130		220.18	0.50	1.60	1.6	720	251	251	251	59		84		3
3	140		226.89	0.49	1.56	1.6	745	251	250	250	59		84		3
4	150		233.77	0.48	1.53	1.5	767	250	249	249	60		82		3
5	160		240.68	0.50	1.60	1.6	678	248	251	251	60		82		3
6	170		247.98	0.48	1.53	1.5	699	250	251	251	60		84		3
7	180		254.83	0.40	1.28	1.3	713	251	248	248	59		82		3
8	190		261.22	0.35	1.12	1.1	699	248	250	250	60		84		3
9	200		267.03	0.29	.9280	.93	730	248	250	250	60		82		3
10	210		272.54	0.27	~~.8640~~	~~.86~~ AG	744	249	250	250	61		80		3
11	220		277.87	0.30	1.14	1.1	665	248	253	253	61		82		3
12	230		283.21	0.25	.9550	.96	680	250	249	249	61		81		3
	240	1216	289.597	—	—	—	—	—	—	—	—		—	—	—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By [signature] Team Leader [signature]

AG* 1.034 and 1.0

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MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 29

Project Information

Date 5/16/19 Project # 006AS-596331

Customer / Facility Owens IC

Unit ID / Sample Location Furnace D

Run # 1- Operator JH

Equipment Identification

Ref. Thermometer —

Hygrometer —

Field Balance 710

Check Weights 10641

Calipers 39744

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/16/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F —

Mobile lab # TU7

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout	MT	613.3	908.3		603.6	804.1		616.9	867.7	
Impinger 1	5%/10%	705.3	869.2		772.9	1002.9		705.4	928.2	
Impinger 2	5%/10%	711.8	741.2		742.2	816.4	715.7	~~613.4~~ 54	765.7	
Impinger 3	MT	607.5	631.6		632.4	664.2		621.5	629.1	
Impinger 4	Knock	708.0	738.0		706.1	723.4		734.5	767.4	
Impinger 5	730.1	~~732.1~~	733.4		705.4	712.5		735.1	741.2	
Impinger 6	silica	817.8	845.4		847.4	880.7		825.0	850.5	
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

914	Nozzle 1 diameters	.2205	D1	.2205	D2	.2200	D3	.2203 Average
503	Nozzle 2 diameters	.3085	D1	.3090	D2	.3080	D3	.3082 Average
	Nozzle 3 diameters		D1		D2		D3	Average

Nozzle Material ☐ quartz ☒ glass ☐ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☒ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other

Filter Number: Run 1: — Run 2: — Run 3: — Run

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Reagent Information

Type	Lot Number
	544
F A North	

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____ Team Leader: ____

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Appendix B.5
Total and Hexavalent Chromium Data Sheets

MONTROSE AIR QUALITY SERVICES

CARB ~~EPA~~ Method 425 Field Datasheet (Isokinetic)
JM 5-21-19

Project Information		Sampling Conditions			
Date	5-21-19	Static Pressure, in. H_2O	-1.1	Ambient Temp, °F	65
Project #	00GAS-596331	Barometric Pressure, in. Hg	29.6	Ref. Barometer ID	—
Customer/Facility	Owens	Wind Speed / Direction	9 NE	Precipitation, Y / N /type	—
Unit ID/Sample Location	Furnace A North	Probe / Filter Temp Range, °F	248 ± 25		
Run #	~~1~~ ~~2~~ 3	Operator	AG/JM/SH		

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	4-14	~~67.5~~ 68	67.5
Probe	4-14	68	
Filter Box	Sen-05-1	67	
Filter Exit	—		
Meter outlet	MB4	69	
Impinger Exit	I-45	68	
Other	—		

Ref. Thermometer ID 1607535 M
Continuity Check ☑ Continuity w/ Proper Polarity
Notes: See back of sheet

Sampling Equipment IDs	
Meterbox ID	MB4 29
Umbilical ID	—
Nozzle ID	G309
Pitot / Probe ID	4-14
Manometer ID	MB4 29
Sensitivity	0.1

Calibration	
Meterbox Y	0.9875
Meterbox ΔH@, in. H_2O	1.8038
Nozzle diameter, Dn, in.	0.1685
Pitot coefficient, Cp	0.84
Manometer zero and level	☑ yes
K-Factor	0.47

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.8	~~@~~	✓ @ 3.6
Pitot (-), pass @ in. H_2O	0 @ 3.6	~~@~~	✓ @ 4.2
Pitot visual inspection	☑ pass	~~pass~~	☑ pass
Nozzle visual inspection	☑ pass	~~pass~~	☑ pass
Meter, cfm @ in. Hg	0.009 @ 11	~~@~~	0.003 @ 9
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temp, °F Inlet	Dry Gas Meter Temp, °F Outlet		Pump Vacuum, in. Hg
2-1	0	0900	646.159	1.2	0.56	0.56	374	255	265		57		69		2
2	10		650.31	1.5	0.71	0.71	391	260	271		55		69		2
3	20		655.24	1.1	0.51	0.51	425	259	265		52		69		2
4	30	0930	659.352	1.0	0.47	0.47	377	254	269		59		76		2
5	40	1000	663.35	1.5	0.71	0.71	408	263	271		59		77		2
6	50		668.16	2.0	0.94	0.94	407	253	268		59		77		8
7	60	1030 / 1100	673.406	2.9	1.36	1.4	373	259	267		59		78		2
8	70		680.50	2.0	0.94	0.94	416	257	270		57		78		2
9	80		686.26	SH 5-21-19 ~~2.0~~ 1.7	0.80 ~~0.94~~	0.80 ~~0.94~~	426	260	269		59		79		2
10	90	1130 / 1200	691.562	1.7	0.80	0.80	358	260	268		60		81		2
11	100		696.74	1.2	0.56	0.56	312	257	270		61		81		2
12	110		701.11	1.5	0.71	0.71	334	261	269		61		82		2
1-1	120	1230 / 1300	706.049	1.3	0.61	0.61	395	257	270		61		83		2
2	130		710.64	1.2	0.56	0.56	415	258	268		61		82		2
3	140		714.98	1.2	0.56	0.56	432	260	267		58		82		2
4	150	1330 / 1400	719.320	1.8	0.85	0.85	378	257	269		58		83		2
5	160		724.63	3.0	1.41	1.4	375	260	268		59		83		3 ~~2~~ SH 5-21-19
6	170		731.25	2.7	1.26	1.3	400	254	266		59		83		3
7	180	1430 / 1500	737.738	2.9	1.36	1.4	358	254	268		53		83		2
8	190		744.41	1.6	0.75	0.75	409	265	268		53		84		2
9	200		749.52	1.5	0.71	0.71	418	251	271		53		84		2
10	210	1530 / 1600	754.513	1.8	0.85	0.85	370	255	~~266~~		56		86		2
11	220		759.87	1.1	0.51	0.51	410	252	264		56		86		2
12	230		764.32	0.99	0.47	0.47	323	251	265		56		86		2
END	240	1630	SH 5-21-19 768.267	—		—			—				—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By PB Team Leader JM

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5-21-19 Furnace A North Carb H2S Run 1

	Stop Volume	pre leak ✓	post leak ✓	start volume	notes
*	659.352	0.008 @ 11	0.004 @ 10	659.478	pH of 9
**	673.406	0.003 @ 10	0.003 @ 12	673.528	pH of 9 - filter change
***	706.049	0.004 @ 9	0.001 @ 6	706.140	pH of 8.5 - filter change - add 30ml IN Bicarb
****	737.738	0.001 @ 6	0.002 @ 7	737.848	ph of 8.5 - filter change - added 60 mL of

Leak ✓ volume total = .126 + .122 + .049 + .110 = 0.407

MONTROSE AIR QUALITY SERVICES

Carb Method 425 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information 5-22-19 SH		Sampling Conditions			
Date ~~5-21-19~~	Project # 006AS-596331	Static Pressure, in. H_2O	-0.99	Ambient Temp, °F	—
Customer/Facility	Owens Illinois	Barometric Pressure, in. Hg	29.98	Ref. Barometer ID	—
Unit ID/Sample Location	Furnace A North	Wind Speed / Direction	—	Precipitation, Y / N, type	—
Run # 2	Operator SH	Probe / Filter Temp Range, °F	248 ± 25		

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	4-14		
Probe	4-4		
Filter Box	Sec-051		
Filter Exit	—		
Meter outlet	MB4		
Impinger Exit	I-85		
Other	—		
Ref. Thermometer ID			
Continuity Check ☐ Continuity w/ Proper Polarity			
Notes	See back of sheet		

See part

Sampling Equipment IDs	
Meterbox ID	MB4 29
Umbilical ID	—
Nozzle ID	G309
Pitot / Probe ID	4-14
Manometer ID	MB4 29
Sensitivity	0.1

Calibration	
Meterbox Y	0.9875
Meterbox ΔH@, in. H_2O	1.8038
Nozzle diameter, Dn, in.	0.1685
Pitot coefficient, Cp	0.54
Manometer zero and level	✓ yes
K-Factor	0.47

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	☐ @ —	✓ @ 4
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ @ —	✓ @ 4
Pitot visual inspection	✓ pass	☐ pass	✓ pass
Nozzle visual inspection	✓ pass	☐ ~~pass~~	✓ pass
Meter, cfm @ in. Hg	0.005 @ 11	— @	0.006 @ 10
Intermediate leak check volume, ft^3	/	/	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1-1	0	0900	768.464	1.9	0.89	0.89	359	253	265		47		64		2
2	10		773.76	1.5	0.71	0.71	399	254	268		47		64		2
3	20		778.63	1.6	0.75	0.75	409	266	268		52		65		2
4	30	~~0930~~ 1100	783.639	1.8	0.85	0.85	360	263	268		53		72		2
5	40		788.92	1.9	0.89	0.89	400	258	268		53		73		2
6	50		794.36	2.1	0.98	0.98	400	257	270		55		79		2
7	60	~~1130~~ 1200	800.252	3.3	1.55	1.6	358	255	269		58		84		3
8	70		807.39	2.9	1.36	1.4	372	249	267		59		85		3
9	80		814.21	1.6	0.75	0.75	419	251	267		56		87		3
10	90	~~1230~~ 1300	819.442	1.8	0.85	0.85	375	255	266		53		93		2
11	100		825.03	1.4	0.66	0.66	411	256	268		53		94		2
12	110		829.72	1.4	0.66	0.60	420	259	268		53		94		2
* 2-1	120	~~1330~~ ~~834~~ 1400	834.361	1.6	0.75	0.75	389	259	265		56		91		2
2	130		839.18	1.3	0.61	0.61	428	251	267		55		91		2
3	140		843.65	1.1	0.52	0.52	443	258	270		56		89		2
4	150	~~1430~~ 1500	847.867	1.8	0.85	0.85	386	255	265		56		88		2
5	160		853.18	1.9	0.89	0.89	420	257	267		56		88		2
6	170		858.66	3.0	1.41	1.4	419	258	269		56		88		3
** 7	180	~~1530~~ 1600	865.231	2.7	1.26	1.3	350	259	265		58		83		3
8	190		871.85	2.1	0.98	0.98	384	258	264		58		83		3
9	200		877.64	1.6	0.75	0.75	405	256	266		58		83		2
10	210	~~1630~~ 1700	882.723	1.6	0.75	0.75	416	256	267		58		80		2
11	220		887.67	1.5	0.71	0.71	395	255	266		58		80		2
12	230		892.64	1.6	0.75	0.75	401	254	265		58		80		2
	240	1730	897.476	—	—	—	—	—	—		—		—		—
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By DB Team Leader SH

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5-22-19 Furnace 4 North Run2 Carb 425

	Stop volume	pre leak ✓	post Leak ✓	start volume	notes
*	800.252	0.004 @ 9	0.003 @ 9	800.468 .216	-filter change -pH of 9
**	834.361	0.004 @ 10	0.002 @ 9	834.502 .141	-filter change -pH of 8.5 -added 30 mL
***	865.231	0.003 @ 20	0.003 @ 12	865.482 .251	-filter change -pH of 8.5 -added 30 mL

MONTROSE AIR QUALITY SERVICES

Carb Method 425 Field Datasheet (Isokinetic)

Project Information
Date 5-23-19 Project # 006AS-596331
Customer/Facility Owens Illinois
Unit ID/Sample Location Furnace A North
Run # 3 Operator SH

Sampling Conditions
Static Pressure, in. H_2O -1.0 Ambient Temp, °F —
Barometric Pressure, in. Hg 29.97 Ref. Barometer ID —
Wind Speed / Direction — Precipitation, Y (N) type —
Probe / Filter Temp Range, °F 248 ± 25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	4-14		
Probe	4-4		
Filter Box	Sen-05-1		
Filter Exit	—		
Meter outlet	MB4		
Impinger Exit	I-45		
Other	—		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes: See back of sheet

See raw

Sampling Equipment IDs
Meterbox ID MB4 29
Umbilical ID —
Nozzle ID 6309
Pitot / Probe ID 4-14
Manometer ID MB4 29
Sensitivity 0.1

Calibration
Meterbox Y 0.9875
Meterbox ΔH@, in. H_2O 1.8038
Nozzle diameter, Dn, in. 0.1685
Pitot coefficient, Cp 0.84
Manometer zero and level ☑ yes
K-Factor 0.47

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 4	☐ @ —	✓ @ 5
Pitot (-), pass @ in. H_2O	✓ @ 5	☐ @ —	✓ @ 4
Pitot visual inspection	✓ pass	☐ ~~pass~~	✓ pass
Nozzle visual inspection	✓ pass	☐ ~~pass~~	✓ pass
Meter, cfm @ in. Hg	0.004 @ 11	— @	0.004 @ 11
Intermediate leak check volume, ft^3	—	/ —	/ —

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
2-1	0	0800	897.655	1.9	0.89	0.89	348	256	269		59		65		2
2	10		902.48	1.7	0.80	0.80	423	254	267		57		65		2
3	20		908.03	2.1	0.99	0.99	420	261	269		57		65		2
4	30	0850 / 0900	913.753	2.5	1.17	1.2	366	249	257		54		65		3
5	40		919.72	2.4	1.13	1.1	407	262	265		54		65		4
6	50		925.27	1.3	0.61	0.61	430	263	269		54		65		6
7	60	0930 / 1000	929.663	3.0	1.41	1.4	347	257	263		58		68		2
8	70		936.83	2.2	1.03	1.0	377	251	272		58		68		2
9	80		942.27	2.1	0.99	0.99	397	254	268		62		71		2
10	90	1030 / 1100	948.010	1.8	0.85	0.85	371	251	270		57		73		2
11	100		953.31	2.2	1.03	1.03	372	262	269		55		74		2
12	110		959.37	2.0	0.94	0.94	399	254	266		55		74		4
1-1	120	1130 / 1200	964.915	1.3	0.66	0.66	360	250	268		56		77		2
2	130		969.57	0.95	0.45	0.45	406	249	269		56		77		2
3	140		973.48	1.5	0.71	0.71	415	253	269		57		77		2
4	150	1230 / 1300	978.381	2.1	0.99	0.99	370	248	263		58		82		2
5	160		984.14	2.2	1.03	1.0	392	251	266		58		84		2
6	170		990.14	2.4	1.13	1.1	400	267	269		53		86		3
7	180	1330 / 1400	996.007	2.4	1.13	1.1	376	253	268		52		91		2
8	190		1002.12	1.8	0.85	0.85	395	256	264		52		91		2
9	200		1007.55	1.5	0.71	0.71	415	261	266		55		93		2
10	210	1430 / 1500	1012.484	1.7	0.80	0.80	384	254	268		56		94		2
11	220		1017.62	1.5	0.71	0.71	403	256	263		56		94		2
12	230		1022.45	1.5	0.71	0.71	416	253	262		57		95		2
END	240	1530	~~1027.91~~ SH 5-23-19	—	—	—	—	—	—		—		—		—
Averages			1027.29												

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By MB Team Leader SH

001AS-QMS-FM-225

5-23-19 Furnace A North Run 3 Carb 425

	Stop volume	pre leak ✓	post leak ✓	start volume	notes
*	929.663	0.004 @ 10	0.003 @ 9	929.753	- pH of 9.5 - filter change
*	964.915	0.002 @ 9	0.002 @ 10	965.016	- pH of 8.5 - 30ml 1N Bicarb - filter change
#	996.007	0.002 @ 10	0.003 @ 11	996.230	pH of 8.5 - 30 ml 1N Bicarb - filter change

part change

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet

425

Page 1 of 1

Project Information

Date: 5/21/19
Project #: 006AS-596331
Customer / Facility: Owens IL Portland OR
Unit ID / Sample Location: Furnace A North
Run #: 1 - 3
Operator: JH

Equipment Identification

Ref. Thermometer: —
Hygrometer: —
Field Balance: 710
Check Weights: 10641
Calipers: 39744

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/21/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, %: —
Temperature, °F: —
Mobile lab #: 403

Moisture Determination

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout			784.6			840.2			814.7	
Impinger 1	1N Bicarb	714.8	904.6		729.6	~~904.8~~		719.5	~~974.7~~	
Impinger 2	1N Bicarb	644.8	669.9		655.3	650.6		646.2	672.3	
Impinger 3	silica	851.4	879.4		831.4	859.1		830.0	861.7	
Impinger 4										
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

G414 Nozzle 1 diameters .2590 D1 .2590 D2 .2590 D3 Average
G905 Nozzle 2 diameters .1930 D1 .1930 D2 .1925 D3 .1928 Average
902 Nozzle 3 diameters .1950 D1 .1945 D2 .1950 D3 .1948 Average

Nozzle Material ☐ quartz ☒ glass ☐ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Filter Number: Run 1: — Run 2: — Run 3: — Run : —

Back Half: ☐ quartz fiber ☐ glass fiber ☒ Teflon ☐ Teflon/quartz ☐ other

Reagent Information

Type	Lot Number
1N Sodium Bicarb	N313003
1N Sodium Bicarb	L310003

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____ Team Leader: ____

001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

Carb ~~EPA~~ Method 425 Field Datasheet (Isokinetic)

Page 1 of 1

Project Information
Date 5-29-19 Project # 006AS-596331
Customer/Facility Owens-Illinois
Unit ID/Sample Location Furnace A South
Run # 1 Operator AG

Sampling Conditions
Static Pressure, in. H_2O -1.2 Ambient Temp, °F —
Barometric Pressure, in. Hg 29.6 Ref. Barometer ID PDX Airport
Wind Speed / Direction — Precipitation, Y / N, type N
Probe / Filter Temp Range, °F 248±25

ALT 011 TC ID:

	Ambient °F	Ref. °F
Stack	See Run 3	
Probe		
Filter Box		
Filter Exit		
Meter outlet		
Impinger Exit		
Other		

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity

Sampling Equipment IDs
Meterbox ID ~~MB24~~ 4
Umbilical ID —
Nozzle ID G302
Pitot / Probe ID 118-ND-4
Manometer ID ~~MB24~~ 4
Sensitivity 0.01

Calibration
Meterbox Y .9927
Meterbox ΔH@, in. H_2O 1.7773
Nozzle diameter, Dn, in. .1597
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor 0.38

Equipment Checks

	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 3	☐ @	✓ @ 4
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ @	✓ @ 5
Pitot visual inspection	✓ pass	✓ pass	✓ pass
Nozzle visual inspection	✓ pass	✓ pass	✓ pass
Meter, cfm @ in. Hg	0.001 @ 12	0.003 @ 15	0.002 @ 15
Intermediate leak check volume, ft^3		/	/

Notes: Filter change notes on back of sheet

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	DGM Outlet		Pump Vacuum, in. Hg
1	0:00	0930	402.456	1.0	.38	.38	330	252	259	259	63		74		1
2	10:00		406.07	1.1	.418	.42	369	250	252	252	64		75		1
3	20:00		409.86	1.1	.419	.42	395	250	260	260	64		76		1
4	30:00	~~10:00~~ 1030	413.621	1.2	.456	.46	333	248	245	245	63		81		1
5	40:00	~~1045~~ 1130	417.45	2.3	.874	.87	361	249	246	246	63		79		8
6	50:00		422.77	3.3	1.254	1.30	315	248	228	228	64		77		1
7	60:00		429.41	3.0	1.14	1.1	340	249	230	230	65		78		2
8	70:00		436.03	3.5	1.33	1.3	351	246	235	235	65		79		2
9	80:00	~~1200~~ 1230	441.89	1.4	.532	.53	347	248	247	247	64		82		1
10	90:00		446.15	1.5	.57	.57	372	248	240	240	63		81		1
11	100:00	~~13:00~~ 1330	450.91	2.3	.874	.87	353	250	244	244	63		81		2
12	110:00		455.99	1.5	.57	.57	330	250	248	248	64		83		2
1	120:00		460.253	1.5	.57	.57	315	249	252	252	65		81		1
2	130:00	~~1400~~ 1430	465.38	3.0	1.19	1.1	333	247	244	244	65		82		2
3	140:00		471.44	2.5	.95	.95	354	250	250	250	64		83		2
4	150:00	~~1500~~ 1530	477.135	2.3	.874	.87	315	247	246	246	63		83		1
5	160:00		482.65	3.0	1.14	1.1	337	249	246	246	63		83		1
6	170:00		488.62	3.0	1.14	1.1	357	249	239	239	64		85		2
7	180:00	~~1600~~ 1630	494.36	2.0	.76	.76	348	~~304~~ 249	249	249	65		93		1
8	190:00		499.62	2.2	.836	.84	342	251	246	246	65		84		1
9	200:00		505.32	2.5	.95	.95	353	250	253	253	65		84		1
10	210:00	~~1700~~ 1730	510.756	1.5	.57	.57	316	247	257	257	64		83		1
11	220:00		515.42	2.0	.76	.76	345	253	253	253	64		84		2
12	230:00		520.32	1.8	.684	.68	356	251	247	247			84		3
	240:00	1800	524.629	—											
Averages					—	—	—	—	—	—	—	—	—	—	—

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By AG Team Leader

001AS-QMS-FM-225

5-21-19
Furnace A South
Run 1
carb 425

Stop Volume	Post Leak check	Pre Leak check	Start Volume		
419.79	0.001 @ 10	0.001 @ 11	420.031	(Added none)	8.5
460.253	0.001 @ 12	0.001 @ 12	460.412	(Added 30 mL)	8.5
494.36	0.001 @ 15	0.001 @ 12	494.549	(None added)	8.5

MONTROSE AIR QUALITY SERVICES

Carb Method 435 Field Datasheet (Isokinetic)

Project Information
Date 5-28-19 Project # 006AS-596331
Customer/Facility Owens-Illinois
Unit ID/Sample Location Furnace A south
Run # 2 Operator AG

Sampling Conditions
Static Pressure, in. H_2O -1.1 Ambient Temp, °F —
Barometric Pressure, in. Hg 29.98 Ref. Barometer ID —
Wind Speed / Direction — Precipitation, Y / N, type N
Probe / Filter Temp Range, °F 248±25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box			
Filter Exit	See Run 3		
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes: See back of sheet

Sampling Equipment IDs
Meterbox ID MB29 4
Umbilical ID —
Nozzle ID G311
Pitot / Probe ID 118-NP-4
Manometer ID MB294
Sensitivity 0.01

Calibration
Meterbox Y .9927
Meterbox ΔH@, in. H_2O 1.7773
Nozzle diameter, Dn, in. .1553
Pitot coefficient, Cp 0.84
Manometer zero and level ✓ yes
K-Factor .34

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	✓ @ 5	☐ ~~@~~	✓ @ 4
Pitot (-), pass @ in. H_2O	✓ @ 4	☐ ~~@~~	✓ @ 4
Pitot visual inspection	✓ pass	☐ ~~pass~~	✓ pass
Nozzle visual inspection	✓ pass	☐ ~~pass~~	✓ pass
Meter, cfm @ in. Hg	.001 @ 11	~~@~~	.002 @ 7
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	~~Exit~~	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Outlet		Pump Vacuum, in. Hg
1	0:00	0830	524.864	.8	.272	.27	308	252	215	215	62		64		1
2	10		527.75	.7	.238	.238	309	252	212	212	62		63		1
3	20		530.10	.85	.289	.290	351	249	230	230	62		66		1
4	30	~~0900~~ 0930	533.12	1.5	.51	.51	328	239	239	239	63		67		2
5	40		537.23	3.0	1.02	1.0	354	250	220	220	64		66		3
6	50	~~[illegible]~~ 1030	542.38	2.2	.85	.85	351	250	233	233	64		67		2
7	60		547.77	3.5	1.19	1.2	336	251	249	249	64		68		3
8	70		553.79	3.6	1.22	1.2	341	248	240	240	64		74		3
9	80	~~1100~~ 1130	559.57	2.7	.918	.92	330	249	258	258	65		76		3
10	90		564.79	2.2	.748	.75	347	251	246	246	65		78		3
11	100	~~1200~~ 1230	569.75	2.0	.68	.68	369	253	242	242	65		80		3
12	110		574.48	1.7	.578	~~.57~~ .58	325	248	259	259	64		79		2
1	120		578.61	.37	.1258	.13	333	252	256	256	60		83		2
2	130		581.88	.68	.2312	.23	370	251	257	257	62		83		2
3	140	~~1300~~ 1330	584.66	.90	.306	.31	371	252	254	254	63		88		2
4	150		588.17	1.0	.34	.38	387	253	251	251	64		87		2
5	160		591.81	2.0	.68	.68	375	251	250	250	65		87		3
6	170		596.79	3.0	1.02	1.0	337	249	250	250	65		85		3
7	180		602.52	2.7	.918	.92	352	253	251	251	65		86		3
8	190	~~1500~~ 1530	608.02	2.0	.68	.68	382	249	252	252	65		88		3
9	200		611.92	1.0	.38	.38	339	250	238	238	66		86		2
10	210		615.53	1.5	.51	.51	372	252	234	234	66		84		2
11	220		619.59	1.7	.578	.58	384	250	239	239	65		83		3
12	230	~~1600~~ 1630	623.89	1.0	.34	.38	369	249	259	259	66		82		
	240	16:45	627.461	—	—	—	—	—	—	—	—	—	—	—	—
Averages															

*AG

QA/QC Check: Completeness ✗ Legibility ✗ Accuracy ✗ Specifications ✗ Checked By AG Team Leader

001AS-QMS-FM-225

5-22-19 Furnace A South Run 2 Carb 425

	Stop Volume	Pre-leak check	post leak check	Start volume	mL Added	PH
	~~[illegible]~~ 555.109	.002@10	.001@8	~~[illegible]~~ 555.319 .21	None	8.5-9.0
	571.087	.001@7	0.001@7	571.123 .076	None	8.5-9.0
* port change leak check	582.569 *	.001@7	0.001@7	582.636 .067		
	593.025	.001@6	0.002@6	593.091 .066	30	8.5

MONTROSE AIR QUALITY SERVICES

Con't Method 425 Field Datasheet (Isokinetic)

Project Information		Sampling Conditions			
Date	5-23-19	Static Pressure, in. H_2O	-1.2	Ambient Temp, °F	—
Project #	006AS-596331	Barometric Pressure, in. Hg	29.97	Ref. Barometer ID	—
Customer/Facility	Owens-Illinois	Wind Speed / Direction	—	Precipitation, Y / N, type	N
Unit ID/Sample Location	Furnace A South	Probe / Filter Temp Range, °F	248±25		
Run #	3	Operator	AG		

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	48	60	60.7
Probe	118	61	60.7
Filter Box	530	60	60.7
Filter Exit	—	—	—
Meter outlet	MB29	61	60.9
Impinger Exit	GS-2	61	61.3
Other			

Ref. Thermometer ID ST-2

Continuity Check ☑ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs		Calibration	
Meterbox ID	MB29 4	~~Meterbox~~ Y	0.9927
Umbilical ID	—	Meterbox ΔH@, in. H_2O	1.7773
Nozzle ID	G311	Nozzle diameter, Dn, in.	.1553
Pitot / Probe ID	118-NP-4	Pitot coefficient, Cp	0.84
Manometer ID	MB29 4	Manometer zero and level	☑ yes
Sensitivity	0.01	K-Factor	0.34

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 3
Pitot (-), pass @ in. H_2O	☑ @ 4	☐ @	☑ @ 5
Pitot visual inspection	☑ pass	☑ pass	☑ pass
Nozzle visual inspection	☑ pass	☑ pass	☑ pass
Meter, cfm @ in. Hg	.001 @ 9	see back @	0.003 @ 12
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1	0	0830	627.924	.6	.204	.20	308	252	248	248	63		65		1
2	10		630.45	1.0	.38	.35	371	250	245	245	50.5		64		1
3	20		633.88	1.5	.51	.51	374	250	239	239	52		64		1
4	30	~~0900~~ 0930	637.304	1.5	.51	.51	305	251	232	232	53		66		1
5	40		641.50	2.7	.918	.92	346	248	227	227	49		64		2
6	50		646.90	3.5	1.19	1.2	347	248	220	220	53		66		3
7	60	~~1000~~ 1030	652.905	2.5	.85	.85	310	252	258	258	55		72		1
8	70		658.37	2.5	.85	.85	341	251	255	255	54		73		1
9	80		663.68	2.0	.76	.76	373	253	256	256	57		74		1
10	90	~~1100~~ 1130	668.622	1.5	.51	.51	225	249	248	248	56		69		1
11	100		672.76	2.0	.76	.76	357	250	247	247	55		70		2
12	110		677.70	1.8	.612	.61	373	249	247	247	57		71		2
1	120	~~1200~~ 1230	682.231	.6	.204	.20	347	246	250	250	61		80		1
2	130		684.98	.55	.187	.19	384	249	239	239	65		82		1
3	140		688.261	.75	.255	.26	395	248	248	248	62		81		1
4	150	~~1300~~ 1330	690.17	.85	.289	.29	347	257	251	251	64		86		1
5	160		693.31	1.5	.51	.51	384	249	254	254	59		85		1
6	170		697.49	3.6	1.224	1.20	350	254	256	256	59		86		3
7	180	~~1400~~ 1430	703.553	3.5	1.19	1.20	352	247	258	258	61		87		3
8	190		708.71	2.0	.76	.76	315	253	~~257~~	257	61		88		2
9	200		714.04	2.5	.85	.85	342	251	256	256	59		89		2
10	210	~~1500~~ 1530	719.06	2.0	.76	.76	355	253	252	256	62		91		2
11	220		724.03	1.7	.578	.58	352	250	257	257	62		88		2
12	230		728.53	2.0	.76	.76	360	261	252	252	63		88		3
	240	1600	733.530	—	—	—	—	—	—	—	—	—	—	—	—
Averages															

QA/QC Check: Completeness ✗ Legibility ✗ Accuracy ✗ Specifications ✗ Checked By AG Team Leader

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5-23-19 Furnace A South Run 3 Carb 425

Stop volume	post Leak check	pre-Leak check	Start volume	pH	mL Added
652.905	0.001 @ 6	0.001 @ 8	653.112	9.0	None new filter
~~645~~ 682.231	0.001 @ 9	0.002 @ 10	682.430	8.5	30 mL ~~PB~~ 1N Bicarb new filter
703.553	0.002 @ 12	0.002 @ 11	703.728	8.5	30 mL 1N Filter change

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 425

Project Information

Date 5/21/19 Project # 00645-596331

Customer / Facility Owens IL Portland OR

Unit ID / Sample Location Furnace A South

Run # 1-3 Operator JH

Equipment Identification

Ref. Thermometer —

Hygrometer —

Field Balance 710

Check Weights 10641

Calipers 39744

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	5/21/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)

Relative humidity, % —

Temperature, °F —

Mobile lab # TU3

Moisture Determination

749.7 5H

	Contents	Run1 Initial	Run1 Final	Run1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout			~~775.7~~ ~~748~~			804.9			789.4	
Impinger 1	1N Bicarb	701.5	~~720.2~~		717.9	~~844.9~~		706.5	~~827.4~~	
Impinger 2	1N Bicarb	648.8	~~647.2~~	657.4	647.2	666.6		651.1	668.2	
Impinger 3	silica	846.6	880.5		829	849.1		849.2	872.9	
Impinger 4										
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

714 Nozzle 1 diameters .2205 D1 .2210 D2 .2210 D3 Average

Nozzle 2 diameters D1 D2 D3 Average

Nozzle 3 diameters D1 D2 D3 Average

Nozzle Material ☐ quartz ☒ glass ☐ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☒ quartz ☐ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Filter Number: Run 1: — Run 2: — Run 3: — Run : —

Back Half: ☐ quartz fiber ☐ glass fiber ☒ Teflon ☐ Teflon/quartz ~~☒~~ other

Reagent Information

Type	Lot Number
1N Sodium Bicarb.	N313003
1N Sodium Bicarb	C310007

Sample Observations

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by: ____________ Team Leader: ____________

001AS-QMS-FM-226

MONTROSE AIR QUALITY SERVICES

Carb 425 Method ______ Field Datasheet (Isokinetic)

Page 1 of ____

Project Information
Date 5-16-19 Project # 006AS-596331
Customer/Facility Owens
Unit ID/Sample Location Furnace D
Run # 1 Operator AK

Sampling Conditions
Static Pressure, in. H_2O +0.08 Ambient Temp, °F 60
Barometric Pressure, in. Hg 29.46 Ref. Barometer ID ——
Wind Speed / Direction SE / 6 Precipitation (Y)/ N, type rain
Probe / Filter Temp Range, °F ~~250~~ AK 5-16-19 248±25

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	117		
Probe	117		
Filter Box	531		
Filter Exit	NA		
Meter outlet	MB-30		
Impinger Exit	GA-75		
Other			

Ref. Thermometer ID ____
Continuity Check ☐ Continuity w/ Proper Polarity
Notes: See back of sheet for Mid Run Leak checks

Sampling Equipment IDs
Meterbox ID MB-30
Umbilical ID ——
Nozzle ID 502
Pitot / Probe ID 117
Manometer ID MB-30
Sensitivity 0.01

Calibration
Meterbox Y 0.9865
Meterbox ΔH@, in. H_2O 1.8243
Nozzle diameter, Dn, in. 0.2842
Pitot coefficient, Cp 0.84
Manometer zero and level X yes
K-Factor 2.27

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.8	☐ @	0 @ 3.3
Pitot (-), pass @ in. H_2O	0 @ 3.7	☐ @	0 @ 4.0
Pitot visual inspection	X pass	☐ pass	X pass
Nozzle visual inspection	X pass	☐ pass	X pass
Meter, cfm @ in. Hg	0.005 @12	@	0.005 @14
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Outlet		Pump Vacuum, in. Hg
1-1	0	850	6.480	0.38	0.86	0.86	655	250	255		61	68	65		2.5
-2	10		11.66	0.35	0.79	0.79	641	249	AK 5-16-19 266		59	71	67		3.0
-3	20		16.37	0.30	0.68	0.68	661	249	247		59	73	67		3.0
*	30	stop -	21.035	→ Leak check	Pre	- 0.005	@ 12	Post	Leak check -	0.005 @ 12		Pf = 9.0			
-4	30	933	21.155	0.35	0.79	0.79	735	247	247		56	73	70		4.5
-5	40		26.13	0.38	0.86	0.86	762	251	239		55	76	70		5.0
-6	50		31.49	0.40	0.91	0.91	676	249	249		58	79	71		5.0
** -7	60	1015	36.910	0.48	1.09	1.1	713	248	258		68	75	72		5.5
-8	70		42.82	0.55	1.24	1.2	730	253	269		56	79	72		6.5
-9	80		48.84	0.55	1.24	1.2	759	249	249		57	81	73		6.0
-10	90		54.91	0.54	1.23	1.2	775	250	256		59	82	74		6.5
-11	100		61.01	0.55	1.25	1.2	672	250	265		59	81	74		6.5
-12	110		67.68	0.52	1.18	1.2	689	249	238		55	81	73		6.5
*** 2-1	120	11:29	73.39	0.33	0.75	0.75	732	252	251	AK 5-16-19 →	~~51~~ 53	75	73		4.0
-2	130		78.28	0.33	0.75	0.75	739	249	261		51	77	73		4.5
-3	140		83.06	0.31	0.70	0.70	640	250	244		53	79	74		4.5
-4	150		87.85	0.30	0.68	0.68	664	249	243		53	78	73		5.0
-5	160		92.47	0.31	0.70	0.70	677	250	260		53	78	73		5.0
-6	170		97.16	0.38	0.86	0.86	659	250	266		53	78	72		5.5
-7	180		102.39	0.35	0.79	0.79	695	251	243		55	79	73		6.0
-8	190		106.91	0.38	0.86	0.86	755	253	251		56	80	74		6.0
-9	200		111.60	0.40	0.91	0.91	668	251	245		56	82	75		6.5
**** -10	210	1313	118.110	0.50	1.14	1.1	708	249	256		56	78	76		7.0
-11	220		123.87	0.55	1.24	1.2	714	252	243		56	81	75		7.5
-12	230		129.97	0.55	1.24	1.2	751	250	245	AK 5-16-19	~~6~~ 59	81	74		7.5
Averages	240	1343	135.803												

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AG Team Leader ________

001AS-QMS-FM-225

5/16/19 Furnace D carb 425 Run1

	Stop Volume	Pre Leak Check	Post Leak Check	Start Volume	Ph	
*	21.035	~~21.~~ 0.005@12	0.005 @ 12	21.155	9.0	
**	36.765	0.008@12	0.003@11	36.910	8.5 - 9.0	Added 20mL 1.0 N Bicarb
***	73.243	0.005@12	0.003 @ 12	73.390	8.0 - 8.5	Added 40mL 1.0N Bicarb
****	117.937	0.004@13	0.004@13	118.110	8.0	Added 60mL 1.0 Bicarb

MONTROSE AIR QUALITY SERVICES

CARB Method 425 Field Datasheet (Isokinetic)

Project Information	
Date	5-16-19
Project #	006AS-596391
Customer/Facility	Owens
Unit ID/Sample Location	Furnace D
Run #	2
Operator	AK

Sampling Conditions			
Static Pressure, in. H_2O	0.08	Ambient Temp, °F	58
Barometric Pressure, in. Hg	29.46	Ref. Barometer ID	
Wind Speed / Direction	SE/6	Precipitation, Y/N, type	N
Probe / Filter Temp Range, °F	248 ± 25		

ALT 011	TC ID	Ambient °F	Ref. °F
Stack	~~58~~ 117 (AKS-16-19)	58	59.1
Probe	117	59	59.1
Filter Box	531	60	59.8
Filter Exit	NA	~~58~~ (AKS-16-19)	~~59.4~~
Meter outlet	MB-30	66	67.1
Impinger Exit	I-43	58	59.4
Other			

Ref. Thermometer ID ST-2

Continuity Check ✓ Continuity w/ Proper Polarity

Notes: See Back for Mid Leak check + PH notes

Sampling Equipment IDs	
Meterbox ID	MB-30
Umbilical ID	NA
Nozzle ID	G914
Pitot / Probe ID	117
Manometer ID	MB-30
Sensitivity	0.01

Calibration	
Meterbox Y	0.9865
Meterbox ΔH@, in. H_2O	1.8243
Nozzle diameter, Dn, in.	0.2203
Pitot coefficient, Cp	0.84
Manometer zero and level	✓ yes
K-Factor	6.82

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 3.3	@	0 @ 3.8
Pitot (-), pass @ in. H_2O	0 @ 4.0	@	0 @ 3.2
Pitot visual inspection	✓ pass	pass	✓ pass
Nozzle visual inspection	✓ pass	pass	✓ pass
Meter, cfm @ in. Hg	0.005 @ 14	@	0.010 @ 20
Intermediate leak check volume, ft^3	/		/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
2-1	0	1507	136.965	0.30	0.25	0.25	669	252	251	NA	53	73	72		2.0
-2	10		139.80	0.30	0.25	0.25	665	252	261		52	72	71		2.0
-3	20		142.58	~~0.27~~ 0.33	0.27	0.27	703	251	264		53	73	71		2.0
-4	30		145.49	0.40	0.33	0.33	763	247	257		54	74	71		2.5
-5	40		148.23	0.46	0.38	0.38	781	249	249		55	74	71		4.0
-6	50		151.41	0.42	0.34	0.34	682	250	260		53	75	71		4.0
-7	60		154.73	0.41	0.34	0.34	702	251	261		56	75	72		5.0
-8	1:10		158.00	0.47	0.39	0.39	714	251	252		53	74	72		7.5
-9	1:20		161.44	0.51	0.42	0.42	728	250	253		53	73	71		8.0
-10	1:30		165.06	0.51	0.42	0.42	751	251	260		55	73	71		8.5
-11	1:40		168.82	0.50	0.41	0.41	777	251	267		57	72	71		10.0
-12	1:50		172.38	0.51	0.42	0.42	679	250	247		59	71	70		12.5
* 1-1	2:00	1733	176.128	0.27	0.22	0.22	717	256	264		55	63	64		2.0
-2	2:10		178.72	0.30	0.25	0.25	733	249	241		53	65	63		2.0
-3	2:20		181.41	0.34	0.28	0.28	668	249	256		52	67	64		2.0
-4	2:30		184.24	0.35	0.29	0.29	688	250	255		51	69	64		2.0
-5	2:40		187.10	0.39	0.32	0.32	705	251	251		51	70	66		2.0
-6	2:50		190.16	0.45	0.37	0.37	701	249	259		51	71	67		5.0
-7	3:00		193.39	0.41	0.34	0.34	741	249	262		51	72	67		5.0
** -8	3:10		196.52	0.45	0.37	0.37	759	250	264		51	71	68		3.0
-9	3:20		200.01	0.53	0.43	0.43	704	250	247		52	75	69		3.0
-10	3:30		203.64	0.53	0.43	0.43	714	250	247		50	75	70		3.0
-11	3:40		207.24	0.54	0.44	0.44	728	252	257		51	75	70		5.0
-12	3:50		210.85	0.51	0.42	0.42	751	251	246		51	77	71		7.5
	4:00	1947	214.402												
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By AG Team Leader ____

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5-16-19 Furnace D Run 2, Carb 425

	Stop Volume	Pre Leak check	Start Volume	Post Leak check	PH	
*	175.895	0.003 @ 15	176.128	0.010 @ 10	8.0	Added 60 mL 1.0 N Bicarb changed out filter because of high Vac
**	197.160	0.010 @ 20	197.375	0.005 @ 12	8.5	Added 20 mL 1.0 N Bicarb

stopped - 1844
restarted - 1859
changed out filter because of high vac

MONTROSE AIR QUALITY SERVICES

CARB Method 425 Field Datasheet (Isokinetic)

Project Information		Sampling Conditions		ALT 011	TC ID:	Ambient °F	Ref. °F
Date	5.17.19	Static Pressure, in. H_2O	0.08	Stack	117	78	77.7
Project #	006AS - 596331	Ambient Temp, °F	55	Probe	117	90	89.5
Customer/Facility	Owens	Barometric Pressure, in. Hg	29.81	Filter Box	531	94	94.8
Unit ID/Sample Location	Furnace D	Ref. Barometer ID	—	Filter Exit	NA	→	
Run #	3	Wind Speed / Direction	4/SE	Meter outlet	MB-30	73	72.8
Operator	A. L	Precipitation Y/N, type	Y, rain off & on	Impinger Exit	I-43	69	69.3
		Probe / Filter Temp Range, °F	248 ± 24	Other	—	—	—

Sampling Equipment IDs		Calibration	
Meterbox ID	MB-30	Meterbox Y	0.9865
Umbilical ID	—	Meterbox ΔH@, in. H_2O	1.8243
Nozzle ID	G914	Nozzle diameter, Dn, in.	0.2203
Pitot / Probe ID	117	Pitot coefficient, Cp	0.84
Manometer ID	MB-30	Manometer zero and level	X yes
Sensitivity	0.01	K-Factor	0.82 (changed @ 3:00 hr to 0.86)

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	0 @ 4.2	@ —	0 @ 3.8
Pitot (-), pass @ in. H_2O	0 @ 5.1	@ —	0 @ 3.5
Pitot visual inspection	X pass	pass	X pass
Nozzle visual inspection	X pass	pass	X pass
Meter, cfm @ in. Hg	0.010 @ 16.5	@ —	~~0.008~~ 0.005 @ 15
Intermediate leak check volume, ft^3		/	0.008 /

Ref. Thermometer ID: ST-2

Continuity Check: + Continuity w/ Proper Polarity

Notes: See Back for Mid run Leak checks + PH notes

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
1-1	0	751	214.925	0.32	0.26	0.26	663	253	269	→269	56	64	63		2.0
-2	10		217.69	0.33	0.27	0.27	683	250	249		53	66	64		2.0
-3	20		220.51	0.33	0.27	0.27	699	248	258		54	68	65		2.0
-4	30		223.34	0.35	0.29	0.29	697	253	261		55	70	66		2.0
-5	40		226.26	0.39	0.32	0.32	738	248	264		54	71	67		2.0
-6	50		229.33	0.43	0.35	0.35	757	250	244		56	72	67		3.0
-7	1:00		232.49	0.40	0.33	0.33	658	250	262		57	72	68		6.5
* -8	1:10	919	235.813	0.47	0.39	0.39	688	251	259		59	70	69		2.0
-9	1:20		239.35	0.47	0.39	0.39	733	251	265		56	74	70		2.0
-10	1:30		242.77	0.50	0.41	0.41	754	251	260		57	76	71		2.0
-11	1:40		246.27	0.53	0.43	0.43	633	251	253		59	78	73		3.0
-12	1:50		249.79	0.52	0.43	0.43	691	250	261		59	79	75		11.0
** 2-1	2:00	1025	253.165	0.32	0.28	0.28	716	247	241		61	74	74		2.0
-2	2:10		256.00	0.29	0.25	0.25	719	252	263		57	76	74		2.0
-3	2:20		258.79	0.29	0.25	0.25	737	252	240		58	79	74		2.0
-4	2:30		261.48	0.34	0.29	0.29	670	250	260		58	80	76		2.0
-5	2:40		264.73	0.39	0.34	0.34	699	249	241		57	80	78		2.0
-6	2:50		267.55	0.41	0.35	0.35	717	246	253		59	80	77		3.5
-7	3:00		270.80	0.45	0.39	0.39	705	249	246		58	81	78		7.0
*** -8	3:10	1148	274.400	0.47	0.40	0.40	653	249	270		62	77	77		2.0
-9	3:20		277.88	0.47	0.40	0.40	681	250	236		59	81	77		2.0
-10	3:30		281.36	0.47	0.40	0.40	695	251	263		62	84	78		2.0
-11	3:40		284.88	0.48	0.41	0.41	657	251	254		61	85	81		2.0
-12	3:50		288.33	0.51	0.44	0.44	727	249	245		59	83	80		3.5
	4:00	1238	291.978												
Averages															

QA/QC Check: Completeness X Legibility X Accuracy X Specifications X Checked By AG Team Leader ______

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5-17-19 Furnace D Run3 Carb 425

um Ft3		Stop Volume	Pre Leak Check	Start Volume	Post Leak Check	PH	
0.266	* 9:01 - 9:19	~~63~~ 235.607	0.010 @ 22	235.813	0.010 @ 20.5	8.5	Added 60mL 1.0 N Bicarb, swapped out filter as well
0.213	** 10:10 - 10:25	252.952	0.010 @ 22	253.165	0.005 @ 19.5	8.5	Added 60mL 1.0 N Bicarb, swapped out filter as well, Changed Kf to 0.86
0.148 / 0.567	*** 11:35 - 11:48	274.252	0.015 @ 20	274.400	0.010 @ 12	NA	swapped out filter

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet 425

Project Information		**Equipment Identification**	
Date	5/16/19	Ref. Thermometer	—
Project #	000AS-596331	Hygrometer	—
Customer / Facility	Opus EC	Field Balance	710
Unit ID / Sample Location	Furnace D	Check Weights	10641
Run #	1-3	Calipers	39744
Operator	JCH		

Balance Audit (Field balance must be within 0.5g of check weight mass)			
Date	5/16/19		
Standard mass, g	500.0		
Field balance mass, g	499.9		

Ambient Conditions (Mobile Lab)	
Relative humidity, %	—
Temperature, °F	—
Mobile lab #	TU3

Moisture Determination

	Contents	Run 1 Initial	Run 1 Final	Run 1 Net	Run 2 Initial	Run 2 Final	Run 2 Net	Run 3 Initial	Run 3 Final	Run 3 Net
Knockout		700.9	820.9		—	790.0			796.0	
Impinger 1	.1N Bicarb	~~640.2~~	~~940.9~~ JCH		713.7	~~964.5~~		704.3	~~916~~	
Impinger 2	.1N Bicarb	645.9	968.3		644.2	~~800.7~~ 850.7 JCH		649.0	809.4	
Impinger 3	silica	830.1	864.1		792.2	~~849.8~~		739.0	761.1	
Impinger 4						814.8 JCH				
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel										
Line Rinse										
Train Net Gain (Vlc)										

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

		D1		D2		D3		Average
504	Nozzle 1 diameters	.3090	D1	.3090	D2	.3050	D3	.3056
502	Nozzle 2 diameters	.2840	D1	.2840	D2	.2845	D3	.2842
902	Nozzle 3 diameters	.1945	D1	.1945	D2	.1945	D3	.1945

Nozzle Material ☐ quartz ☐ glass ☐ steel ☐ titanium ☐ inconel ☒ other NA

Probe Type ☒ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☐ quartz ☒ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☒ other NA

Filter Number: Run 1: — Run 2: — Run 3: — Run

Back Half: ☐ quartz fiber ☐ glass fiber ☒ Teflon ☐ Teflon/quartz ☐ other

Reagent Information Type	Lot Number	**Sample Observations**
	944	
	Furnace A	
	South	

QA/QC Check: Completeness ____ Legibility ____ Accuracy ____ Specifications ____

Checked by:____________ Team Leader:____________

001AS-QMS-FM-226

Appendix B.6
Reference Method Data

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 1 Average Results

09:32:00 - 10:59:53

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
May 15 2019	09:33:00	5.887	10.22	0.614	646.4	1.115	396.5		
May 15 2019	09:34:00	5.830	10.24	0.717	651.5	1.083	410.9		
May 15 2019	09:35:00	6.060	10.04	0.943	682.9	1.031	394.9		
May 15 2019	09:36:00	5.974	10.07	1.230	567.5	1.043	394.9		
May 15 2019	09:37:00	5.834	10.25	1.349	534.5	1.066	403.6		
May 15 2019	09:38:00	5.931	10.22	1.436	517.1	1.017	403.3		
May 15 2019	09:39:00	6.150	10.03	1.553	550.7	0.953	396.6		
May 15 2019	09:40:00	6.142	10.08	1.630	651.3	0.127	405.8		
May 15 2019	10:08:53	6.422	9.983	0.248	572.5	1.647	421.4		
May 15 2019	10:09:53	6.598	9.899	0.086	583.3	1.765	419.2		
May 15 2019	10:10:53	6.571	9.887	0.140	608.9	1.838	419.3		
May 15 2019	10:11:53	6.573	9.851	0.090	608.5	1.817	411.4		
May 15 2019	10:12:53	6.518	9.906	0.118	586.1	1.754	424.8		
May 15 2019	10:13:53	6.521	9.843	0.134	585.0	1.834	417.7		
May 15 2019	10:14:53	6.576	9.819	0.210	606.3	1.777	420.8		
May 15 2019	10:15:53	6.543	9.846	0.173	598.5	1.932	424.1		
May 15 2019	10:16:53	6.466	9.926	0.220	589.5	1.879	435.3		
May 15 2019	10:17:53	6.670	9.791	0.148	592.3	1.827	429.5		
May 15 2019	10:18:53	6.421	9.940	0.218	572.7	1.783	439.5		
May 15 2019	10:19:53	14.65	4.885	0.363	280.4	4.894	325.0		
End of port 1 point 1									
May 15 2019	10:20:53	9.963	7.993	0.783	447.8	0.906	187.8		
May 15 2019	10:21:53	5.715	10.28	0.097	606.6	0.903	355.0		
May 15 2019	10:22:53	5.790	10.21	0.049	674.5	0.897	372.5		
May 15 2019	10:23:53	5.735	10.25	0.100	680.6	0.919	385.4		
May 15 2019	10:24:53	5.892	10.17	0.114	707.5	0.898	394.6		
May 15 2019	10:25:53	5.879	10.17	0.149	724.9	0.892	399.4		
May 15 2019	10:26:53	6.065	9.996	0.158	759.8	0.901	396.5		
May 15 2019	10:27:53	5.861	10.16	0.226	721.3	0.881	404.9		
May 15 2019	10:28:53	5.976	10.10	0.235	724.2	0.868	406.8		
May 15 2019	10:29:53	6.033	10.05	0.181	709.8	0.889	394.4		
May 15 2019	10:30:53	6.101	9.984	0.259	729.2	0.894	395.1		
May 15 2019	10:31:53	5.989	10.07	0.328	694.7	0.882	393.3		
May 15 2019	10:32:53	6.070	10.04	0.269	688.5	0.909	396.9		
May 15 2019	10:33:53	5.937	10.11	0.253	702.3	0.893	390.5		
May 15 2019	10:34:53	5.981	10.09	0.293	691.7	0.915	400.6		
May 15 2019	10:35:53	6.047	10.06	0.248	690.2	0.894	401.1		
May 15 2019	10:36:53	5.977	10.08	0.328	653.6	0.858	405.3		
May 15 2019	10:37:53	5.989	10.09	0.304	654.0	0.895	411.1		
May 15 2019	10:38:53	5.983	10.11	0.342	662.9	0.916	412.7		
May 15 2019	10:39:53	6.125	10.03	0.369	682.5	0.904	417.3		
End of port 1 point 2									
May 15 2019	10:40:53	5.894	10.15	0.380	656.9	0.914	426.8		
May 15 2019	10:41:53	6.040	10.04	0.388	680.0	0.935	429.6		
May 15 2019	10:42:53	5.972	10.06	0.341	655.2	0.935	432.2		
May 15 2019	10:43:53	6.031	10.01	0.312	691.9	0.942	426.7		
May 15 2019	10:44:53	5.909	10.08	0.322	635.9	0.934	432.0		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

May 15 2019	10:45:53	6.096	9.946	0.327	666.0	0.956	427.7		
May 15 2019	10:46:53	6.083	9.929	0.394	675.5	0.955	421.6		
May 15 2019	10:47:53	6.007	9.953	0.444	635.8	0.946	420.6		
May 15 2019	10:48:53	5.960	9.968	0.419	629.8	0.964	425.5		
May 15 2019	10:49:53	14.51	4.835	0.486	305.9	2.004	320.9		
May 15 2019	10:50:53	10.85	7.067	0.627	428.0	1.133	151.2		
May 15 2019	10:51:53	5.944	9.831	0.118	514.1	1.758	305.0		
May 15 2019	10:52:53	6.288	9.611	-0.003	583.5	1.784	316.5		
May 15 2019	10:53:53	6.265	9.622	0.017	606.3	1.840	320.9		
May 15 2019	10:54:53	6.258	9.614	0.058	600.2	2.006	329.7		
May 15 2019	10:55:53	6.278	9.616	0.071	624.6	1.937	338.0		
May 15 2019	10:56:53	6.287	9.593	0.049	631.7	1.877	339.3		
May 15 2019	10:57:53	6.355	9.572	0.041	611.5	1.838	347.2		
May 15 2019	10:58:53	6.381	9.544	0.030	616.1	1.708	343.8		
May 15 2019	10:59:53	6.228	9.622	0.025	576.3	1.911	350.8		
End of port 1 point 3									

	Average:	6.551	9.724	0.359	620.3	1.306	387.0		
	Max:	14.65	10.28	1.630	759.8	4.894	439.5		
	Min:	5.715	4.835	-0.003	280.4	0.127	151.2		

Stratification Results

Port	**Point**	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
1	1	6.816	9.647	0.637	573.2	1.421	399.8		
1	2	5.975	10.10	0.240	684.1	0.894	393.9		
1	3	6.739	9.389	0.228	589.4	1.391	361.6		
	Strat diff:	0.306	0.388	0.269	68.53	0.186	14.70		
	Strat %:	8.218	3.995	72.94	6.883	27.63	6.102		

MAQDAQ 1.0

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 1 Post run bias

09:32:00 - 10:59:53 PM/EPA 316 TESTING

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
	25A or 7E:	7E	7E	7E	7E	25A	7E		
Run summary data									
	Raw Avg:	6.551	9.724	0.359	620.3	1.306	387.0		
	Max:	14.65	10.28	1.630	759.8	4.894	439.5		
	Min:	5.715	4.835	-0.003	280.4	0.127	151.2		
Cylinder Concentrations									
	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	500.2	5.044	490.2		
	High:	20.28	18.52	56.72	1066	8.517	934.0		
Calibration Readings									
	Zero reading:	-0.015	0.138	0.342	-0.492	0.168	3.780		
	Low reading:					3.114			
	Mid reading:	9.880	9.980	28.09	511.1	5.128	490.5		
	High reading:	20.22	18.35	56.77	1069	8.637	934.5		
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.074	0.745	0.603	-0.098	N/A	0.405		
Mid %Err:	**<2.0**	-0.690	0.167	1.128	1.023	N/A	0.032		
High %Err:	**<2.0**	-0.296	-0.918	0.088	0.281	N/A	0.054		
EPA Method 25A Error Calculations									
Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.168	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.148	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.084	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.120	N/A		
Initial Bias Data									
	Zero reading:	0.283	0.145	0.506	0.132	0.168	0.631		
	Span reading:	9.843	9.873	27.56	497.6	5.128	468.5		
Zero % bias:	**<5.0**	1.469	0.038	0.289	0.059	N/A	-0.337		
Span % bias:	**<5.0**	-0.182	-0.578	-0.934	-1.266	N/A	-2.355		
Final Bias Data									
	Zero reading:	0.130	0.253	0.440	0.803	0.398	3.157		
	Span reading:	9.538	9.698	26.76	485.6	5.317	464.9		
Zero % bias:	**<5.0**	0.715	0.621	0.173	0.122	N/A	-0.067		
Span % bias:	**<5.0**	-1.686	-1.523	-2.345	-2.392	N/A	-2.741		
Zero % drift:	**<3.0**	0.754	0.583	0.116	0.062	N/A	0.270		
Span % drift:	**<3.0**	1.504	0.945	1.411	1.126	N/A	0.386		
Zero drift:	**<3.0% span**	N/A	N/A	N/A	N/A	-0.230	N/A		
Span drift:	**<3.0% span**	N/A	N/A	N/A	N/A	-0.189	N/A		
Bias Corrected Averages									
	Cor Avg:	6.703	9.885	-0.117	631.3	1.306	406.1		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 2 Average Results

11:44:00 - 12:44:00

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
May 15 2019	11:45:00	6.295	9.558	0.281	716.3	0.910	351.7		
May 15 2019	11:46:00	6.315	9.539	0.312	666.6	0.907	349.9		
May 15 2019	11:47:00	6.277	9.561	0.354	700.3	0.911	350.3		
May 15 2019	11:48:00	6.179	9.669	0.347	678.1	0.908	356.4		
May 15 2019	11:49:00	6.176	9.677	0.312	652.4	0.905	361.1		
May 15 2019	11:50:00	15.31	4.239	0.346	272.2	2.069	265.5		
May 15 2019	11:51:00	10.11	7.392	0.595	497.3	1.183	147.0		
May 15 2019	11:52:00	7.085	9.038	0.203	645.9	1.573	253.1		
May 15 2019	11:53:00	6.465	9.563	0.088	554.5	1.859	289.3		
May 15 2019	11:54:00	6.524	9.544	0.119	591.2	1.800	302.3		
May 15 2019	11:55:00	6.361	9.653	0.153	547.4	1.653	314.7		
May 15 2019	11:56:00	6.519	9.539	0.111	603.2	1.881	317.5		
May 15 2019	11:57:00	6.587	9.489	0.088	595.9	1.715	318.9		
May 15 2019	11:58:00	6.554	9.534	0.176	606.8	1.766	334.5		
May 15 2019	11:59:00	6.526	9.536	0.136	610.7	1.946	339.8		
May 15 2019	12:00:00	6.500	9.561	0.150	605.7	1.945	347.2		
May 15 2019	12:01:00	6.404	9.659	0.156	574.3	1.832	360.3		
May 15 2019	12:02:00	6.570	9.556	0.140	596.2	1.848	360.9		
May 15 2019	12:03:00	6.564	9.559	0.179	584.5	1.638	357.3		
May 15 2019	12:04:00	6.514	9.588	0.106	584.9	1.655	364.2		
End of port 1 point 1									
May 15 2019	12:05:00	6.574	9.533	0.124	596.3	1.777	358.4		
May 15 2019	12:06:00	6.545	9.599	0.171	577.3	1.787	371.0		
May 15 2019	12:07:00	6.520	9.660	0.183	568.8	1.880	378.0		
May 15 2019	12:08:00	6.517	9.644	0.133	558.9	1.780	376.9		
May 15 2019	12:09:00	6.447	9.697	0.140	563.5	1.773	382.3		
May 15 2019	12:10:00	6.522	9.601	0.225	580.0	1.612	377.2		
May 15 2019	12:11:00	6.592	9.528	0.188	574.2	1.512	377.0		
May 15 2019	12:12:00	6.664	9.438	0.176	597.1	1.848	370.1		
May 15 2019	12:13:00	6.474	9.592	0.168	567.0	1.524	379.6		
May 15 2019	12:14:00	6.564	9.522	0.180	583.7	1.611	375.7		
May 15 2019	12:15:00	6.651	9.459	0.119	602.6	1.756	366.8		
May 15 2019	12:16:00	6.583	9.530	0.168	591.4	1.615	375.4		
May 15 2019	12:17:00	6.516	9.612	0.180	580.8	1.638	380.7		
May 15 2019	12:18:00	6.567	9.649	0.197	565.5	1.825	386.4		
May 15 2019	12:19:00	6.511	9.701	0.141	557.4	1.654	394.7		
May 15 2019	12:20:00	14.93	4.611	0.296	239.2	4.768	299.6		
May 15 2019	12:21:00	9.321	8.094	0.638	434.7	0.959	183.4		
May 15 2019	12:22:00	6.069	9.831	0.056	640.2	0.985	317.9		
May 15 2019	12:23:00	5.866	9.935	-0.020	632.0	0.996	339.2		
May 15 2019	12:24:00	5.866	9.933	0.038	633.5	1.029	348.1		
End of port 1 point 2									
May 15 2019	12:25:00	5.917	9.937	0.034	675.1	1.042	350.4		
May 15 2019	12:26:00	6.078	9.875	0.101	719.3	1.033	353.5		
May 15 2019	12:27:00	6.002	9.929	0.100	698.3	0.984	354.7		
May 15 2019	12:28:00	6.180	9.867	0.069	701.1	0.987	355.8		
May 15 2019	12:29:00	6.048	10.01	0.064	672.0	0.994	365.8		

MAQDAQ 1.0

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

May 15 2019	12:30:00	6.009	10.07	0.108	668.8	1.028	372.5		
May 15 2019	12:31:00	6.003	10.09	0.129	676.5	0.994	382.0		
May 15 2019	12:32:00	6.053	10.06	0.129	684.3	0.984	387.7		
May 15 2019	12:33:00	6.159	10.02	0.143	679.7	0.942	383.0		
May 15 2019	12:34:00	5.966	10.21	0.142	654.8	0.932	395.2		
May 15 2019	12:35:00	6.175	10.10	0.107	666.2	0.919	394.4		
May 15 2019	12:36:00	6.117	10.13	0.130	676.1	0.895	403.3		
May 15 2019	12:37:00	6.016	10.19	0.093	641.6	0.877	409.6		
May 15 2019	12:38:00	6.024	10.26	0.129	657.8	0.875	420.4		
May 15 2019	12:39:00	6.162	10.17	0.150	676.8	0.863	415.8		
May 15 2019	12:40:00	5.996	10.31	0.164	647.3	0.868	429.6		
May 15 2019	12:41:00	5.983	10.31	0.140	639.0	0.856	437.0		
May 15 2019	12:42:00	5.969	10.30	0.179	624.3	0.842	449.0		
May 15 2019	12:43:00	6.040	10.22	0.184	624.5	0.875	449.6		
May 15 2019	12:44:00	5.910	10.34	0.224	621.4	0.880	463.3		
End of port 1 point 3									

	Average:	6.716	9.534	0.173	607.2	1.398	359.2		
	Max:	15.31	10.34	0.638	719.3	4.768	463.3		
	Min:	5.866	4.239	-0.020	239.2	0.842	147.0		

Stratification Results

Port	**Point**	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
1	1	7.080	9.142	0.219	593.0	1.540	320.4		
1	2	6.864	9.369	0.172	565.9	1.521	354.9		
1	3	6.037	10.13	0.123	665.9	0.941	401.9		
	Strat diff:	0.420	0.583	0.048	57.63	0.206	42.83		
	Strat %:	9.359	6.107	28.21	9.475	29.46	11.93		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 2 Post run bias

11:44:00 - 12:44:00 PM/EPA 316 TESTING

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
	25A or 7E:	7E	7E	7E	7E	25A	7E		
Run summary data									
	Raw Avg:	6.716	9.534	0.173	607.2	1.398	359.2		
	Max:	15.31	10.34	0.638	719.3	4.768	463.3		
	Min:	5.866	4.239	-0.020	239.2	0.842	147.0		
Cylinder Concentrations									
	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	500.2	5.044	490.2		
	High:	20.28	18.52	56.72	1066	8.517	934.0		
Calibration Readings									
	Zero reading:	-0.015	0.138	0.342	-0.492	0.168	3.780		
	Low reading:					3.114			
	Mid reading:	9.880	9.980	28.09	511.1	5.128	490.5		
	High reading:	20.22	18.35	56.77	1069	8.637	934.5		
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.074	0.745	0.603	-0.098	N/A	0.405		
Mid %Err:	**<2.0**	-0.690	0.167	1.128	1.023	N/A	0.032		
High %Err:	**<2.0**	-0.296	-0.918	0.088	0.281	N/A	0.054		
EPA Method 25A Error Calculations									
Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.168	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.148	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.084	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.120	N/A		
Initial Bias Data									
	Zero reading:	0.130	0.253	0.440	0.803	0.398	3.157		
	Span reading:	9.538	9.698	26.76	485.6	5.317	464.9		
Zero % bias:	**<5.0**	0.715	0.621	0.173	0.122	N/A	-0.067		
Span % bias:	**<5.0**	-1.686	-1.523	-2.345	-2.392	N/A	-2.741		
Final Bias Data									
	Zero reading:	0.245	0.283	0.946	1.507	0.437	7.514		
	Span reading:	9.363	9.788	27.62	481.4	5.077	473.8		
Zero % bias:	**<5.0**	1.282	0.783	1.065	0.188	N/A	0.400		
Span % bias:	**<5.0**	-2.549	-1.037	-0.829	-2.786	N/A	-1.788		
Zero % drift:	**<3.0**	0.567	0.162	0.892	0.067	N/A	0.467		
Span % drift:	**<3.0**	0.863	0.486	1.516	0.394	N/A	0.953		
Zero drift:	**<3.0% span**	N/A	N/A	N/A	N/A	-0.039	N/A		
Span drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.240	N/A		
Bias Corrected Averages									
	Cor Avg:	7.062	9.730	-0.539	628.5	1.398	373.8		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 3 Average Results 13:45:00 - 14:45:00									
	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
May 15 2019	13:46:00	6.028	9.852	0.333	667.9	0.851	399.4		
May 15 2019	13:47:00	5.844	10.03	0.371	628.8	0.835	413.0		
May 15 2019	13:48:00	5.979	9.943	0.416	660.3	0.839	416.2		
May 15 2019	13:49:00	6.026	9.883	0.402	651.8	0.866	420.3		
May 15 2019	13:50:00	15.72	4.046	0.543	242.4	2.257	286.2		
May 15 2019	13:51:00	9.368	7.882	0.617	486.5	1.158	188.5		
May 15 2019	13:52:00	6.160	9.600	0.131	550.4	1.653	318.8		
May 15 2019	13:53:00	6.135	9.585	0.140	604.7	1.707	335.4		
May 15 2019	13:54:00	6.336	9.437	0.049	644.5	1.717	337.4		
May 15 2019	13:55:00	6.354	9.393	0.075	629.2	1.698	335.2		
May 15 2019	13:56:00	6.239	9.530	0.102	611.4	1.708	340.7		
May 15 2019	13:57:00	6.335	9.489	0.162	624.8	1.731	337.1		
May 15 2019	13:58:00	6.401	9.469	0.189	636.3	1.719	339.4		
May 15 2019	13:59:00	6.310	9.533	0.176	612.6	2.128	340.2		
May 15 2019	14:00:00	6.506	9.418	0.165	639.6	2.124	341.1		
May 15 2019	14:01:00	6.458	9.458	0.152	623.9	2.012	342.9		
May 15 2019	14:02:00	6.418	9.499	0.112	636.7	2.117	350.7		
May 15 2019	14:03:00	6.391	9.521	0.153	627.1	1.851	356.2		
May 15 2019	14:04:00	6.437	9.502	0.143	621.7	1.782	356.9		
May 15 2019	14:05:00	6.537	9.448	0.171	613.4	1.918	353.9		
End of port 1 point 1									
May 15 2019	14:06:00	6.393	9.544	0.165	596.9	1.878	361.8		
May 15 2019	14:07:00	6.356	9.546	0.223	584.1	2.016	364.9		
May 15 2019	14:08:00	6.465	9.486	0.201	616.2	1.856	356.4		
May 15 2019	14:09:00	6.419	9.568	0.238	588.5	1.853	358.0		
May 15 2019	14:10:00	6.558	9.471	0.192	625.3	1.703	353.8		
May 15 2019	14:11:00	6.402	9.561	0.188	600.1	1.938	361.1		
May 15 2019	14:12:00	6.431	9.556	0.193	593.6	1.907	367.5		
May 15 2019	14:13:00	6.438	9.589	0.248	585.9	1.735	370.9		
May 15 2019	14:14:00	6.560	9.516	0.256	597.1	1.867	362.3		
May 15 2019	14:15:00	6.435	9.631	0.270	593.4	1.798	373.5		
May 15 2019	14:16:00	6.437	9.623	0.228	578.4	1.731	380.5		
May 15 2019	14:17:00	6.510	9.567	0.180	609.4	1.648	379.1		
May 15 2019	14:18:00	6.427	9.651	0.163	575.5	1.693	381.8		
May 15 2019	14:19:00	6.408	9.673	0.202	557.6	1.592	389.4		
May 15 2019	14:20:00	15.34	4.309	0.406	237.6	4.579	264.2		
May 15 2019	14:21:00	8.872	8.301	0.579	540.0	0.929	187.8		
May 15 2019	14:22:00	6.278	9.744	0.051	716.1	0.898	301.9		
May 15 2019	14:23:00	5.894	10.04	-0.013	654.4	0.850	341.6		
May 15 2019	14:24:00	6.037	9.924	0.001	678.9	0.797	352.0		
May 15 2019	14:25:00	5.858	10.09	0.010	674.6	0.798	368.9		
End of port 1 point 2									
May 15 2019	14:26:00	5.954	10.02	0.040	673.0	0.788	376.1		
May 15 2019	14:27:00	5.963	10.01	0.047	684.7	0.779	384.1		
May 15 2019	14:28:00	6.079	9.962	0.081	709.5	0.774	386.5		
May 15 2019	14:29:00	6.087	9.949	0.050	692.1	0.754	386.1		
May 15 2019	14:30:00	5.928	10.08	0.060	660.5	0.753	395.6		

May 15 2019	14:31:00	6.068	9.976	0.103	662.5	0.772	395.6		
May 15 2019	14:32:00	5.980	10.03	0.100	643.4	0.762	400.7		
May 15 2019	14:33:00	6.032	10.01	0.113	668.6	0.744	401.8		
May 15 2019	14:34:00	6.081	10.03	0.114	657.8	0.741	402.6		
May 15 2019	14:35:00	6.147	9.993	0.088	667.2	0.720	399.1		
May 15 2019	14:36:00	5.989	10.06	0.143	637.0	0.723	411.5		
May 15 2019	14:37:00	5.997	10.05	0.141	616.1	0.731	410.7		
May 15 2019	14:38:00	5.958	10.07	0.142	635.7	0.728	419.6		
May 15 2019	14:39:00	6.054	10.03	0.135	667.6	0.751	412.8		
May 15 2019	14:40:00	6.087	10.02	0.151	687.0	0.760	417.7		
May 15 2019	14:41:00	6.016	10.07	0.106	654.8	0.760	427.8		
May 15 2019	14:42:00	5.951	10.07	0.132	634.7	0.759	437.7		
May 15 2019	14:43:00	6.008	10.03	0.145	637.6	0.745	435.7		
May 15 2019	14:44:00	5.947	10.05	0.193	624.1	0.743	435.7		
May 15 2019	14:45:00	6.043	10.04	0.171	647.2	0.737	432.3		
End of port 1 point 3									

	Average:	6.614	9.524	0.181	616.3	1.363	367.6		
	Max:	15.72	10.09	0.617	716.1	4.579	437.7		
	Min:	5.844	4.046	-0.013	237.6	0.720	187.8		

Stratification Results

Port	**Point**	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
1	1	6.717	9.319	0.229	595.7	1.589	342.3		
1	2	6.733	9.431	0.199	595.7	1.525	347.3		
1	3	6.057	9.981	0.113	659.6	0.749	407.9		
	Strat diff:	0.231	0.404	0.049	42.60	0.301	42.07		
	Strat %:	6.849	4.218	37.34	6.904	41.83	6.433		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 3 Post run bias

13:45:00 - 14:45:00 PM/EPA 316

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
	25A or 7E:	7E	7E	7E	7E	25A	7E		
Run summary data									
	Raw Avg:	6.614	9.524	0.181	616.3	1.363	367.6		
	Max:	15.72	10.09	0.617	716.1	4.579	437.7		
	Min:	5.844	4.046	-0.013	237.6	0.720	187.8		
Cylinder Concentrations									
	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	500.2	5.044	490.2		
	High:	20.28	18.52	56.72	1066	8.517	934.0		
Calibration Readings									
	Zero reading:	-0.015	0.138	0.342	-0.492	0.168	3.780		
	Low reading:					3.114			
	Mid reading:	9.880	9.980	28.09	511.1	5.128	490.5		
	High reading:	20.22	18.35	56.77	1069	8.637	934.5		
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.074	0.745	0.603	-0.098	N/A	0.405		
Mid %Err:	**<2.0**	-0.690	0.167	1.128	1.023	N/A	0.032		
High %Err:	**<2.0**	-0.296	-0.918	0.088	0.281	N/A	0.054		
EPA Method 25A Error Calculations									
Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.168	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.148	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.084	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.120	N/A		
Initial Bias Data									
	Zero reading:	0.245	0.283	0.946	1.507	0.437	7.514		
	Span reading:	9.363	9.788	27.62	481.4	5.077	473.8		
Zero % bias:	**<5.0**	1.282	0.783	1.065	0.188	N/A	0.400		
Span % bias:	**<5.0**	-2.549	-1.037	-0.829	-2.786	N/A	-1.788		
Final Bias Data									
	Zero reading:	0.160	0.253	0.568	1.947	0.375	10.11		
	Span reading:	9.743	9.523	27.73	490.4	5.278	469.4		
Zero % bias:	**<5.0**	0.863	0.621	0.398	0.229	N/A	0.678		
Span % bias:	**<5.0**	-0.676	-2.468	-0.635	-1.942	N/A	-2.259		
Zero % drift:	**<3.0**	0.419	0.162	0.667	0.041	N/A	0.278		
Span % drift:	**<3.0**	1.873	1.431	0.194	0.844	N/A	0.471		
Zero drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.062	N/A		
Span drift:	**<3.0% span**	N/A	N/A	N/A	N/A	-0.201	N/A		
Bias Corrected Averages									
	Cor Avg:	6.871	9.810	-0.587	634.9	1.363	380.0		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 4 Average Results

15:26:00 - 16:26:00

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
May 15 2019	15:27:00	6.052	10.08						
May 15 2019	15:28:00	6.093	10.10						
May 15 2019	15:29:00	6.041	10.16						
May 15 2019	15:30:00	5.964	10.22						
May 15 2019	15:31:00	5.959	10.19						
May 15 2019	15:32:00	6.054	10.12						
May 15 2019	15:33:00	6.013	10.11						
May 15 2019	15:34:00	5.984	10.09						
May 15 2019	15:35:00	5.985	10.08						
May 15 2019	15:36:00	6.149	9.998						
May 15 2019	15:37:00	6.083	10.05						
May 15 2019	15:38:00	6.042	10.05						
May 15 2019	15:39:00	6.125	9.971						
May 15 2019	15:40:00	6.101	9.985						
May 15 2019	15:41:00	6.149	9.991						
May 15 2019	15:42:00	6.150	9.982						
May 15 2019	15:43:00	6.069	10.04						
May 15 2019	15:44:00	6.143	9.971						
May 15 2019	15:45:00	6.135	9.995						
May 15 2019	15:46:00	6.193	9.942						
End of port 1 point 1									
May 15 2019	15:47:00	6.242	9.879						
May 15 2019	15:48:00	6.229	9.874						
May 15 2019	15:49:00	6.294	9.805						
May 15 2019	15:50:00	6.539	9.716						
May 15 2019	15:51:00	15.54	4.302						
May 15 2019	15:52:00	9.936	7.555						
May 15 2019	15:53:00	6.513	9.497						
May 15 2019	15:54:00	6.413	9.515						
May 15 2019	15:55:00	6.538	9.429						
May 15 2019	15:56:00	6.586	9.393						
May 15 2019	15:57:00	6.530	9.453						
May 15 2019	15:58:00	6.569	9.429						
May 15 2019	15:59:00	6.493	9.442						
May 15 2019	16:00:00	6.413	9.492						
May 15 2019	16:01:00	6.533	9.386						
May 15 2019	16:02:00	6.556	9.348						
May 15 2019	16:03:00	6.423	9.435						
May 15 2019	16:04:00	6.441	9.403						
May 15 2019	16:05:00	6.539	9.297						
May 15 2019	16:06:00	6.563	9.284						
End of port 1 point 2									
May 15 2019	16:07:00	6.513	9.299						
May 15 2019	16:08:00	6.383	9.418						
May 15 2019	16:09:00	6.551	9.312						
May 15 2019	16:10:00	6.520	9.303						
May 15 2019	16:11:00	6.510	9.297						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

May 15 2019	16:12:00	6.544	9.242						
May 15 2019	16:13:00	6.467	9.260						
May 15 2019	16:14:00	6.442	9.265						
May 15 2019	16:15:00	6.595	9.128						
May 15 2019	16:16:00	6.536	9.146						
May 15 2019	16:17:00	6.541	9.120						
May 15 2019	16:18:00	6.534	9.096						
May 15 2019	16:19:00	6.585	9.056						
May 15 2019	16:20:00	6.877	8.979						
May 15 2019	16:21:00	14.86	4.411						
May 15 2019	16:22:00	10.05	6.919						
May 15 2019	16:23:00	6.255	9.163						
May 15 2019	16:24:00	6.273	9.143						
May 15 2019	16:25:00	6.276	9.125						
May 15 2019	16:26:00	6.238	9.147						
End of port 1 point 3									

	Average:	6.749	9.348						
	Max:	15.54	10.22						
	Min:	5.959	4.302						

Stratification Results

Port	**Point**	O2 294	CO2 11						
1	1	6.068	10.05						
1	2	7.007	9.219						
1	3	6.964	8.922						
	Strat diff:	0.327	0.653						
	Strat %:	9.157	6.949						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 4 Post run bias

15:26:00 - 16:26:00 PM TESTING

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Run summary data

	Raw Avg:	6.749	9.348						
	Max:	15.54	10.22						
	Min:	5.959	4.302						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	-0.015	0.138						
	Low reading:								
	Mid reading:	9.880	9.980						
	High reading:	20.22	18.35						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.074	0.745						
Mid %Err:	**<2.0**	-0.690	0.167						
High %Err:	**<2.0**	-0.296	-0.918						

Initial Bias Data

	Zero reading:	0.160	0.253						
	Span reading:	9.743	9.523						
Zero % bias:	**<5.0**	0.863	0.621						
Span % bias:	**<5.0**	-0.676	-2.468						

Final Bias Data

	Zero reading:	0.268	0.168						
	Span reading:	9.805	9.460						
Zero % bias:	**<5.0**	1.396	0.162						
Span % bias:	**<5.0**	-0.370	-2.808						
Zero % drift:	**<3.0**	0.532	0.459						
Span % drift:	**<3.0**	0.306	0.340						

Bias Corrected Averages

	Cor Avg:	6.849	9.795						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 2 Average Results

10:00:37 - 13:53:37

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
May 16 2019	10:01:37	6.497	9.878						
May 16 2019	10:02:37	6.448	9.893						
May 16 2019	10:03:37	6.391	9.941						
May 16 2019	10:04:37	6.428	9.945						
May 16 2019	10:05:37	6.440	9.934						
May 16 2019	10:06:37	6.453	9.889						
May 16 2019	10:07:37	6.355	9.979						
May 16 2019	10:08:37	6.360	9.972						
May 16 2019	10:09:37	6.440	9.910						
May 16 2019	10:10:37	6.545	9.808						
May 16 2019	10:11:37	6.436	9.909						
May 16 2019	10:12:37	6.524	9.845						
May 16 2019	10:13:37	6.395	9.950						
May 16 2019	10:14:37	6.526	9.888						
May 16 2019	10:15:37	6.355	10.01						
May 16 2019	10:16:37	6.382	9.977						
May 16 2019	10:17:37	6.323	9.992						
May 16 2019	10:18:37	6.392	9.912						
May 16 2019	10:19:37	6.453	9.847						
May 16 2019	10:20:37	6.350	9.916						
May 16 2019	10:21:37	9.086	8.504						
May 16 2019	10:22:37	14.83	4.838						
May 16 2019	10:23:37	7.680	8.916						
May 16 2019	10:24:37	6.029	9.951						
May 16 2019	10:25:37	5.947	9.961						
May 16 2019	10:26:37	5.818	10.09						
May 16 2019	10:27:37	5.781	10.11						
May 16 2019	10:28:37	5.729	10.16						
May 16 2019	10:29:37	5.853	10.07						
May 16 2019	10:30:37	5.824	10.10						
May 16 2019	10:31:37	5.885	10.06						
May 16 2019	10:32:37	5.835	10.08						
May 16 2019	10:33:37	6.006	9.960						
May 16 2019	10:34:37	5.958	9.961						
May 16 2019	10:35:37	5.984	9.932						
May 16 2019	10:36:37	5.970	9.923						
May 16 2019	10:37:37	5.974	9.901						
May 16 2019	10:38:37	6.076	9.826						
May 16 2019	10:39:37	5.969	9.838						
May 16 2019	10:40:37	5.968	9.831						
May 16 2019	10:41:37	5.941	9.850						
May 16 2019	10:42:37	6.112	9.710						
May 16 2019	10:43:37	6.142	9.689						
May 16 2019	10:44:37	6.153	9.656						
May 16 2019	10:45:37	6.167	9.655						
May 16 2019	10:46:37	6.321	9.515						
May 16 2019	10:47:37	6.236	9.536						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

May 16 2019	10:48:37	6.192	9.590						
May 16 2019	10:49:37	6.245	9.520						
May 16 2019	10:50:37	6.195	9.544						
May 16 2019	10:51:37	6.303	9.439						
May 16 2019	10:52:37	9.200	8.060						
May 16 2019	10:53:37	14.57	4.584						
May 16 2019	10:54:37	8.677	7.788						
May 16 2019	10:55:37	6.656	9.050						
May 16 2019	10:56:37	6.445	9.214						
May 16 2019	10:57:38	6.582	9.149						
May 16 2019	10:58:38	6.666	9.098						
May 16 2019	10:59:37	6.718	9.043						
May 16 2019	11:00:37	6.660	9.070						
May 16 2019	11:01:37	6.553	9.205						
May 16 2019	11:02:37	6.552	9.207						
May 16 2019	11:03:37	6.560	9.207						
May 16 2019	11:04:37	6.545	9.226						
May 16 2019	11:05:37	6.642	9.158						
May 16 2019	11:06:37	6.502	9.257						
May 16 2019	11:07:37	6.470	9.289						
May 16 2019	11:08:37	6.469	9.275						
May 16 2019	11:09:37	6.554	9.210						
May 16 2019	11:10:37	6.555	9.192						
May 16 2019	11:11:37	6.499	9.239						
May 16 2019	11:12:37	6.514	9.207						
May 16 2019	11:13:37	6.476	9.240						
May 16 2019	11:14:37	6.549	9.180						
May 16 2019	11:15:37	6.470	9.223						
May 16 2019	11:16:37	6.500	9.210						
May 16 2019	11:17:37	6.467	9.232						
May 16 2019	11:18:37	6.463	9.216						
May 16 2019	11:19:37	6.466	9.192						
May 16 2019	11:20:37	6.475	9.162						
End of port 1 point 1									
May 16 2019	11:21:37	6.531	9.167						
May 16 2019	11:22:37	13.58	5.325						
May 16 2019	11:23:37	10.99	6.382						
May 16 2019	11:24:37	6.610	8.889						
May 16 2019	11:25:37	5.956	9.382						
May 16 2019	11:26:37	6.054	9.333						
May 16 2019	11:27:37	6.087	9.275						
May 16 2019	11:28:37	5.979	9.335						
May 16 2019	11:29:37	6.083	9.248						
May 16 2019	11:30:37	6.180	9.174						
May 16 2019	11:31:37	6.158	9.192						
May 16 2019	11:32:37	6.241	9.148						
May 16 2019	11:33:37	6.149	9.240						
May 16 2019	11:34:37	6.289	9.134						
May 16 2019	11:35:37	6.255	9.133						
May 16 2019	11:36:37	6.329	9.101						
May 16 2019	11:37:37	6.338	9.105						
May 16 2019	11:38:37	6.394	9.053						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

May 16 2019	11:39:37	6.349	9.080						
May 16 2019	11:40:37	6.453	9.037						
May 16 2019	11:41:37	6.401	9.116						
May 16 2019	11:42:37	6.419	9.173						
May 16 2019	11:43:37	6.465	9.178						
May 16 2019	11:44:37	6.451	9.201						
May 16 2019	11:45:37	6.598	9.135						
May 16 2019	11:46:37	6.522	9.235						
May 16 2019	11:47:37	6.550	9.245						
May 16 2019	11:48:37	6.509	9.290						
May 16 2019	11:49:37	6.490	9.335						
May 16 2019	11:50:37	6.513	9.344						
May 16 2019	11:51:37	6.522	9.404						
May 16 2019	11:52:37	13.89	5.259						
May 16 2019	11:53:37	12.13	6.010						
May 16 2019	11:54:37	8.399	8.184						
May 16 2019	11:55:37	6.977	9.163						
May 16 2019	11:56:37	6.820	9.353						
May 16 2019	11:57:37	6.852	9.326						
May 16 2019	11:58:37	6.815	9.351						
May 16 2019	11:59:37	6.829	9.344						
May 16 2019	12:00:37	6.783	9.369						
May 16 2019	12:01:37	6.940	9.302						
May 16 2019	12:02:37	6.918	9.323						
May 16 2019	12:03:37	6.863	9.405						
May 16 2019	12:04:37	6.869	9.437						
May 16 2019	12:05:37	6.748	9.568						
May 16 2019	12:06:37	6.804	9.527						
May 16 2019	12:07:37	6.797	9.558						
May 16 2019	12:08:37	6.840	9.545						
May 16 2019	12:09:37	6.871	9.490						
May 16 2019	12:10:37	6.833	9.514						
May 16 2019	12:11:37	6.797	9.537						
May 16 2019	12:12:37	6.876	9.469						
May 16 2019	12:13:37	6.800	9.528						
May 16 2019	12:14:37	6.797	9.537						
May 16 2019	12:15:37	6.804	9.467						
May 16 2019	12:16:37	6.843	9.437						
May 16 2019	12:17:37	6.846	9.405						
May 16 2019	12:18:37	6.801	9.436						
May 16 2019	12:19:37	6.853	9.407						
May 16 2019	12:20:37	6.918	9.398						
May 16 2019	12:21:37	7.209	9.346						
May 16 2019	12:22:37	14.62	4.920						
May 16 2019	12:23:37	9.414	7.858						
May 16 2019	12:24:37	6.792	9.395						
May 16 2019	12:25:37	6.257	9.788						
May 16 2019	12:26:37	6.244	9.799						
May 16 2019	12:27:37	6.342	9.732						
May 16 2019	12:28:37	6.366	9.717						
May 16 2019	12:29:37	6.368	9.729						
May 16 2019	12:30:37	6.506	9.670						

May 16 2019	12:31:37	6.320	9.849						
May 16 2019	12:32:37	6.330	9.874						
May 16 2019	12:33:37	6.317	9.926						
May 16 2019	12:34:37	6.408	9.863						
May 16 2019	12:35:37	6.346	9.891						
May 16 2019	12:36:37	6.417	9.842						
May 16 2019	12:37:37	6.478	9.818						
May 16 2019	12:38:37	6.361	9.936						
May 16 2019	12:39:37	6.388	9.963						
May 16 2019	12:40:37	6.393	9.981						
End of port 1 point 2									
May 16 2019	12:41:37	6.484	9.942						
May 16 2019	12:42:37	6.433	9.967						
May 16 2019	12:43:37	6.430	9.966						
May 16 2019	12:44:37	6.387	9.982						
May 16 2019	12:45:37	6.387	9.928						
May 16 2019	12:46:37	6.438	9.902						
May 16 2019	12:47:37	6.601	9.754						
May 16 2019	12:48:37	6.544	9.803						
May 16 2019	12:49:37	6.462	9.886						
May 16 2019	12:50:37	6.458	9.910						
May 16 2019	12:51:37	6.567	9.841						
May 16 2019	12:52:37	7.225	9.577						
May 16 2019	12:53:37	14.39	5.166						
May 16 2019	12:54:37	11.87	6.543						
May 16 2019	12:55:37	7.692	8.946						
May 16 2019	12:56:37	7.045	9.268						
May 16 2019	12:57:37	6.769	9.464						
May 16 2019	12:58:37	6.714	9.533						
May 16 2019	12:59:37	6.720	9.551						
May 16 2019	13:00:37	6.757	9.557						
May 16 2019	13:01:37	6.696	9.662						
May 16 2019	13:02:37	6.804	9.614						
May 16 2019	13:03:37	6.773	9.669						
May 16 2019	13:04:37	6.671	9.698						
May 16 2019	13:05:37	6.712	9.655						
May 16 2019	13:06:37	6.789	9.612						
May 16 2019	13:07:37	6.785	9.701						
May 16 2019	13:08:37	6.791	9.711						
May 16 2019	13:09:37	6.890	9.670						
May 16 2019	13:10:37	6.771	9.769						
May 16 2019	13:11:37	6.828	9.764						
May 16 2019	13:12:37	6.805	9.811						
May 16 2019	13:13:37	6.764	9.816						
May 16 2019	13:14:37	6.765	9.779						
May 16 2019	13:15:37	6.762	9.770						
May 16 2019	13:16:37	6.781	9.742						
May 16 2019	13:17:37	6.858	9.732						
May 16 2019	13:18:37	6.904	9.796						
May 16 2019	13:19:37	6.875	9.809						
May 16 2019	13:20:37	6.853	9.779						
May 16 2019	13:21:37	6.902	9.629						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

May 16 2019	13:22:37	10.59	7.669						
May 16 2019	13:23:37	13.12	5.791						
May 16 2019	13:24:37	7.227	9.230						
May 16 2019	13:25:37	6.447	9.711						
May 16 2019	13:26:37	6.250	9.849						
May 16 2019	13:27:37	6.316	9.809						
May 16 2019	13:28:37	6.477	9.691						
May 16 2019	13:29:37	6.402	9.759						
May 16 2019	13:30:37	6.433	9.735						
May 16 2019	13:31:37	6.466	9.717						
May 16 2019	13:32:37	6.508	9.701						
May 16 2019	13:33:37	6.554	9.680						
May 16 2019	13:34:37	6.498	9.698						
May 16 2019	13:35:37	6.508	9.702						
May 16 2019	13:36:37	6.607	9.608						
May 16 2019	13:37:37	6.503	9.684						
May 16 2019	13:38:37	6.557	9.626						
May 16 2019	13:39:37	6.659	9.516						
May 16 2019	13:40:37	6.613	9.490						
May 16 2019	13:41:37	6.532	9.530						
May 16 2019	13:42:37	6.627	9.475						
May 16 2019	13:43:37	6.756	9.376						
May 16 2019	13:44:37	6.633	9.487						
May 16 2019	13:45:37	6.704	9.541						
May 16 2019	13:46:37	6.753	9.503						
May 16 2019	13:47:37	6.753	9.506						
May 16 2019	13:48:37	6.745	9.533						
May 16 2019	13:49:37	6.767	9.426						
May 16 2019	13:50:37	6.762	9.442						
May 16 2019	13:51:37	6.887	9.360						
May 16 2019	13:52:37	13.51	5.655						
May 16 2019	13:53:37	12.24	5.971						

	Average:	6.933	9.320						
	Max:	14.83	10.16						
	Min:	5.729	4.584						

Stratification Results

Port	**Point**	O2 294	CO2 11						
1	1	6.676	9.426						
1	2	6.972	9.180						
	Strat diff:	0.148	0.123						
	Strat %:	2.169	1.322						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 2 Post run bias FURNACE "D" RUN #1

10:00:37 - 13:53:37 METALS TESTING

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						
Run summary data									
	Raw Avg:	6.933	9.320						
	Max:	14.83	10.16						
	Min:	5.729	4.584						
Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						
Calibration Readings									
	Zero reading:	0.175	0.138						
	Low reading:								
	Mid reading:	9.995	9.973						
	High reading:	20.20	18.33						
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.863	0.745						
Mid %Err:	**<2.0**	-0.123	0.130						
High %Err:	**<2.0**	-0.394	-1.026						
Initial Bias Data									
	Zero reading:	0.428	0.145						
	Span reading:	9.965	10.000						
Zero % bias:	**<5.0**	1.248	0.038						
Span % bias:	**<5.0**	-0.148	0.146						
Final Bias Data									
	Zero reading:	0.313	0.268						
	Span reading:	10.10	9.705						
Zero % bias:	**<5.0**	0.681	0.702						
Span % bias:	**<5.0**	0.518	-1.447						
Zero % drift:	**<3.0**	0.568	0.664						
Span % drift:	**<3.0**	0.666	1.593						
Bias Corrected Averages									
	Cor Avg:	6.806	9.400						

OWENS BROCKWAY
FURNACE D RUN #2
16-May-19 Metals

	O2	CO2
	191221-195551	
19:13:51	7.198	9.541
19:14:51	7.216	9.530
19:15:51	7.226	9.507
19:16:51	7.217	9.555
19:17:51	7.280	9.527
19:18:51	7.247	9.550
19:19:51	7.181	9.597
19:20:51	8.973	8.789
19:21:51	15.420	4.538
19:22:51	8.367	8.781
19:23:51	6.670	9.883
19:24:51	6.706	9.859
19:25:51	6.680	9.877
19:26:51	6.699	9.833
19:27:51	6.744	9.781
19:28:51	6.754	9.738
19:29:51	6.869	9.614
19:30:51	6.798	9.679
19:31:51	6.788	9.689
19:32:51	6.810	9.660
19:33:51	6.799	9.685
19:34:51	6.891	9.623
19:35:51	6.760	9.709
19:36:51	6.772	9.703
19:37:51	6.784	9.696
19:38:51	6.727	9.743
19:39:51	6.761	9.712
19:40:51	6.893	9.613
19:41:51	6.739	9.703
19:42:51	6.796	9.682
19:43:51	6.762	9.709
19:44:51	6.787	9.710
19:45:51	6.792	9.726
19:46:51	6.861	9.640
19:47:51	6.813	9.655
19:48:51	6.825	9.628
19:49:51	6.778	9.590
19:50:51	11.820	6.761
19:51:51	14.450	4.901
19:52:51	7.650	8.856
19:53:51	6.910	9.372
19:54:51	6.920	9.316
19:55:51	6.903	9.326
AVG	7.466	9.293
MIN	6.670	4.538
MAX	15.420	9.883

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 4 Post run bias FURNACE "D" RUN #2

19:12:51 - 19:55:51 METALS TESTING

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						
Run summary data									
	Raw Avg:	7.466	9.293						
	Max:	15.42	9.883						
	Min:	6.670	4.538						
Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						
Calibration Readings									
	Zero reading:	0.175	0.138						
	Low reading:								
	Mid reading:	9.995	9.973						
	High reading:	20.20	18.33						
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.863	0.745						
Mid %Err:	**<2.0**	-0.123	0.130						
High %Err:	**<2.0**	-0.394	-1.026						
Initial Bias Data									
	Zero reading:	0.313	0.268						
	Span reading:	10.10	9.705						
Zero % bias:	**<5.0**	0.681	0.702						
Span % bias:	**<5.0**	0.518	-1.447						
Final Bias Data									
	Zero reading:	0.320	0.205						
	Span reading:	10.01	9.850						
Zero % bias:	**<5.0**	0.715	0.362						
Span % bias:	**<5.0**	0.074	-0.664						
Zero % drift:	**<3.0**	0.035	0.340						
Span % drift:	**<3.0**	0.444	0.783						
Bias Corrected Averages									
	Cor Avg:	7.356	9.444						

OWENS BROCKWAY
FURNACE D RUN #3
17-May-19 Metals

	O2	CO2
	115849-124949	
11:59:49	7.517	9.201
12:00:49	7.477	9.247
12:01:49	7.599	9.195
12:02:49	7.471	9.301
12:03:49	7.438	9.338
12:04:49	7.499	9.342
12:05:49	7.461	9.376
12:06:49	7.444	9.415
12:07:49	7.458	9.378
12:08:49	7.459	9.381
12:09:49	7.559	9.367
12:10:49	7.496	9.405
12:11:49	7.475	9.412
12:12:49	7.452	9.441
12:13:49	7.513	9.427
12:14:49	7.406	9.522
12:15:49	7.442	9.499
12:16:49	7.436	9.544
12:17:49	7.487	9.53
12:18:49	7.555	9.478
12:19:49	7.444	9.582
12:20:49	14.15	5.51
12:21:49	11.46	7.203
12:22:49	7.069	9.719
12:23:49	6.833	9.878
12:24:49	6.944	9.806
12:25:49	6.959	9.804
12:26:49	7.033	9.742
12:27:49	6.949	9.822
12:28:49	7.043	9.755
12:29:49	7.122	9.697
12:30:49	7.078	9.709
12:31:49	7.206	9.607
12:32:49	7.114	9.663
12:33:49	7.17	9.604
12:34:49	7.25	9.541
12:35:49	7.094	9.691
12:36:49	7.231	9.615
12:37:49	7.248	9.626
12:38:49	7.277	9.612
12:39:49	7.23	9.659
12:40:49	7.337	9.619
12:41:49	7.239	9.737
12:42:49	7.2	9.777
12:43:49	7.292	9.66
12:44:49	7.177	9.722
12:45:49	7.142	9.753
12:46:49	7.235	9.722
12:47:49	7.163	9.757
12:48:49	7.147	9.785
12:49:49	7.173	9.753
AVG	7.503	9.450
MIN	6.833	5.510
MAX	14.150	9.878

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Run 2 Post run bias

11:58:49 - 12:49:49

FURNACE "D" RUN #3

METALS TESTING

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Run summary data

	Raw Avg:	7.503	9.450						
	Max:	14.15	9.878						
	Min:	6.833	5.510						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.030	0.115						
	Low reading:								
	Mid reading:	10.04	10.14						
	High reading:	20.26	18.59						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.148	0.621						
Mid %Err:	**<2.0**	0.099	1.031						
High %Err:	**<2.0**	-0.099	0.378						

Initial Bias Data

	Zero reading:	0.428	0.335						
	Span reading:	10.13	9.505						
Zero % bias:	**<5.0**	1.963	1.188						
Span % bias:	**<5.0**	0.444	-3.429						

Final Bias Data

	Zero reading:	0.543	0.740						
	Span reading:	10.07	10.06						
Zero % bias:	**<5.0**	2.530	3.375						
Span % bias:	**<5.0**	0.148	-0.432						
Zero % drift:	**<3.0**	0.567	2.187						
Span % drift:	**<3.0**	0.296	2.997						

Bias Corrected Averages

	Cor Avg:	7.313	9.591						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 2 Average Results

12:54:08 - 14:08:50

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
May 20 2019	12:55:08	17.33	2.593	0.231	100.6	5.967	80.34		
May 20 2019	12:56:08	17.36	2.582	0.200	99.5	7.553	79.20		
May 20 2019	12:57:08	17.37	2.562	0.199	100.7	8.645	78.45		
May 20 2019	12:58:08	17.38	2.566	0.178	98.20	6.714	77.67		
May 20 2019	12:59:08	17.39	2.573	0.214	97.74	6.792	77.65		
May 20 2019	13:00:08	17.38	2.568	0.225	97.77	6.566	79.78		
May 20 2019	13:01:08	17.38	2.575	0.219	94.12	7.827	79.74		
May 20 2019	13:05:06	17.14	2.777	0.270	162.1	7.009	79.30		
May 20 2019	13:06:06	16.32	3.249	0.296	213.9	7.265	82.01		
May 20 2019	13:07:06	16.31	3.253	0.272	208.1	6.832	84.95		
May 20 2019	13:08:06	16.42	3.191	0.238	198.5	6.845	86.65		
May 20 2019	13:09:06	16.24	3.285	0.252	206.2	7.699	85.81		
May 20 2019	13:10:06	16.65	3.067	0.305	187.5	6.477	86.46		
May 20 2019	13:11:06	16.89	2.895	0.324	171.7	8.790	78.00		
May 20 2019	13:12:06	16.90	2.896	0.309	168.2	7.604	76.92		
May 20 2019	13:13:06	16.91	2.866	0.257	168.8	8.693	76.28		
May 20 2019	13:14:06	16.94	2.863	0.259	169.0	6.627	75.40		
May 20 2019	13:15:06	16.96	2.860	0.259	165.1	6.476	75.50		
May 20 2019	13:16:06	16.95	2.846	0.280	163.3	7.939	75.01		
May 20 2019	13:17:06	16.96	2.849	0.345	166.0	9.085	74.54		
May 20 2019	13:18:06	16.97	2.853	0.339	162.1	8.804	75.65		
May 20 2019	13:19:06	16.98	2.855	0.391	159.6	9.325	76.65		
May 20 2019	13:20:06	16.98	2.852	0.363	156.3	6.260	77.12		
May 20 2019	13:21:06	17.02	2.830	0.304	153.8	7.727	77.26		
May 20 2019	13:22:06	17.00	2.830	0.361	154.7	7.719	77.90		
May 20 2019	13:23:06	16.99	2.836	0.341	149.7	7.608	80.10		
May 20 2019	13:24:06	17.01	2.821	0.321	152.1	7.121	81.62		
May 20 2019	13:25:06	17.02	2.828	0.358	151.2	9.649	82.50		
May 20 2019	13:26:06	17.00	2.816	0.360	147.5	7.164	82.00		
May 20 2019	13:27:06	17.04	2.818	0.311	147.1	5.826	83.00		
May 20 2019	13:28:06	17.05	2.817	0.318	144.6	6.205	82.64		
May 20 2019	13:29:06	17.05	2.809	0.324	145.7	6.908	83.01		
May 20 2019	13:30:06	17.04	2.813	0.362	143.9	6.137	83.00		
May 20 2019	13:34:37	17.07	2.805	0.418	134.5	5.777	77.49		
May 20 2019	13:35:37	17.07	2.825	0.206	118.9	5.693	68.18		
May 20 2019	13:36:37	17.10	2.810	0.177	123.6	6.321	71.80		
May 20 2019	13:37:37	17.09	2.811	0.160	123.7	6.801	74.58		
May 20 2019	13:38:37	17.11	2.802	0.198	124.2	8.509	75.64		
May 20 2019	13:39:37	17.11	2.797	0.186	128.2	5.416	75.83		
May 20 2019	13:40:37	17.09	2.807	0.168	127.5	7.025	77.61		
May 20 2019	13:41:37	17.10	2.798	0.227	129.4	7.366	79.38		
May 20 2019	13:42:37	17.13	2.787	0.235	126.0	5.564	81.30		
May 20 2019	13:43:37	17.12	2.791	0.271	121.7	5.166	84.19		
May 20 2019	13:44:37	17.12	2.800	0.212	116.2	5.737	85.29		
May 20 2019	13:45:37	17.12	2.799	0.164	116.9	6.304	87.97		
May 20 2019	13:46:37	17.13	2.793	0.154	113.7	8.024	90.34		
May 20 2019	13:47:37	17.15	2.793	0.185	113.6	5.331	92.17		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 20 2019	13:48:37	17.21	2.749	0.185	111.3	4.276	91.43		
May 20 2019	13:49:37	17.27	2.708	0.200	107.7	4.196	89.54		
May 20 2019	13:50:37	17.29	2.696	0.193	107.0	4.293	89.97		
May 20 2019	13:51:37	17.29	2.673	0.191	107.0	5.945	89.35		
May 20 2019	13:52:37	17.33	2.657	0.218	106.9	6.578	89.21		
May 20 2019	13:53:37	17.30	2.663	0.197	105.5	6.793	89.71		
May 20 2019	13:54:37	17.31	2.664	0.212	102.9	6.428	92.03		
May 20 2019	14:03:50	17.03	2.850	0.258	187.6	6.477	70.92		
May 20 2019	14:04:50	16.92	2.914	0.234	183.1	7.626	77.68		
May 20 2019	14:05:50	16.85	2.992	0.284	176.5	8.514	83.46		
May 20 2019	14:06:50	16.79	3.017	0.383	171.5	8.329	86.31		
May 20 2019	14:07:50	16.76	3.041	0.416	172.4	10.79	88.85		
May 20 2019	14:08:50	16.77	3.039	0.326	171.5	10.23	90.62		

	Average:	17.03	2.826	0.264	142.2	7.056	81.38		
	Max:	17.39	3.285	0.418	213.9	10.79	92.17		
	Min:	16.24	2.562	0.154	94.12	4.196	68.18		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 2 Post run bias
12:54:08 - 14:08:50

FURNACE "A" RUN #1
PM/EPA 316 TESTING

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
	25A or 7E:	7E	7E	7E	7E	25A	7E		

Run summary data

	Raw Avg:	17.03	2.826	0.264	142.2	7.056	81.38		
	Max:	17.39	3.285	0.418	213.9	10.79	92.17		
	Min:	16.24	2.562	0.154	94.12	4.196	68.18		

Cylinder Concentrations

	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	278.2	5.044	241.0		
	High:	20.28	18.52	56.72	500.2	8.517	490.2		

Calibration Readings

	Zero reading:	-0.015	0.183	0.268	-1.342	0.082	2.246		
	Low reading:					3.095			
	Mid reading:	9.958	10.18	27.64	277.3	5.194	231.4		
	High reading:	20.14	18.61	55.66	502.2	8.894	488.2		

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.074	0.988	0.472	-0.268	N/A	0.458		
Mid %Err:	**<2.0**	-0.306	1.247	0.335	-0.180	N/A	-1.958		
High %Err:	**<2.0**	-0.690	0.486	-1.869	0.400	N/A	-0.408		

EPA Method 25A Error Calculations

Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.082	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.129	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.150	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.377	N/A		

Initial Bias Data

	Zero reading:	0.253	0.145	0.402	1.782	0.082	1.960		
	Span reading:	9.965	9.925	27.39	267.4	5.194	230.0		
Zero % bias:	**<5.0**	1.321	-0.205	0.236	0.625	N/A	-0.058		
Span % bias:	**<5.0**	0.035	-1.377	-0.441	-1.979	N/A	-0.286		

Final Bias Data

	Zero reading:	0.168	0.205	0.678	0.803	-0.101	2.819		
	Span reading:	9.895	9.895	27.11	269.2	5.154	224.2		
Zero % bias:	**<5.0**	0.902	0.119	0.723	0.429	N/A	0.117		
Span % bias:	**<5.0**	-0.311	-1.539	-0.934	-1.619	N/A	-1.469		
Zero % drift:	**<3.0**	0.419	0.324	0.487	0.196	N/A	0.175		
Span % drift:	**<3.0**	0.346	0.162	0.493	0.360	N/A	1.183		
Zero drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.183	N/A		
Span drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.040	N/A		

Bias Corrected Averages

	Cor Avg:	17.34	2.709	-0.284	146.8	7.056	84.72		

MAQDAQ 1.0

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 3 Average Results

15:03:00 - 17:18:17

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
May 20 2019	15:04:00	17.11	2.720	0.282	185.0	10.35	63.16		
May 20 2019	15:05:00	17.00	2.800	0.268	178.0	10.38	68.46		
May 20 2019	15:06:00	16.93	2.846	0.274	178.6	9.070	73.08		
May 20 2019	15:07:00	16.91	2.850	0.319	173.9	8.569	74.33		
May 20 2019	15:08:00	16.88	2.874	0.288	172.8	8.830	76.56		
May 20 2019	15:09:00	16.90	2.882	0.257	174.0	6.563	76.58		
May 20 2019	15:10:00	16.92	2.856	0.281	170.3	5.741	77.22		
May 20 2019	15:11:00	16.90	2.858	0.283	169.9	7.532	77.63		
May 20 2019	15:12:00	16.93	2.849	0.277	165.3	6.585	78.36		
May 20 2019	15:13:00	16.93	2.857	0.328	159.4	6.944	79.50		
May 20 2019	15:14:00	16.95	2.836	0.351	161.3	9.203	79.27		
May 20 2019	15:15:00	16.95	2.844	0.368	158.6	8.095	80.63		
May 20 2019	15:16:00	16.96	2.830	0.397	156.1	7.485	82.75		
May 20 2019	15:17:00	16.97	2.813	0.398	154.0	6.138	82.67		
May 20 2019	15:18:00	16.97	2.826	0.353	149.6	7.608	83.55		
May 20 2019	15:19:00	16.97	2.815	0.395	149.3	9.933	85.09		
May 20 2019	15:20:00	16.99	2.803	0.369	147.7	7.658	85.19		
May 20 2019	15:21:00	16.99	2.793	0.306	147.4	7.565	85.42		
May 20 2019	15:22:00	17.00	2.803	0.304	147.2	7.585	86.20		
May 20 2019	15:23:00	17.00	2.790	0.328	144.4	6.910	87.10		
May 20 2019	15:24:00	17.02	2.762	0.350	144.5	6.385	85.58		
May 20 2019	15:25:00	17.02	2.777	0.352	144.0	7.530	84.73		
May 20 2019	15:26:00	17.02	2.772	0.484	142.7	6.592	84.68		
May 20 2019	15:27:00	17.04	2.758	0.539	140.7	7.330	83.31		
May 20 2019	15:28:00	17.07	2.759	0.672	140.6	8.820	80.97		
May 20 2019	15:29:00	17.05	2.757	0.584	137.1	8.822	80.24		
May 20 2019	15:30:00	17.07	2.741	0.607	136.7	7.886	79.45		
May 20 2019	15:31:00	17.09	2.741	0.550	137.7	6.857	79.30		
May 20 2019	15:34:31	17.19	2.731	0.312	124.2	6.651	68.13		
May 20 2019	15:35:31	16.99	2.812	0.176	128.8	4.881	64.93		
May 20 2019	15:36:31	16.99	2.822	0.154	131.3	6.590	65.68		
May 20 2019	15:37:31	17.00	2.788	0.159	131.3	6.757	67.37		
May 20 2019	15:38:31	17.04	2.779	0.186	131.3	6.674	68.52		
May 20 2019	15:39:31	17.03	2.779	0.155	130.0	4.397	69.63		
May 20 2019	15:40:31	17.04	2.775	0.201	131.3	4.441	70.30		
May 20 2019	15:41:31	17.06	2.763	0.178	131.4	6.854	70.86		
May 20 2019	15:42:31	17.08	2.767	0.198	128.2	7.233	71.05		
May 20 2019	15:43:31	17.09	2.758	0.203	125.4	5.818	71.41		
May 20 2019	15:44:31	17.08	2.753	0.211	127.9	6.678	71.72		
May 20 2019	15:45:31	17.10	2.751	0.198	125.7	5.232	72.61		
May 20 2019	15:46:31	17.11	2.743	0.188	123.0	7.274	72.96		
May 20 2019	15:47:31	17.11	2.750	0.207	114.6	6.550	74.84		
May 20 2019	15:48:31	17.11	2.749	0.225	113.2	6.484	75.83		
May 20 2019	15:49:31	17.13	2.728	0.214	114.3	6.011	75.37		
May 20 2019	15:50:31	17.12	2.734	0.206	113.8	3.959	76.63		
May 20 2019	15:51:31	17.15	2.730	0.231	113.1	4.688	77.07		
May 20 2019	15:52:31	17.12	2.739	0.250	111.1	5.635	78.18		

May 20 2019	15:53:31	17.16	2.707	0.243	108.2	6.538	78.68		
May 20 2019	15:54:31	17.24	2.657	0.206	105.5	4.835	78.04		
May 20 2019	15:55:31	17.23	2.674	0.204	104.9	5.264	77.73		
May 20 2019	15:56:31	17.25	2.642	0.218	102.8	5.244	78.28		
May 20 2019	15:57:31	17.28	2.652	0.239	98.34	6.784	78.84		
May 20 2019	15:58:31	17.28	2.664	0.243	99.5	4.233	80.29		
May 20 2019	15:59:31	17.27	2.638	0.225	97.80	4.481	81.68		
May 20 2019	16:00:31	17.29	2.642	0.207	99.3	5.963	81.52		
May 20 2019	16:06:12	17.02	2.802	0.271	131.1	5.217	80.11		
May 20 2019	16:07:12	16.28	3.259	0.361	200.6	5.056	80.22		
May 20 2019	16:08:12	16.30	3.252	0.327	200.7	4.306	81.84		
May 20 2019	16:09:12	16.30	3.273	0.374	202.4	4.061	83.65		
May 20 2019	16:10:12	16.29	3.264	0.395	198.9	4.873	84.72		
May 20 2019	16:11:12	16.26	3.281	0.462	199.3	5.690	86.30		
May 20 2019	16:12:12	16.25	3.295	0.407	197.7	6.273	87.92		
May 20 2019	16:13:12	16.25	3.291	0.363	197.5	5.677	89.35		
May 20 2019	16:14:12	16.24	3.309	0.361	195.8	7.155	91.85		
May 20 2019	16:15:12	16.25	3.296	0.361	193.5	4.993	94.27		
May 20 2019	16:16:12	16.23	3.312	0.373	189.8	4.683	95.69		
May 20 2019	16:17:12	16.20	3.333	0.381	189.9	4.824	98.24		
May 20 2019	16:18:12	16.22	3.337	0.404	188.6	5.524	100.3		
May 20 2019	16:19:12	16.23	3.337	0.434	186.6	6.374	101.1		
May 20 2019	16:20:12	16.22	3.336	0.462	186.1	5.280	102.8		
May 20 2019	16:21:12	16.19	3.352	0.585	187.0	5.904	104.5		
May 20 2019	16:22:12	16.21	3.337	0.667	182.3	6.418	105.5		
May 20 2019	16:23:12	16.21	3.338	0.724	184.2	5.450	107.5		
May 20 2019	16:24:12	16.22	3.332	0.787	178.3	3.508	109.0		
May 20 2019	16:25:12	16.24	3.323	0.797	177.3	3.533	108.4		
May 20 2019	16:26:12	16.22	3.324	0.945	176.4	6.227	109.3		
May 20 2019	16:27:12	16.25	3.320	0.659	178.6	5.066	109.3		
May 20 2019	16:28:12	16.24	3.296	0.683	177.5	7.734	108.8		
May 20 2019	16:29:12	16.25	3.292	0.652	178.5	7.408	108.3		
May 20 2019	16:30:12	16.27	3.284	0.719	172.9	6.346	108.5		
May 20 2019	16:35:38	16.48	3.153	0.703	161.0	6.074	100.8		
May 20 2019	16:36:38	17.27	2.658	0.202	120.7	6.967	75.27		
May 20 2019	16:37:38	17.30	2.649	0.192	117.8	6.360	76.70		
May 20 2019	16:38:38	17.29	2.639	0.203	116.7	5.221	77.71		
May 20 2019	16:39:38	17.31	2.630	0.229	112.3	3.184	78.32		
May 20 2019	16:40:38	17.32	2.628	0.169	111.3	2.494	79.61		
May 20 2019	16:41:38	17.32	2.632	0.192	111.1	3.678	80.84		
May 20 2019	16:42:38	17.32	2.637	0.192	109.4	4.150	81.98		
May 20 2019	16:43:38	17.32	2.631	0.194	108.0	8.453	82.03		
May 20 2019	16:44:38	17.34	2.622	0.182	107.8	5.754	83.10		
May 20 2019	16:45:38	17.32	2.630	0.218	105.9	6.469	84.32		
May 20 2019	16:46:38	17.30	2.625	0.219	106.7	5.078	85.63		
May 20 2019	16:47:38	17.29	2.624	0.212	106.6	5.617	85.68		
May 20 2019	16:48:38	17.32	2.612	0.218	105.7	2.990	87.22		
May 20 2019	16:49:38	17.30	2.630	0.210	107.6	4.969	88.50		
May 20 2019	16:50:38	17.31	2.607	0.198	105.0	6.892	89.46		
May 20 2019	16:51:38	17.29	2.611	0.247	105.6	5.730	89.63		
May 20 2019	16:52:38	17.26	2.640	0.213	103.7	5.324	90.76		
May 20 2019	16:53:38	17.24	2.666	0.231	103.6	5.805	91.83		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 20 2019	16:54:38	17.22	2.681	0.220	102.6	8.035	92.05		
May 20 2019	16:55:38	17.25	2.678	0.230	104.0	6.130	92.96		
May 20 2019	16:56:38	17.25	2.676	0.229	102.4	7.396	92.89		
May 20 2019	16:57:38	17.26	2.670	0.221	102.5	5.047	92.28		
May 20 2019	16:58:38	17.26	2.667	0.204	102.3	3.836	91.92		
May 20 2019	16:59:38	17.26	2.654	0.242	101.1	5.402	92.14		
May 20 2019	17:00:38	17.28	2.631	0.243	100.8	8.562	92.04		
May 20 2019	17:05:17	17.05	2.816	0.297	131.4	6.581	91.91		
May 20 2019	17:06:17	16.20	3.295	0.291	207.9	8.483	91.08		
May 20 2019	17:07:17	16.21	3.315	0.300	205.3	6.675	92.78		
May 20 2019	17:08:17	16.29	3.263	0.271	200.1	6.614	93.74		
May 20 2019	17:09:17	16.29	3.245	0.298	196.0	4.791	94.35		
May 20 2019	17:10:17	16.26	3.270	0.318	195.2	9.298	95.64		
May 20 2019	17:11:17	16.27	3.270	0.345	195.7	6.674	97.07		
May 20 2019	17:12:17	16.26	3.281	0.343	194.5	4.207	97.53		
May 20 2019	17:13:17	16.24	3.298	0.346	193.9	5.458	98.64		
May 20 2019	17:14:17	16.21	3.294	0.378	190.7	3.898	99.7		
May 20 2019	17:15:17	16.22	3.285	0.392	189.2	6.725	99.00		
May 20 2019	17:16:17	16.23	3.305	0.418	191.4	5.599	101.2		
May 20 2019	17:17:17	16.22	3.297	0.436	188.8	4.731	100.9		
May 20 2019	17:18:17	16.22	3.305	0.373	188.4	5.370	102.5		

	Average:	16.85	2.910	0.333	147.5	6.195	85.74		
	Max:	17.34	3.352	0.945	207.9	10.38	109.3		
	Min:	16.19	2.607	0.154	97.80	2.494	63.16		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 3 Post run bias FURNACE "A" RUN #2

15:03:00 - 17:18:17 PM/EPA 316 TESTING

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
	25A or 7E:	7E	7E	7E	7E	25A	7E		
Run summary data									
	Raw Avg:	16.85	2.910	0.333	147.5	6.195	85.74		
	Max:	17.34	3.352	0.945	207.9	10.38	109.3		
	Min:	16.19	2.607	0.154	97.80	2.494	63.16		
Cylinder Concentrations									
	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	278.2	5.044	241.0		
	High:	20.28	18.52	56.72	500.2	8.517	490.2		
Calibration Readings									
	Zero reading:	-0.015	0.183	0.268	-1.342	0.082	2.246		
	Low reading:					3.095			
	Mid reading:	9.958	10.18	27.64	277.3	5.194	231.4		
	High reading:	20.14	18.61	55.66	502.2	8.894	488.2		
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.074	0.988	0.472	-0.268	N/A	0.458		
Mid %Err:	**<2.0**	-0.306	1.247	0.335	-0.180	N/A	-1.958		
High %Err:	**<2.0**	-0.690	0.486	-1.869	0.400	N/A	-0.408		
EPA Method 25A Error Calculations									
Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.082	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.129	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.150	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.377	N/A		
Initial Bias Data									
	Zero reading:	0.168	0.205	0.678	0.803	-0.101	2.819		
	Span reading:	9.895	9.895	27.11	269.2	5.154	224.2		
Zero % bias:	**<5.0**	0.902	0.119	0.723	0.429	N/A	0.117		
Span % bias:	**<5.0**	-0.311	-1.539	-0.934	-1.619	N/A	-1.469		
Final Bias Data									
	Zero reading:	0.198	0.245	0.994	-0.165	-0.333	1.960		
	Span reading:	9.910	9.903	26.28	269.8	5.103	225.8		
Zero % bias:	**<5.0**	1.050	0.335	1.280	0.235	N/A	-0.058		
Span % bias:	**<5.0**	-0.237	-1.496	-2.398	-1.499	N/A	-1.142		
Zero % drift:	**<3.0**	0.148	0.216	0.557	0.194	N/A	0.175		
Span % drift:	**<3.0**	0.074	0.043	1.464	0.120	N/A	0.327		
Zero drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.232	N/A		
Span drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.051	N/A		
Bias Corrected Averages									
	Cor Avg:	17.18	2.761	-0.534	152.1	6.195	90.24		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 4 Average Results

17:37:19 - 19:52:42

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
May 20 2019	17:38:19	17.24	2.601	0.207	110.5	4.190	73.04		
May 20 2019	17:39:19	17.23	2.615	0.137	111.0	8.019	74.27		
May 20 2019	17:40:19	17.28	2.588	0.177	113.0	3.038	73.86		
May 20 2019	17:41:19	17.29	2.584	0.168	110.4	6.569	74.49		
May 20 2019	17:42:19	17.27	2.569	0.221	108.8	4.059	73.71		
May 20 2019	17:43:19	17.29	2.578	0.215	107.8	5.907	74.95		
May 20 2019	17:44:19	17.27	2.581	0.156	106.7	7.710	75.85		
May 20 2019	17:45:19	17.27	2.567	0.190	105.6	5.239	76.88		
May 20 2019	17:46:19	17.27	2.568	0.232	103.1	6.402	77.46		
May 20 2019	17:47:19	17.29	2.575	0.203	103.7	7.485	78.60		
May 20 2019	17:48:19	17.28	2.569	0.202	104.1	8.550	78.51		
May 20 2019	17:49:19	17.32	2.554	0.200	102.1	7.287	79.35		
May 20 2019	17:50:19	17.28	2.566	0.228	102.1	7.375	81.08		
May 20 2019	17:51:19	17.31	2.550	0.203	99.6	7.604	80.94		
May 20 2019	17:52:19	17.29	2.568	0.203	99.3	4.811	81.19		
May 20 2019	17:53:19	17.30	2.577	0.184	100.5	5.721	81.63		
May 20 2019	17:54:19	17.27	2.591	0.206	98.23	7.229	82.35		
May 20 2019	17:55:19	17.22	2.630	0.208	98.20	7.368	83.72		
May 20 2019	17:56:19	17.20	2.653	0.226	98.10	7.237	85.59		
May 20 2019	17:57:19	17.19	2.644	0.225	99.6	7.325	85.33		
May 20 2019	17:58:19	17.23	2.637	0.223	100.3	9.051	85.34		
May 20 2019	17:59:19	17.23	2.633	0.218	99.2	6.838	85.46		
May 20 2019	18:00:19	17.23	2.631	0.212	96.98	3.848	85.43		
May 20 2019	18:01:19	17.30	2.622	0.190	96.49	7.395	86.75		
May 20 2019	18:05:37	16.50	3.088	0.323	195.0	9.536	77.96		
May 20 2019	18:06:37	16.40	3.171	0.310	192.3	6.521	83.03		
May 20 2019	18:07:37	16.37	3.189	0.315	190.1	6.734	85.55		
May 20 2019	18:08:37	16.40	3.168	0.315	185.7	4.771	86.35		
May 20 2019	18:09:37	16.44	3.149	0.400	183.8	8.800	87.19		
May 20 2019	18:10:37	16.47	3.126	0.362	182.1	6.415	87.81		
May 20 2019	18:11:37	16.49	3.117	0.378	179.5	6.554	88.09		
May 20 2019	18:12:37	16.48	3.104	0.350	178.7	9.021	88.78		
May 20 2019	18:13:37	16.47	3.127	0.357	175.9	7.588	91.03		
May 20 2019	18:14:37	16.49	3.114	0.355	173.2	9.200	90.02		
May 20 2019	18:15:37	16.52	3.099	0.446	172.9	4.841	90.67		
May 20 2019	18:16:37	16.53	3.085	0.467	170.2	6.467	90.43		
May 20 2019	18:17:37	16.57	3.068	0.460	166.4	9.373	89.18		
May 20 2019	18:18:37	16.55	3.077	0.416	165.7	9.437	90.86		
May 20 2019	18:19:37	16.59	3.031	0.450	162.7	5.492	90.51		
May 20 2019	18:20:37	16.61	3.032	0.552	162.4	5.923	89.56		
May 20 2019	18:21:37	16.61	3.024	0.738	162.1	3.566	89.09		
May 20 2019	18:22:37	16.65	2.999	0.805	160.5	5.440	87.19		
May 20 2019	18:23:37	16.69	2.978	0.749	159.5	4.686	85.51		
May 20 2019	18:24:37	16.69	2.973	0.580	154.9	6.474	85.88		
May 20 2019	18:25:37	16.69	2.954	0.466	154.8	7.872	84.73		
May 20 2019	18:26:37	16.72	2.942	0.488	155.1	4.480	84.35		
May 20 2019	18:27:37	16.71	2.931	0.737	151.7	4.830	84.78		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 20 2019	18:28:37	16.74	2.930	0.626	147.5	7.450	84.03		
May 20 2019	18:29:37	16.75	2.918	0.539	145.6	6.622	84.35		
May 20 2019	18:30:37	16.74	2.926	0.575	145.3	3.532	84.17		
May 20 2019	18:35:00	17.06	2.800	0.511	139.0	4.904	81.55		
May 20 2019	18:36:00	17.04	2.749	0.168	130.3	2.862	69.52		
May 20 2019	18:37:00	17.04	2.763	0.138	129.0	4.789	72.42		
May 20 2019	18:38:00	17.05	2.764	0.165	127.0	5.437	74.12		
May 20 2019	18:39:00	17.06	2.751	0.157	127.6	5.262	75.52		
May 20 2019	18:40:00	17.06	2.752	0.148	124.6	7.517	78.55		
May 20 2019	18:41:00	17.10	2.714	0.181	118.0	5.523	80.51		
May 20 2019	18:42:01	17.31	2.585	0.158	106.8	8.026	78.30		
May 20 2019	18:43:00	17.31	2.590	0.176	106.2	6.191	78.74		
May 20 2019	18:44:00	17.29	2.596	0.171	109.9	6.855	80.49		
May 20 2019	18:45:00	17.28	2.624	0.177	112.1	6.992	82.60		
May 20 2019	18:46:00	17.29	2.620	0.174	111.4	8.221	83.51		
May 20 2019	18:47:00	17.26	2.624	0.217	104.3	4.692	84.42		
May 20 2019	18:48:00	17.28	2.610	0.181	102.6	6.398	85.29		
May 20 2019	18:49:00	17.27	2.615	0.183	102.1	8.683	84.15		
May 20 2019	18:50:00	17.27	2.602	0.213	100.9	5.614	86.01		
May 20 2019	18:51:00	17.29	2.616	0.179	100.7	2.952	86.32		
May 20 2019	18:52:00	17.27	2.615	0.179	99.1	7.611	87.60		
May 20 2019	18:53:00	17.31	2.589	0.177	102.1	4.218	88.59		
May 20 2019	18:54:00	17.34	2.567	0.202	98.46	4.219	87.49		
May 20 2019	18:55:00	17.33	2.552	0.177	96.65	5.365	86.94		
May 20 2019	18:56:00	17.35	2.554	0.196	95.61	6.214	87.00		
May 20 2019	18:57:00	17.36	2.552	0.222	93.75	8.674	86.61		
May 20 2019	18:58:00	17.37	2.550	0.222	95.06	5.843	87.44		
May 20 2019	18:59:00	17.36	2.541	0.221	94.98	6.863	87.19		
May 20 2019	19:00:00	17.37	2.536	0.224	93.76	4.463	88.09		
May 20 2019	19:01:00	17.40	2.528	0.183	94.33	5.549	88.62		
May 20 2019	19:06:05	17.13	2.719	0.231	147.0	6.767	81.67		
May 20 2019	19:07:05	16.97	2.817	0.253	163.4	7.613	80.27		
May 20 2019	19:08:05	16.95	2.823	0.342	162.8	8.047	82.47		
May 20 2019	19:09:05	16.95	2.825	0.318	160.4	7.171	82.70		
May 20 2019	19:10:05	16.92	2.843	0.325	162.8	5.681	84.49		
May 20 2019	19:11:05	16.92	2.847	0.352	161.2	6.173	84.60		
May 20 2019	19:12:05	16.94	2.828	0.295	159.6	7.246	84.51		
May 20 2019	19:13:05	16.92	2.839	0.349	158.1	5.934	85.97		
May 20 2019	19:14:05	16.84	2.891	0.398	161.5	6.847	86.80		
May 20 2019	19:15:05	16.85	2.893	0.324	159.7	9.969	89.00		
May 20 2019	19:16:05	16.85	2.875	0.340	158.3	8.528	88.61		
May 20 2019	19:17:05	16.85	2.877	0.374	156.6	4.089	89.39		
May 20 2019	19:18:05	16.84	2.882	0.419	154.0	3.340	88.72		
May 20 2019	19:19:05	16.87	2.858	0.520	155.9	4.327	87.70		
May 20 2019	19:20:05	16.87	2.867	0.534	151.8	7.350	87.32		
May 20 2019	19:21:05	16.89	2.844	0.476	150.9	7.568	86.52		
May 20 2019	19:22:05	16.90	2.838	0.507	149.1	7.969	85.48		
May 20 2019	19:23:05	16.89	2.841	0.459	148.8	7.169	86.14		
May 20 2019	19:24:05	16.91	2.831	0.436	144.4	5.451	85.64		
May 20 2019	19:25:05	16.94	2.804	0.558	143.8	3.829	84.54		
May 20 2019	19:26:05	16.96	2.791	0.584	143.3	5.615	84.76		
May 20 2019	19:27:05	16.96	2.796	0.516	143.0	9.158	85.02		

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 20 2019	19:28:05	16.93	2.799	0.466	140.5	7.666	84.17		
May 20 2019	19:29:05	16.93	2.789	0.479	138.3	7.802	84.02		
May 20 2019	19:30:05	16.97	2.777	0.563	136.7	4.542	84.63		
May 20 2019	19:31:05	16.98	2.789	0.572	134.6	4.981	84.05		
May 20 2019	19:32:05	19.10	1.480	0.518	64.42	2.363	65.81		
May 20 2019	19:33:05	20.54	0.327	0.390	3.149	1.088	14.31		
May 20 2019	19:34:05	20.60	0.260	0.476	1.399	0.959	5.057		
May 20 2019	19:39:42	19.43	1.072	0.365	38.33	1.775	25.34		
May 20 2019	19:40:42	16.62	3.017	0.118	125.8	6.971	77.14		
May 20 2019	19:41:42	16.65	3.004	0.131	127.0	4.887	78.87		
May 20 2019	19:42:42	16.69	2.993	0.127	126.1	5.225	78.70		
May 20 2019	19:43:42	16.68	2.987	0.124	123.0	5.917	79.83		
May 20 2019	19:44:42	16.67	2.980	0.132	121.2	5.545	79.85		
May 20 2019	19:45:42	16.70	2.986	0.154	119.7	3.963	79.98		
May 20 2019	19:46:42	16.69	2.964	0.122	122.7	3.618	79.47		
May 20 2019	19:47:42	16.69	2.961	0.112	123.2	4.552	79.41		
May 20 2019	19:48:42	16.72	2.949	0.123	118.7	4.699	78.64		
May 20 2019	19:49:42	16.73	2.937	0.145	116.4	3.771	77.97		
May 20 2019	19:50:42	16.75	2.953	0.166	115.4	3.487	78.15		
May 20 2019	19:51:42	16.74	2.944	0.155	114.2	2.299	78.97		
May 20 2019	19:52:42	16.76	2.924	0.144	114.4	4.771	78.74		

	Average:	17.06	2.732	0.310	128.2	6.038	81.42		
	Max:	20.60	3.189	0.805	195.0	9.969	91.03		
	Min:	16.37	0.260	0.112	1.399	0.959	5.057		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 4 Post run bias

FURNACE "A" RUN #3

17:37:19 - 19:52:42

PM/EPA 316 TESTING

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
	25A or 7E:	7E	7E	7E	7E	25A	7E		
Run summary data									
	Raw Avg:	17.06	2.732	0.310	128.2	6.038	81.42		
	Max:	20.60	3.189	0.805	195.0	9.969	91.03		
	Min:	16.37	0.260	0.112	1.399	0.959	5.057		
Cylinder Concentrations									
	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	278.2	5.044	241.0		
	High:	20.28	18.52	56.72	500.2	8.517	490.2		
Calibration Readings									
	Zero reading:	-0.015	0.183	0.268	-1.342	0.082	2.246		
	Low reading:					3.095			
	Mid reading:	9.958	10.18	27.64	277.3	5.194	231.4		
	High reading:	20.14	18.61	55.66	502.2	8.894	488.2		
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.074	0.988	0.472	-0.268	N/A	0.458		
Mid %Err:	**<2.0**	-0.306	1.247	0.335	-0.180	N/A	-1.958		
High %Err:	**<2.0**	-0.690	0.486	-1.869	0.400	N/A	-0.408		
EPA Method 25A Error Calculations									
Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.082	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.129	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.150	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.377	N/A		
Initial Bias Data									
	Zero reading:	0.198	0.245	0.994	-0.165	-0.333	1.960		
	Span reading:	9.910	9.903	26.28	269.8	5.103	225.8		
Zero % bias:	**<5.0**	1.050	0.335	1.280	0.235	N/A	-0.058		
Span % bias:	**<5.0**	-0.237	-1.496	-2.398	-1.499	N/A	-1.142		
Final Bias Data									
	Zero reading:	0.153	0.238	0.580	1.078	-0.299	2.354		
	Span reading:	9.843	9.795	27.33	271.5	5.093	224.7		
Zero % bias:	**<5.0**	0.828	0.297	0.550	0.484	N/A	0.022		
Span % bias:	**<5.0**	-0.567	-2.079	-0.547	-1.160	N/A	-1.367		
Zero % drift:	**<3.0**	0.222	0.038	0.730	0.249	N/A	0.080		
Span % drift:	**<3.0**	0.330	0.583	1.851	0.339	N/A	0.225		
Zero drift:	**<3.0% span**	N/A	N/A	N/A	N/A	-0.034	N/A		
Span drift:	**<3.0% span**	N/A	N/A	N/A	N/A	0.010	N/A		
Bias Corrected Averages									
	Cor Avg:	17.44	2.579	-0.503	131.5	6.038	85.63		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 2 Average Results

15:52:47 - 18:01:15

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
May 21 2019	15:53:47	16.84	3.033						
May 21 2019	15:54:47	16.86	2.996						
May 21 2019	15:55:47	16.85	2.984						
May 21 2019	15:56:47	16.84	2.981						
May 21 2019	15:57:47	16.86	2.975						
May 21 2019	15:58:47	16.86	2.979						
May 21 2019	15:59:47	16.87	2.969						
May 21 2019	16:00:47	16.85	2.983						
May 21 2019	16:01:47	16.88	2.969						
May 21 2019	16:02:47	16.86	2.981						
May 21 2019	16:06:02	17.01	2.835						
May 21 2019	16:07:02	16.61	3.083						
May 21 2019	16:08:02	16.40	3.230						
May 21 2019	16:09:02	16.27	3.333						
May 21 2019	16:10:02	16.20	3.373						
May 21 2019	16:11:02	16.16	3.417						
May 21 2019	16:12:02	16.20	3.366						
May 21 2019	16:13:02	16.23	3.362						
May 21 2019	16:14:02	16.24	3.344						
May 21 2019	16:15:02	16.27	3.332						
May 21 2019	16:16:02	16.27	3.333						
May 21 2019	16:17:02	16.25	3.347						
May 21 2019	16:18:02	16.25	3.347						
May 21 2019	16:19:02	16.27	3.328						
May 21 2019	16:20:02	16.28	3.299						
May 21 2019	16:21:02	16.33	3.278						
May 21 2019	16:22:02	16.35	3.276						
May 21 2019	16:23:02	16.39	3.250						
May 21 2019	16:24:02	16.38	3.249						
May 21 2019	16:25:02	16.40	3.232						
May 21 2019	16:26:02	16.42	3.227						
May 21 2019	16:27:02	16.47	3.193						
May 21 2019	16:28:02	16.45	3.182						
May 21 2019	16:29:02	16.47	3.166						
May 21 2019	16:30:02	16.48	3.155						
May 21 2019	16:31:02	16.52	3.156						
May 21 2019	16:32:02	16.54	3.132						
May 21 2019	16:33:02	16.53	3.133						
May 21 2019	16:36:57	16.68	3.015						
May 21 2019	16:37:57	16.53	3.127						
May 21 2019	16:38:57	16.53	3.125						
May 21 2019	16:39:57	16.51	3.139						
May 21 2019	16:40:57	16.53	3.127						
May 21 2019	16:41:57	16.54	3.122						
May 21 2019	16:42:57	16.54	3.125						
May 21 2019	16:43:57	16.56	3.122						
May 21 2019	16:44:57	16.58	3.095						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 21 2019	16:45:57	16.59	3.087						
May 21 2019	16:46:57	16.59	3.088						
May 21 2019	16:47:57	16.61	3.078						
May 21 2019	16:48:57	16.62	3.069						
May 21 2019	16:49:57	16.64	3.068						
May 21 2019	16:50:57	16.64	3.054						
May 21 2019	16:51:57	16.67	3.049						
May 21 2019	16:52:57	16.69	3.038						
May 21 2019	16:53:57	16.69	3.029						
May 21 2019	16:54:57	16.72	3.019						
May 21 2019	16:55:57	16.72	3.004						
May 21 2019	16:56:57	16.76	3.008						
May 21 2019	16:57:57	16.83	2.954						
May 21 2019	16:58:57	16.89	2.901						
May 21 2019	16:59:57	16.93	2.877						
May 21 2019	17:00:57	16.96	2.864						
May 21 2019	17:01:57	16.98	2.872						
May 21 2019	17:02:57	17.00	2.853						
May 21 2019	17:03:57	18.60	1.869						
May 21 2019	17:04:57	20.26	0.601						
May 21 2019	17:29:05	17.81	2.240						
May 21 2019	17:30:05	16.69	3.023						
May 21 2019	17:31:05	16.72	3.019						
May 21 2019	17:32:05	16.76	3.009						
May 21 2019	17:33:05	16.78	3.005						
May 21 2019	17:34:05	18.98	1.631						
May 21 2019	17:36:15	20.35	0.520						
May 21 2019	17:37:15	20.48	0.355						
May 21 2019	17:38:15	20.04	0.556						
May 21 2019	17:39:15	17.32	2.475						
May 21 2019	17:40:15	16.94	2.797						
May 21 2019	17:41:15	16.94	2.820						
May 21 2019	17:42:15	16.92	2.862						
May 21 2019	17:43:15	16.94	2.885						
May 21 2019	17:44:15	16.97	2.883						
May 21 2019	17:45:15	16.97	2.873						
May 21 2019	17:46:15	16.97	2.882						
May 21 2019	17:47:15	16.96	2.890						
May 21 2019	17:48:15	16.99	2.883						
May 21 2019	17:49:15	16.97	2.890						
May 21 2019	17:50:15	16.97	2.881						
May 21 2019	17:51:15	16.99	2.876						
May 21 2019	17:52:15	16.99	2.864						
May 21 2019	17:53:15	17.00	2.862						
May 21 2019	17:54:15	17.01	2.829						
May 21 2019	17:55:15	17.02	2.838						
May 21 2019	17:56:15	17.03	2.822						
May 21 2019	17:57:15	17.05	2.810						
May 21 2019	17:58:15	17.04	2.819						
May 21 2019	17:59:15	17.06	2.819						
May 21 2019	18:00:15	17.07	2.796						
May 21 2019	18:01:15	17.10	2.816						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

	Average:	16.89	2.906						
	Max:	20.48	3.417						
	Min:	16.16	0.355						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 2 Post run bias

FURNACE "A" RUN #1

15:52:47 - 18:01:15

METALS TESTING

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						
Run summary data									
	Raw Avg:	16.89	2.906						
	Max:	20.48	3.417						
	Min:	16.16	0.355						
Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						
Calibration Readings									
	Zero reading:	-0.030	0.223						
	Low reading:								
	Mid reading:	9.835	10.07						
	High reading:	20.05	18.53						
EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.148	1.204						
Mid %Err:	**<2.0**	-0.912	0.653						
High %Err:	**<2.0**	-1.134	0.054						
Initial Bias Data									
	Zero reading:	0.900	0.358						
	Span reading:	9.813	9.415						
Zero % bias:	**<5.0**	4.586	0.729						
Span % bias:	**<5.0**	-0.108	-3.537						
Final Bias Data									
	Zero reading:	0.458	0.595						
	Span reading:	10.09	9.813						
Zero % bias:	**<5.0**	2.406	2.009						
Span % bias:	**<5.0**	1.257	-1.388						
Zero % drift:	**<3.0**	2.180	1.280						
Span % drift:	**<3.0**	1.365	2.149						
Bias Corrected Averages									
	Cor Avg:	17.52	2.645						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 2 Average Results

15:08:30 - 17:33:59

	Name:	O2 294	CO2 11
	Make/Model:	SERVO 1400	SERVO 1400
May 22 2019	15:09:30	16.24	3.323
May 22 2019	15:10:30	16.25	3.318
May 22 2019	15:11:30	16.25	3.307
May 22 2019	15:12:30	16.27	3.304
May 22 2019	15:13:30	16.27	3.311
May 22 2019	15:14:30	16.28	3.304
May 22 2019	15:15:30	16.26	3.305
May 22 2019	15:16:30	16.28	3.300
May 22 2019	15:17:30	16.29	3.299
May 22 2019	15:18:30	16.29	3.290
May 22 2019	15:19:30	16.28	3.299
May 22 2019	15:20:30	16.31	3.275
May 22 2019	15:21:30	16.31	3.278
May 22 2019	15:22:30	16.31	3.279
May 22 2019	15:23:30	16.33	3.241
May 22 2019	15:24:30	16.34	3.257
May 22 2019	15:25:30	16.34	3.257
May 22 2019	15:26:30	16.32	3.266
May 22 2019	15:27:30	16.31	3.269
May 22 2019	15:28:30	16.31	3.279
May 22 2019	15:29:30	16.38	3.242
May 22 2019	15:30:30	16.40	3.241
May 22 2019	15:31:30	16.44	3.231
May 22 2019	15:32:30	16.44	3.214
May 22 2019	15:34:59	16.86	2.990
May 22 2019	15:35:59	17.07	2.811
May 22 2019	15:36:59	16.98	2.899
May 22 2019	15:37:59	16.98	2.896
May 22 2019	15:38:59	16.96	2.924
May 22 2019	15:39:59	16.96	2.904
May 22 2019	15:40:59	16.95	2.929
May 22 2019	15:41:59	16.97	2.902
May 22 2019	15:42:59	16.98	2.884
May 22 2019	15:43:59	16.98	2.875
May 22 2019	15:44:59	17.00	2.878
May 22 2019	15:45:59	17.00	2.871
May 22 2019	15:46:59	17.01	2.850
May 22 2019	15:47:59	17.00	2.868
May 22 2019	15:48:59	17.01	2.850
May 22 2019	15:49:59	17.01	2.856
May 22 2019	15:50:59	17.02	2.839
May 22 2019	15:51:59	17.02	2.838
May 22 2019	15:52:59	17.01	2.833
May 22 2019	15:53:59	17.04	2.816
May 22 2019	15:54:59	17.06	2.818
May 22 2019	15:55:59	17.04	2.810
May 22 2019	15:56:59	17.06	2.794

MONTROSE ENVIRONMENTAL

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 22 2019	15:57:59	17.08	2.787						
May 22 2019	15:58:59	17.07	2.798						
May 22 2019	15:59:59	17.09	2.770						
May 22 2019	16:00:59	17.09	2.780						
May 22 2019	16:01:59	17.11	2.760						
May 22 2019	16:02:59	17.13	2.763						
May 22 2019	16:05:50	16.59	3.066						
May 22 2019	16:06:50	16.27	3.253						
May 22 2019	16:07:50	16.23	3.291						
May 22 2019	16:08:50	16.24	3.288						
May 22 2019	16:09:50	16.23	3.299						
May 22 2019	16:10:50	16.24	3.280						
May 22 2019	16:11:50	16.22	3.284						
May 22 2019	16:12:50	16.22	3.276						
May 22 2019	16:13:50	16.23	3.284						
May 22 2019	16:14:50	16.24	3.268						
May 22 2019	16:15:50	16.24	3.277						
May 22 2019	16:16:50	16.25	3.266						
May 22 2019	16:17:50	16.26	3.264						
May 22 2019	16:18:50	16.25	3.256						
May 22 2019	16:19:50	16.23	3.276						
May 22 2019	16:20:50	16.24	3.278						
May 22 2019	16:21:50	16.24	3.260						
May 22 2019	16:22:50	16.25	3.256						
May 22 2019	16:23:50	16.25	3.256						
May 22 2019	16:24:50	16.26	3.264						
May 22 2019	16:25:50	16.27	3.233						
May 22 2019	16:26:50	16.27	3.245						
May 22 2019	16:27:50	16.28	3.242						
May 22 2019	16:28:50	16.29	3.244						
May 22 2019	16:29:50	16.31	3.216						
May 22 2019	16:30:50	16.39	3.189						
May 22 2019	16:31:50	16.44	3.151						
May 22 2019	16:32:50	16.44	3.152						
May 22 2019	16:35:31	17.01	2.783						
May 22 2019	16:36:31	16.96	2.813						
May 22 2019	16:37:31	16.94	2.842						
May 22 2019	16:38:31	16.92	2.855						
May 22 2019	16:39:31	16.94	2.848						
May 22 2019	16:40:31	16.93	2.843						
May 22 2019	16:41:31	16.92	2.852						
May 22 2019	16:42:31	16.93	2.859						
May 22 2019	16:43:31	16.94	2.849						
May 22 2019	16:44:31	16.94	2.846						
May 22 2019	16:45:31	16.93	2.857						
May 22 2019	16:46:31	16.90	2.861						
May 22 2019	16:47:31	16.93	2.833						
May 22 2019	16:48:31	16.95	2.836						
May 22 2019	16:49:31	16.93	2.841						
May 22 2019	16:50:31	16.96	2.831						
May 22 2019	16:51:31	16.96	2.838						
May 22 2019	16:52:31	16.97	2.847						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 22 2019	16:53:31	16.95	2.832						
May 22 2019	16:54:31	16.97	2.825						
May 22 2019	16:55:31	16.98	2.828						
May 22 2019	16:56:31	16.97	2.829						
May 22 2019	16:57:31	16.96	2.840						
May 22 2019	16:58:31	16.98	2.830						
May 22 2019	16:59:31	17.01	2.823						
May 22 2019	17:00:31	17.01	2.824						
May 22 2019	17:01:31	18.58	1.874						
May 22 2019	17:02:31	20.48	0.438						
May 22 2019	17:03:31	20.52	0.347						
May 22 2019	17:04:32	18.56	1.696						
May 22 2019	17:05:31	16.79	2.866						
May 22 2019	17:06:32	16.55	3.061						
May 22 2019	17:21:59	16.51	3.095						
May 22 2019	17:22:59	16.55	3.073						
May 22 2019	17:23:59	16.56	3.060						
May 22 2019	17:24:59	16.57	3.057						
May 22 2019	17:25:59	16.58	3.030						
May 22 2019	17:26:59	16.58	3.046						
May 22 2019	17:27:59	16.59	3.027						
May 22 2019	17:28:59	16.59	3.033						
May 22 2019	17:29:59	16.58	3.031						
May 22 2019	17:30:59	16.61	3.022						
May 22 2019	17:31:59	16.63	3.022						
May 22 2019	17:32:59	16.67	3.010						
May 22 2019	17:33:59	18.57	1.872						

	Average:	16.75	2.973						
	Max:	20.52	3.323						
	Min:	16.22	0.347						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 2 Post run bias — FURNACE "A" RUN #2

15:08:30 - 17:33:59 — METALS TESTING

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Run summary data

	Raw Avg:	16.75	2.973						
	Max:	20.52	3.323						
	Min:	16.22	0.347						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.015	0.290						
	Low reading:								
	Mid reading:	10.02	10.17						
	High reading:	20.05	18.60						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.074	1.566						
Mid %Err:	**<2.0**	0.000	1.193						
High %Err:	**<2.0**	-1.134	0.432						

Initial Bias Data

	Zero reading:	0.465	0.283						
	Span reading:	20.09	17.89						
Zero % bias:	**<5.0**	2.219	-0.038						
Span % bias:	**<5.0**	0.197	-3.834						

Final Bias Data

	Zero reading:	0.405	0.358						
	Span reading:	20.16	17.85						
Zero % bias:	**<5.0**	1.923	0.367						
Span % bias:	**<5.0**	0.542	-4.050						
Zero % drift:	**<3.0**	0.296	0.405						
Span % drift:	**<3.0**	0.345	0.216						

Bias Corrected Averages

	Cor Avg:	16.80	2.799						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Run 1 Average Results

08:04:49 - 16:01:04

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
May 23 2019	08:05:49	16.69	2.975						
May 23 2019	08:06:49	16.47	3.121						
May 23 2019	08:07:49	16.40	3.180						
May 23 2019	08:08:49	16.43	3.182						
May 23 2019	08:09:49	16.42	3.194						
May 23 2019	08:10:49	16.42	3.186						
May 23 2019	08:11:49	16.40	3.188						
May 23 2019	08:12:49	16.42	3.196						
May 23 2019	08:13:49	16.44	3.168						
May 23 2019	08:14:49	16.44	3.173						
May 23 2019	08:15:49	16.44	3.174						
May 23 2019	08:16:49	16.45	3.179						
May 23 2019	08:17:49	16.49	3.128						
May 23 2019	08:18:49	16.49	3.138						
May 23 2019	08:19:49	16.50	3.132						
May 23 2019	08:20:49	16.57	3.091						
May 23 2019	08:21:49	16.62	3.044						
May 23 2019	08:22:49	16.66	3.038						
May 23 2019	08:23:49	16.65	3.034						
May 23 2019	08:24:49	16.68	3.017						
May 23 2019	08:25:49	16.69	3.008						
May 23 2019	08:26:49	16.73	2.986						
May 23 2019	08:27:49	16.74	2.973						
May 23 2019	08:28:49	16.76	2.977						
May 23 2019	08:29:49	16.77	2.966						
May 23 2019	08:30:49	16.79	2.966						
May 23 2019	08:31:49	16.82	2.960						
May 23 2019	08:32:49	16.79	2.953						
May 23 2019	08:35:53	17.01	2.846						
May 23 2019	08:36:53	16.97	2.861						
May 23 2019	08:37:53	16.98	2.856						
May 23 2019	08:38:53	16.98	2.873						
May 23 2019	08:39:53	17.00	2.849						
May 23 2019	08:40:53	17.00	2.843						
May 23 2019	08:41:53	17.01	2.839						
May 23 2019	08:42:53	17.02	2.837						
May 23 2019	08:43:53	17.02	2.833						
May 23 2019	08:44:53	17.03	2.845						
May 23 2019	08:45:53	17.04	2.840						
May 23 2019	08:46:53	17.06	2.822						
May 23 2019	08:47:53	17.06	2.824						
May 23 2019	08:48:53	17.08	2.806						
May 23 2019	08:49:53	17.07	2.821						
May 23 2019	08:50:53	17.06	2.798						
May 23 2019	08:51:53	17.08	2.793						
May 23 2019	08:52:53	17.09	2.781						
May 23 2019	08:53:53	17.08	2.779						

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 23 2019	08:54:53	17.12	2.760						
May 23 2019	08:55:53	17.12	2.763						
May 23 2019	08:56:53	17.13	2.749						
May 23 2019	08:57:53	17.15	2.730						
May 23 2019	08:58:53	17.16	2.705						
May 23 2019	08:59:53	17.17	2.682						
May 23 2019	09:00:53	17.24	2.633						
May 23 2019	09:01:53	17.31	2.600						
May 23 2019	09:02:53	17.30	2.572						
May 23 2019	09:05:51	17.13	2.666						
May 23 2019	09:06:51	16.78	2.885						
May 23 2019	09:07:51	16.69	2.963						
May 23 2019	09:08:51	16.68	2.960						
May 23 2019	09:09:51	16.69	2.968						
May 23 2019	09:10:51	16.71	2.986						
May 23 2019	09:11:51	16.75	2.962						
May 23 2019	09:12:51	16.75	2.958						
May 23 2019	09:13:51	16.75	2.965						
May 23 2019	09:14:51	16.78	2.942						
May 23 2019	09:15:51	16.79	2.955						
May 23 2019	09:16:51	16.80	2.953						
May 23 2019	09:17:51	16.81	2.947						
May 23 2019	09:18:51	16.83	2.945						
May 23 2019	09:19:51	16.83	2.939						
May 23 2019	09:20:51	16.84	2.919						
May 23 2019	09:21:51	16.85	2.912						
May 23 2019	09:22:51	16.90	2.884						
May 23 2019	09:23:51	16.91	2.883						
May 23 2019	09:24:51	16.91	2.895						
May 23 2019	09:25:51	16.96	2.878						
May 23 2019	09:26:51	16.99	2.839						
May 23 2019	09:27:51	16.99	2.852						
May 23 2019	09:28:51	17.00	2.845						
May 23 2019	09:29:51	17.02	2.839						
May 23 2019	09:30:51	17.05	2.817						
May 23 2019	09:31:51	17.08	2.810						
May 23 2019	09:32:51	17.08	2.822						
May 23 2019	09:35:41	17.21	2.786						
May 23 2019	09:36:41	17.02	2.881						
May 23 2019	09:37:41	17.00	2.913						
May 23 2019	09:38:41	17.00	2.914						
May 23 2019	09:39:41	17.00	2.900						
May 23 2019	09:40:41	17.01	2.910						
May 23 2019	09:41:41	17.00	2.916						
May 23 2019	09:42:41	17.01	2.922						
May 23 2019	09:43:41	17.02	2.913						
May 23 2019	09:44:41	17.03	2.920						
May 23 2019	09:45:41	17.03	2.918						
May 23 2019	09:46:41	17.07	2.882						
May 23 2019	09:47:41	17.08	2.878						
May 23 2019	09:48:41	17.09	2.879						
May 23 2019	09:49:41	17.09	2.897						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 23 2019	09:50:41	17.09	2.869						
May 23 2019	09:51:41	17.11	2.868						
May 23 2019	09:52:41	17.13	2.849						
May 23 2019	09:53:41	17.14	2.848						
May 23 2019	09:54:41	17.16	2.831						
May 23 2019	09:55:41	17.16	2.834						
May 23 2019	09:56:41	17.17	2.824						
May 23 2019	09:57:41	17.18	2.801						
May 23 2019	09:58:41	17.21	2.789						
May 23 2019	09:59:41	17.26	2.742						
May 23 2019	10:00:41	17.34	2.691						
May 23 2019	10:01:41	17.37	2.671						
May 23 2019	10:02:41	17.38	2.659						
May 23 2019	10:05:21	17.39	2.645						
May 23 2019	10:06:21	16.87	2.941						
May 23 2019	10:07:21	16.70	3.079						
May 23 2019	10:08:21	16.66	3.106						
May 23 2019	10:09:21	16.62	3.107						
May 23 2019	10:10:21	16.62	3.108						
May 23 2019	10:11:21	16.66	3.108						
May 23 2019	10:12:21	16.65	3.105						
May 23 2019	10:13:21	16.63	3.117						
May 23 2019	10:14:21	16.65	3.104						
May 23 2019	10:15:21	16.65	3.101						
May 23 2019	10:16:21	16.66	3.090						
May 23 2019	10:17:21	16.70	3.065						
May 23 2019	10:18:21	16.69	3.067						
May 23 2019	10:19:21	16.71	3.044						
May 23 2019	10:20:21	16.71	3.025						
May 23 2019	10:21:21	16.76	3.002						
May 23 2019	10:22:21	16.80	2.990						
May 23 2019	10:23:21	16.84	2.954						
May 23 2019	10:24:21	16.86	2.949						
May 23 2019	10:25:21	16.87	2.930						
May 23 2019	10:26:21	16.89	2.912						
May 23 2019	10:27:21	16.92	2.899						
May 23 2019	10:28:21	16.92	2.889						
May 23 2019	10:29:21	16.94	2.878						
May 23 2019	10:30:21	16.95	2.872						
May 23 2019	10:31:21	16.98	2.877						
May 23 2019	10:32:21	16.98	2.877						
May 23 2019	10:35:25	17.02	2.844						
May 23 2019	10:36:25	17.00	2.867						
May 23 2019	10:37:25	16.98	2.882						
May 23 2019	10:38:25	17.00	2.881						
May 23 2019	10:39:25	16.98	2.887						
May 23 2019	10:40:25	16.98	2.884						
May 23 2019	10:41:25	17.03	2.870						
May 23 2019	10:42:25	17.00	2.881						
May 23 2019	10:43:25	17.00	2.872						
May 23 2019	10:44:25	17.00	2.878						
May 23 2019	10:45:25	17.03	2.873						

May 23 2019	10:46:25	17.02	2.884						
May 23 2019	10:47:25	17.03	2.870						
May 23 2019	10:48:25	17.06	2.851						
May 23 2019	10:49:25	17.06	2.869						
May 23 2019	10:50:25	17.08	2.853						
May 23 2019	10:51:25	17.09	2.835						
May 23 2019	10:52:25	17.08	2.831						
May 23 2019	10:53:25	17.08	2.828						
May 23 2019	10:54:25	17.10	2.818						
May 23 2019	10:55:25	17.10	2.801						
May 23 2019	10:56:25	17.10	2.809						
May 23 2019	10:57:25	17.13	2.773						
May 23 2019	10:58:25	17.16	2.753						
May 23 2019	10:59:25	17.18	2.739						
May 23 2019	11:00:25	17.20	2.737						
May 23 2019	11:01:25	17.28	2.696						
May 23 2019	11:02:25	17.33	2.675						
May 23 2019	11:03:25	17.63	2.519						
May 23 2019	11:04:25	19.66	1.068						
May 23 2019	11:05:25	17.41	2.496						
May 23 2019	11:06:25	16.73	3.038						
May 23 2019	11:07:25	16.52	3.166						
May 23 2019	11:08:25	16.46	3.218						
May 23 2019	11:09:25	16.43	3.245						
May 23 2019	11:10:25	16.42	3.255						
May 23 2019	11:11:25	16.43	3.241						
May 23 2019	11:12:25	16.43	3.240						
May 23 2019	11:13:25	16.42	3.235						
May 23 2019	11:14:25	16.43	3.234						
May 23 2019	11:15:25	16.46	3.224						
May 23 2019	11:16:25	16.47	3.225						
May 23 2019	11:17:25	16.48	3.222						
May 23 2019	11:18:25	16.46	3.202						
May 23 2019	11:19:25	16.51	3.177						
May 23 2019	11:20:25	16.53	3.170						
May 23 2019	11:21:25	16.54	3.161						
May 23 2019	11:22:25	16.60	3.131						
May 23 2019	11:23:25	16.62	3.127						
May 23 2019	11:24:25	16.67	3.097						
May 23 2019	11:25:25	16.68	3.087						
May 23 2019	11:26:25	16.68	3.108						
May 23 2019	11:27:25	16.76	3.059						
May 23 2019	11:28:25	16.72	3.065						
May 23 2019	11:29:25	16.69	3.102						
May 23 2019	11:30:25	16.71	3.075						
May 23 2019	11:31:25	16.76	3.057						
May 23 2019	11:32:25	16.77	3.053						
May 23 2019	11:36:40	16.83	3.042						
May 23 2019	11:37:40	16.74	3.072						
May 23 2019	11:38:40	16.73	3.083						
May 23 2019	11:39:40	16.74	3.063						
May 23 2019	11:40:40	16.76	3.046						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 23 2019	11:41:40	16.76	3.057						
May 23 2019	11:42:40	16.78	3.044						
May 23 2019	11:43:40	16.78	3.032						
May 23 2019	11:44:40	16.79	3.041						
May 23 2019	11:45:40	16.81	3.017						
May 23 2019	11:46:40	16.83	3.022						
May 23 2019	11:47:40	16.84	3.001						
May 23 2019	11:48:40	16.83	3.015						
May 23 2019	11:49:40	16.86	2.978						
May 23 2019	11:50:40	16.88	2.977						
May 23 2019	11:51:40	16.88	2.978						
May 23 2019	11:52:40	16.88	2.958						
May 23 2019	11:53:40	16.91	2.954						
May 23 2019	11:54:40	16.90	2.962						
May 23 2019	11:55:40	16.89	2.962						
May 23 2019	11:56:40	16.88	2.971						
May 23 2019	11:57:40	16.91	2.964						
May 23 2019	11:58:40	16.92	2.930						
May 23 2019	11:59:40	16.92	2.936						
May 23 2019	12:00:40	16.94	2.930						
May 23 2019	12:01:40	16.99	2.900						
May 23 2019	12:02:40	17.01	2.881						
May 23 2019	12:05:41	17.18	2.782						
May 23 2019	12:06:41	16.70	3.029						
May 23 2019	12:07:41	16.65	3.072						
May 23 2019	12:08:41	16.64	3.086						
May 23 2019	12:09:41	16.61	3.090						
May 23 2019	12:10:41	16.63	3.089						
May 23 2019	12:11:41	16.62	3.076						
May 23 2019	12:12:41	16.63	3.071						
May 23 2019	12:13:41	16.67	3.038						
May 23 2019	12:14:41	16.68	3.036						
May 23 2019	12:15:41	16.71	3.012						
May 23 2019	12:16:41	16.73	2.999						
May 23 2019	12:17:41	16.75	2.988						
May 23 2019	12:18:41	16.79	2.958						
May 23 2019	12:19:41	16.80	2.951						
May 23 2019	12:20:41	16.81	2.966						
May 23 2019	12:21:41	16.82	2.946						
May 23 2019	12:22:41	16.82	2.954						
May 23 2019	12:23:41	16.81	2.945						
May 23 2019	12:24:41	16.82	2.956						
May 23 2019	12:25:41	16.87	2.920						
May 23 2019	12:26:41	16.89	2.900						
May 23 2019	12:27:41	16.91	2.887						
May 23 2019	12:28:41	16.89	2.890						
May 23 2019	12:29:41	16.88	2.874						
May 23 2019	12:30:41	16.90	2.866						
May 23 2019	12:31:41	16.98	2.858						
May 23 2019	12:32:41	17.00	2.830						
May 23 2019	12:36:16	16.97	2.857						
May 23 2019	12:37:16	16.80	2.947						

May 23 2019	12:38:16	16.81	2.951						
May 23 2019	12:39:16	16.81	2.968						
May 23 2019	12:40:16	16.84	2.938						
May 23 2019	12:41:16	16.84	2.939						
May 23 2019	12:42:16	16.87	2.919						
May 23 2019	12:43:16	16.86	2.913						
May 23 2019	12:44:16	16.85	2.929						
May 23 2019	12:45:16	16.88	2.919						
May 23 2019	12:46:16	16.87	2.918						
May 23 2019	12:47:16	16.88	2.916						
May 23 2019	12:48:16	16.88	2.918						
May 23 2019	12:49:16	16.89	2.906						
May 23 2019	12:50:16	16.88	2.909						
May 23 2019	12:51:16	16.90	2.902						
May 23 2019	12:52:16	16.92	2.880						
May 23 2019	12:53:16	16.94	2.871						
May 23 2019	12:54:16	16.96	2.872						
May 23 2019	12:55:16	16.99	2.852						
May 23 2019	12:56:16	17.00	2.839						
May 23 2019	12:57:16	17.03	2.835						
May 23 2019	12:58:16	17.11	2.787						
May 23 2019	12:59:16	17.15	2.761						
May 23 2019	13:00:16	17.17	2.734						
May 23 2019	13:01:16	17.22	2.729						
May 23 2019	13:02:16	17.20	2.721						
May 23 2019	13:05:52	17.19	2.732						
May 23 2019	13:06:52	16.90	2.886						
May 23 2019	13:07:52	16.79	2.968						
May 23 2019	13:08:52	16.77	2.986						
May 23 2019	13:09:52	16.77	2.984						
May 23 2019	13:10:52	16.77	3.006						
May 23 2019	13:11:52	16.78	2.967						
May 23 2019	13:12:52	16.79	2.974						
May 23 2019	13:13:52	16.80	2.974						
May 23 2019	13:14:52	16.83	2.966						
May 23 2019	13:15:52	16.82	2.959						
May 23 2019	13:16:52	16.81	2.955						
May 23 2019	13:17:52	16.81	2.960						
May 23 2019	13:18:52	16.85	2.939						
May 23 2019	13:19:52	16.90	2.910						
May 23 2019	13:20:52	16.92	2.883						
May 23 2019	13:21:52	16.95	2.881						
May 23 2019	13:22:52	16.95	2.858						
May 23 2019	13:23:52	16.95	2.852						
May 23 2019	13:24:52	16.95	2.871						
May 23 2019	13:25:52	16.96	2.858						
May 23 2019	13:26:52	16.95	2.860						
May 23 2019	13:27:52	16.96	2.852						
May 23 2019	13:28:52	16.95	2.863						
May 23 2019	13:29:52	16.93	2.855						
May 23 2019	13:30:52	16.96	2.855						
May 23 2019	13:31:52	17.00	2.857						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 23 2019	13:32:52	16.98	2.852						
May 23 2019	13:35:23	17.39	2.641						
May 23 2019	13:36:23	16.84	2.956						
May 23 2019	13:37:23	16.77	3.017						
May 23 2019	13:38:23	16.80	2.987						
May 23 2019	13:39:23	16.81	2.983						
May 23 2019	13:40:23	16.82	2.987						
May 23 2019	13:41:23	16.83	2.993						
May 23 2019	13:42:23	16.84	2.982						
May 23 2019	13:43:23	16.85	2.966						
May 23 2019	13:44:23	16.85	2.968						
May 23 2019	13:45:23	16.87	2.966						
May 23 2019	13:46:23	16.89	2.955						
May 23 2019	13:47:23	16.90	2.946						
May 23 2019	13:48:23	16.90	2.942						
May 23 2019	13:49:23	16.89	2.945						
May 23 2019	13:50:23	16.90	2.942						
May 23 2019	13:51:23	16.91	2.931						
May 23 2019	13:52:23	16.93	2.928						
May 23 2019	13:53:23	16.91	2.950						
May 23 2019	13:54:23	16.91	2.949						
May 23 2019	13:55:23	16.93	2.934						
May 23 2019	13:56:23	16.93	2.943						
May 23 2019	13:57:23	16.95	2.932						
May 23 2019	13:58:23	16.97	2.898						
May 23 2019	13:59:23	17.02	2.888						
May 23 2019	14:00:23	17.10	2.819						
May 23 2019	14:01:23	17.15	2.792						
May 23 2019	14:02:23	17.14	2.781						
May 23 2019	14:06:22	17.20	2.774						
May 23 2019	14:07:22	16.72	3.016						
May 23 2019	14:08:22	16.65	3.067						
May 23 2019	14:09:22	16.61	3.086						
May 23 2019	14:10:22	16.60	3.099						
May 23 2019	14:11:22	16.62	3.078						
May 23 2019	14:12:22	16.61	3.083						
May 23 2019	14:13:22	16.62	3.082						
May 23 2019	14:14:22	16.59	3.091						
May 23 2019	14:15:22	16.64	3.071						
May 23 2019	14:16:22	16.62	3.076						
May 23 2019	14:17:22	16.63	3.054						
May 23 2019	14:18:22	16.64	3.054						
May 23 2019	14:19:22	16.66	3.054						
May 23 2019	14:20:22	16.68	3.025						
May 23 2019	14:21:22	16.66	3.026						
May 23 2019	14:22:22	16.68	3.029						
May 23 2019	14:23:22	16.69	3.015						
May 23 2019	14:24:22	16.73	2.998						
May 23 2019	14:25:22	16.78	2.969						
May 23 2019	14:26:22	16.78	2.945						
May 23 2019	14:27:22	16.81	2.940						
May 23 2019	14:28:22	16.79	2.953						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 23 2019	14:29:22	16.76	2.969						
May 23 2019	14:30:22	16.81	2.942						
May 23 2019	14:31:22	16.87	2.894						
May 23 2019	14:32:22	16.90	2.882						
May 23 2019	14:35:04	16.96	2.841						
May 23 2019	14:36:04	16.73	2.979						
May 23 2019	14:37:04	16.63	3.063						
May 23 2019	14:38:04	16.63	3.077						
May 23 2019	14:39:04	16.63	3.075						
May 23 2019	14:40:04	16.64	3.074						
May 23 2019	14:41:04	16.67	3.058						
May 23 2019	14:42:04	16.66	3.045						
May 23 2019	14:43:04	16.68	3.021						
May 23 2019	14:44:04	16.69	3.021						
May 23 2019	14:45:04	16.68	3.024						
May 23 2019	14:46:04	16.70	3.022						
May 23 2019	14:47:04	16.69	3.024						
May 23 2019	14:48:04	16.72	3.016						
May 23 2019	14:49:04	16.72	3.016						
May 23 2019	14:50:04	16.72	3.006						
May 23 2019	14:51:04	16.73	3.004						
May 23 2019	14:52:04	16.74	3.006						
May 23 2019	14:53:04	16.77	3.000						
May 23 2019	14:54:04	16.77	2.984						
May 23 2019	14:55:04	16.79	2.985						
May 23 2019	14:56:04	16.80	2.975						
May 23 2019	14:57:04	16.80	2.972						
May 23 2019	14:58:04	16.84	2.956						
May 23 2019	14:59:04	16.87	2.930						
May 23 2019	15:00:04	16.90	2.921						
May 23 2019	15:01:04	16.97	2.873						
May 23 2019	15:02:04	17.06	2.829						
May 23 2019	15:03:04	17.05	2.800						
May 23 2019	15:06:25	16.84	2.892						
May 23 2019	15:07:25	16.56	3.065						
May 23 2019	15:08:25	16.53	3.102						
May 23 2019	15:09:25	16.51	3.111						
May 23 2019	15:10:25	16.52	3.111						
May 23 2019	15:11:25	16.49	3.123						
May 23 2019	15:12:25	16.53	3.106						
May 23 2019	15:13:25	16.53	3.111						
May 23 2019	15:14:25	16.54	3.102						
May 23 2019	15:15:25	16.58	3.074						
May 23 2019	15:16:25	16.58	3.084						
May 23 2019	15:17:25	16.57	3.101						
May 23 2019	15:18:25	16.56	3.083						
May 23 2019	15:19:25	16.57	3.084						
May 23 2019	15:20:25	16.59	3.075						
May 23 2019	15:21:25	16.58	3.089						
May 23 2019	15:22:25	16.59	3.073						
May 23 2019	15:23:25	16.62	3.059						
May 23 2019	15:24:25	16.61	3.064						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

May 23 2019	15:25:25	16.62	3.024						
May 23 2019	15:26:25	16.64	3.034						
May 23 2019	15:27:25	16.65	3.025						
May 23 2019	15:28:25	16.66	3.019						
May 23 2019	15:29:25	16.65	3.018						
May 23 2019	15:30:25	16.69	2.980						
May 23 2019	15:31:25	16.71	2.981						
May 23 2019	15:32:25	16.74	2.967						
May 23 2019	15:33:25	17.04	2.835						
May 23 2019	15:35:04	19.03	1.503						
May 23 2019	15:36:04	16.71	2.984						
May 23 2019	15:37:04	16.64	3.044						
May 23 2019	15:38:04	16.59	3.076						
May 23 2019	15:39:04	16.61	3.069						
May 23 2019	15:40:04	16.60	3.059						
May 23 2019	15:41:04	16.61	3.058						
May 23 2019	15:42:04	16.56	3.087						
May 23 2019	15:43:04	16.53	3.111						
May 23 2019	15:44:04	16.56	3.092						
May 23 2019	15:45:04	16.56	3.104						
May 23 2019	15:46:04	16.56	3.097						
May 23 2019	15:47:04	16.56	3.095						
May 23 2019	15:48:04	16.57	3.081						
May 23 2019	15:49:04	16.58	3.086						
May 23 2019	15:50:04	16.57	3.095						
May 23 2019	15:51:04	16.59	3.075						
May 23 2019	15:52:04	16.58	3.070						
May 23 2019	15:53:04	16.64	3.037						
May 23 2019	15:54:04	16.66	3.018						
May 23 2019	15:55:04	16.67	3.009						
May 23 2019	15:56:04	16.69	3.006						
May 23 2019	15:57:04	16.70	2.994						
May 23 2019	15:58:04	16.72	2.982						
May 23 2019	15:59:04	16.75	2.973						
May 23 2019	16:00:04	16.78	2.929						
May 23 2019	16:01:04	16.78	2.937						

	Average:	16.84	2.949						
	Max:	19.66	3.255						
	Min:	16.40	1.068						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

FURNACE "A" RUN #3
METALS TESTING

Run 1 Post run bias 08:04:49 - 16:01:04			
	Name:	O2 294	CO2 11
	Make/Model:	SERVO 1400	SERVO 1400
	25A or 7E:	7E	7E
Run summary data			
	Raw Avg:	16.84	2.949
	Max:	19.66	3.255
	Min:	16.40	1.068
Cylinder Concentrations			
	Zero:	0.000	0.000
	Low:		
	Mid:	10.02	9.949
	High:	20.28	18.52
Calibration Readings			
	Zero reading:	0.015	0.198
	Low reading:		
	Mid reading:	10.01	10.14
	High reading:	20.23	18.41
EPA Method 7E Error Calculations			
Zero %Err:	**<2.0**	0.074	1.069
Mid %Err:	**<2.0**	-0.049	1.031
High %Err:	**<2.0**	-0.247	-0.594
Initial Bias Data			
	Zero reading:	0.450	0.520
	Span reading:	20.22	18.01
Zero % bias:	**<5.0**	2.145	1.739
Span % bias:	**<5.0**	-0.049	-2.160
Final Bias Data			
	Zero reading:	0.390	0.223
	Span reading:	19.88	17.66
Zero % bias:	**<5.0**	1.849	0.135
Span % bias:	**<5.0**	-1.726	-4.050
Zero % drift:	**<3.0**	0.296	1.604
Span % drift:	**<3.0**	1.677	1.890
Bias Corrected Averages			
	Cor Avg:	16.96	2.733

APPENDIX C
LABORATORY ANALYSIS DATA

Appendix C.1
Combined Laboratory Analyses

MONTROSE AIR QUALITY SERVICES

PROJECT: 006AS-596331
OWENS ILLINOIS - BROCKWAY

CLIENT # H007
REPORT # 19-219

SUBMITTED BY:
CHESTER LabNet
12242 S.W. GARDEN PLACE
TIGARD, OR 97223
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CHESTER LabNet

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Case Narrative

Date: July 2, 2019

General Information

Client:	Montrose Air Quality Services
Client Number:	H007
Report Number:	19-219
Sample Description:	Impinger Trains
Sample Numbers:	19-U82 – 19-U86, 19-U88 – 19-U90, 19-U94, 19-U95 19-S958 -19-S1074

Analysis

Analytes:	Formaldehyde, Cr VI, Total Cr, Particulate Mass, Sb, As, Be, Cd, Co, Cu, Pb, Mn, Hg, Ni, Se
Analytical Protocols:	EPA Method 316 (8/7/17 version) Oregon DEQ Method 5 (April 2015 version) CARB Method 425 (7/28/97 version) EPA Method 29 (8/2/17 version)
Analytical Notes:	Two of the three formaldehyde matrix spike recoveries were below the control limit, possibly due to an unknown interferant. The non-blank CARB 425 samples were diluted by a factor of five. The samples were diluted for Cr VI to resolve matrix interference while they were diluted for total Cr because of high viscosity to avoid blowing out the torch. The ODEQ Method 5 filters hygroscopic and did not stabilize. They were weighed following the procedure in the e-mail on page 67 of this report. The method 29 samples were unremarkable. Results are not blank corrected.
QA/QC Review:	All of the data have been reviewed by the analysts performing the analyses and the project manager. All of the quality control and sample-specific information in this package is complete and meets or exceeds the minimum requirements for acceptability.
Comments:	If you have any questions or concerns regarding this analysis, please feel free to contact the project manager.
Disclaimer:	This report shall not be reproduced, except in full, without the written approval of the laboratory. The results only represent that of the samples as received into the laboratory.

Paul Duda 7/2/19

Project Manager Date
Paul Duda

Lab ID: 19-S958
Client ID: R1 N Rinse/Impingers
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/20/19
Sample Volume: 540. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	16.2

Lab ID: 19-S959
Client ID: R2 N Rinse/Impingers
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/20/19
Sample Volume: 530. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	15.9

Lab ID: 19-S960
Client ID: R3 N Rinse/Impingers
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/20/19
Sample Volume: 505. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	15.2

Lab ID: 19-S961
Client ID: R1 S Rinse/Impingers
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/20/19
Sample Volume: 510. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	15.3

Lab ID: 19-S962
Client ID: R2 S Rinse/Impingers
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/20/19
Sample Volume: 425. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	12.8

Lab ID: 19-S963
Client ID: R3 S Rinse/Impingers
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/20/19
Sample Volume: 510. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	15.3

Lab ID: 19-S964
Client ID: R1 Rinse/Impingers
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/15/19
Sample Volume: 505. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	15.2

Lab ID: 19-S965
Client ID: R2 Rinse/Impingers
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/15/19
Sample Volume: 555. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	16.6

Lab ID: 19-S966
Client ID: R3 Rinse/Impingers
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/15/19
Sample Volume: 485. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	14.6

Lab ID: 19-S967
Client ID: FB Rinse/Impingers
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/15/19
Sample Volume: 590. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	17.7

Client: H007 - Montrose Air Quality Services
Report Number: 19-219

Lab ID: 19-S968
Client ID: Sample Blank
Site: Owens-Brockway
Sample Date: 5/24/19
Sample Volume: 480. mL

Analyte	µg/mL Conc.	µg/mL DL	µg/sample Conc.	µg/sample DL
Formaldehyde	< DL	0.030	< DL	14.4

Lab ID: 19-S969
Client ID: R1 N Probe Rinse
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/21/19
Sample Volume: 97.2 mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	2.56	0.0500	0.248	0.0049
Total Cr	273.	4.00	26.6	0.389

Lab ID: 19-S970
Client ID: R1 N Filter Imp1&2
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/21/19
Sample Volume: 467. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	0.248	0.0500	0.116	0.0234
Total Cr	212.	4.00	99.2	1.87

Lab ID: 19-S971
Client ID: R2 N Probe Rinse
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/22/19
Sample Volume: 101. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	1.70	0.0500	0.172	0.0050
Total Cr	342.	4.00	34.5	0.404

Lab ID: 19-S972
Client ID: R2 N Filter Imp1&2
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/22/19
Sample Volume: 458. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	0.240	0.0500	0.110	0.0229
Total Cr	272.	4.00	124.	1.83

Lab ID: 19-S973
Client ID: R3 N Probe Rinse
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/23/19
Sample Volume: 89.5 mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	3.77	0.0500	0.337	0.0045
Total Cr	269.	4.00	24.1	0.358

Lab ID: 19-S974
Client ID: R3 N Filter Imp1&2
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/23/19
Sample Volume: 448. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	0.207	0.0500	0.0927	0.0224
Total Cr	290.	4.00	130.	1.79

Lab ID: 19-S975
Client ID: R1 S Probe Rinse
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/21/19
Sample Volume: 102. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	1.57	0.0500	0.160	0.0051
Total Cr	184.	4.00	18.7	0.408

Lab ID: 19-S976
Client ID: R1 S Filter Imp1&2
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/21/19
Sample Volume: 372. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	0.476	0.0500	0.177	0.0186
Total Cr	304.	4.00	113.	1.49

Lab ID: 19-S977
Client ID: R2 S Probe Rinse
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/22/19
Sample Volume: 99.0 mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	2.13	0.0500	0.211	0.0050
Total Cr	194.	4.00	19.2	0.396

Lab ID: 19-S978
Client ID: R2 S Filter Imp1&2
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/22/19
Sample Volume: 393. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	0.212	0.0500	0.0833	0.0196
Total Cr	266.	4.00	104.	1.57

Lab ID: 19-S979
Client ID: R3 S Probe Rinse
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/23/19
Sample Volume: 108. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	0.842	0.0500	0.0909	0.0054
Total Cr	113.	4.00	12.2	0.432

Lab ID: 19-S980
Client ID: R3 S Filter Imp1&2
Site: Owens-Brockway
Source: Furnace A
Sample Date: 5/23/19
Sample Volume: 401. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	0.252	0.0500	0.101	0.0200
Total Cr	210.	4.00	84.0	1.60

Lab ID: 19-S981
Client ID: R1 Probe Rinse
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19
Sample Volume: 104. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	3.08	0.0500	0.321	0.0052
Total Cr	945.	4.00	98.3	0.416

Lab ID: 19-S982
Client ID: R1 Filter Imp1&2
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19
Sample Volume: 812. mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	< DL	0.0500	< DL	0.0406
Total Cr	197.	4.00	160.	3.25

Lab ID: 19-S983
Client ID: R2 Probe Rinse
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19
Sample Volume: 94.2 mL

Analyte	µg/L Conc.	µg/L DL	µg/sample Conc.	µg/sample DL
Cr VI	1.54	0.0500	0.145	0.0047
Total Cr	994.	4.00	93.6	0.377

Lab ID: 19-S984
Client ID: R2 Filter Imp1&2
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19
Sample Volume: 583. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	< DL	0.0500	< DL	0.0292
Total Cr	273.	4.00	159.	2.33

Lab ID: 19-S985
Client ID: R3 Probe Rinse
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19
Sample Volume: 100. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	1.62	0.0500	0.162	0.0050
Total Cr	708.	4.00	70.8	0.400

Lab ID: 19-S986
Client ID: R3 Filter Imp1&2
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19
Sample Volume: 621. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	< DL	0.0500	< DL	0.0310
Total Cr	395.	4.00	245.	2.48

Lab ID: 19-S987
Client ID: FB Probe Rinse
Site: Owens-Brockway
Sample Date: 5/23/19
Sample Volume: 104. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	0.0140	0.0100	0.0015	0.0010
Total Cr	< DL	4.00	< DL	0.416

Lab ID: 19-S988
Client ID: FB Imp1&2
Site: Owens-Brockway
Sample Date: 5/23/19
Sample Volume: 257. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	< DL	0.0100	< DL	0.0026
Total Cr	< DL	4.00	< DL	1.03

Lab ID: 19-S989
Client ID: 1N Bicarb Blank
Site: Owens-Brockway
Sample Date: 5/24/19
Sample Volume: 190. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	< DL	0.0100	< DL	0.0019
Total Cr	< DL	4.00	< DL	0.760

Lab ID: 19-S990
Client ID: 0.1N Bicarb Blank
Site: Owens-Brockway
Sample Date: 5/24/19
Sample Volume: 159. mL

	µg/L		µg/sample	
Analyte	Conc.	DL	Conc.	DL
Cr VI	< DL	0.0100	< DL	0.0016
Total Cr	< DL	4.00	< DL	0.636

Montrose Air Quality Services
Project: 006AS-596331
ODEQ Method 5 Data - Report # 19-219

Sample ID	Client ID	Source	Sample Date	Sample Volume (mL)	Net Weight (mg) Acetone	Filter	Aqueous Phase	Organic Phase	Comments
Lab_Blk					**-0.06**				
Meth_Blk					**0.03**				
Lab_Blk							**0.11**	**0.15**	
Meth_Blk							**0.40**	**0.39**	
19-U86	R1 N Filter	Furnace A N	5/20/19			**43.18**			Filter
19-S991	R1 N FH Acetone	Furnace A N	5/20/19	75	**2.65**				FH Rinse
19-S992	R1 N Imp H2O	Furnace A N	5/20/19	290			**43.34**	**0.13**	DI H2O
19-S993	R1 N BH Acetone	Furnace A N	5/20/19	116	**13.09**				Impinger Acetone Rinse
19-U88	R2 N Filter	Furnace A N	5/20/19			**40.05**			Filter
19-S994	R2 N FH Acetone	Furnace A N	5/20/19	59	**1.83**				FH Rinse
19-S995	R2 N Imp H2O	Furnace A N	5/20/19	400			**52.20**	**-0.34**	DI H2O
19-S996	R2 N BH Acetone	Furnace A N	5/20/19	102	**1.97**				Impinger Acetone Rinse
19-U90	R3 N Filter	Furnace A N	5/20/19			**37.41**			Filter
19-S997	R3 N FH Acetone	Furnace A N	5/20/19	62	**3.35**				FH Rinse
19-S998	R3 N Imp H2O	Furnace A N	5/20/19	347			**39.34**	**0.10**	DI H2O
19-S999	R3 N BH Acetone	Furnace A N	5/20/19	101	**3.07**				Impinger Acetone Rinse
19-U85	R1 S Filter	Furnace A S	5/20/19			**33.07**			Filter
19-S1000	R1 S FH Acetone	Furnace A S	5/20/19	102	**3.13**				FH Rinse
19-S1001	R1 S Imp H2O	Furnace A S	5/20/19	335			**61.74**	**0.19**	DI H2O
19-S1002	R1 S BH Acetone	Furnace A S	5/20/19	115	**5.62**				Impinger Acetone Rinse
19-U84	R2 S Filter	Furnace A S	5/20/19			**33.13**			Filter
19-S1003	R2 S FH Acetone	Furnace A S	5/20/19	68	**2.23**				FH Rinse
19-S1004	R2 S Imp H2O	Furnace A S	5/20/19	362			**37.87**	**0.07**	DI H2O
19-S1005	R2 S BH Acetone	Furnace A S	5/20/19	136	**1.94**				Impinger Acetone Rinse
19-U89	R3 S Filter	Furnace A S	5/20/19			**35.86**			Filter
19-S1006	R3 S FH Acetone	Furnace A S	5/20/19	59	**3.22**				FH Rinse
19-S1007	R3 S Imp H2O	Furnace A S	5/20/19	354			**64.28**	**0.31**	DI H2O
19-S1008	R3 S BH Acetone	Furnace A S	5/20/19	100	**1.85**				Impinger Acetone Rinse

Montrose Air Quality Services
Project: 006AS-596331
ODEQ Method 5 Data - Report # 19-219

Sample ID	Client ID	Source	Sample Date	Sample Volume (mL)	Net Weight (mg) Acetone	Filter	Aqueous Phase	Organic Phase	Comments
19-U82	R1 Filter	Furnace D	5/20/19			**233.39**			Filter
19-S1009	R1 FH Acetone	Furnace D	5/15/19	94	**37.46**				FH Rinse
19-S1010	R1 Imp H2O	Furnace D	5/15/19	365			**74.34**	**0.27**	DI H2O
19-S1011	R1 BH Acetone	Furnace D	5/15/19	156	**7.15**				Impinger Acetone Rinse
19-U83	R2 Filter	Furnace D	5/15/19			**224.35**			Filter
19-S1012	R2 FH Acetone	Furnace D	5/15/19	96	**79.20**				FH Rinse
19-S1013	R2 Imp H2O	Furnace D	5/15/19	385			**66.58**	**0.28**	DI H2O
19-S1014	R2 BH Acetone	Furnace D	5/15/19	95	**4.99**				Impinger Acetone Rinse
19-U94	R4 Filter	Furnace D	5/15/19			**223.29**			Filter
19-S1015	R4 FH Acetone	Furnace D	5/15/19	124	**48.16**				FH Rinse
19-S1016	R4 Imp H2O	Furnace D	5/15/19	390			**40.53**	**0.03**	DI H2O
19-S1017	R4 BH Acetone	Furnace D	5/15/19	101	**2.90**				Impinger Acetone Rinse
19-U95	Filter Blank		5/15/19			**0.15**			
19-S1018	Acetone Blank		5/15/19	128	**0.86**				
19-S1019	Water Blank		5/15/19	162			**1.05**		

Analysis performed by: ***CHESTER LabNet***
12242 SW Garden Place ♦ Tigard, OR 97223
(503) 624-2183 ♦ www.chesterlab.net

Lab ID: 19-S1020
Client ID: R1 N FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/21/19

Analyte	Result	DL	Units
Antimony, ICP	26.5	1.25	µg/sample
Arsenic, ICP	500.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	22.7	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	26.8	1.25	µg/sample
Lead, ICP	1,500	1.25	µg/sample
Manganese, ICP	2.60	0.075	µg/sample
Mercury, CVAA	0.0312	0.0219	µg/sample
Nickel, ICP	4.55	0.750	µg/sample
Selenium, ICP	9.86	3.75	µg/sample

Lab ID: 19-S1021
Client ID: R1 N BH Cont. 4
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/21/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.570	µg/sample
Arsenic, ICP	51.3	0.798	µg/sample
Beryllium, ICP	< DL	0.023	µg/sample
Cadmium, ICP	0.636	0.046	µg/sample
Cobalt, ICP	0.076	0.057	µg/sample
Copper, ICP	< DL	0.570	µg/sample
Lead, ICP	2.67	0.570	µg/sample
Manganese, ICP	0.699	0.034	µg/sample
Mercury, CVAA	1.39	0.0411	µg/sample
Nickel, ICP	0.889	0.342	µg/sample
Selenium, ICP	101.	1.71	µg/sample

Lab ID: 19-S1022
Client ID: R1 N Cont. 5a
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/21/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0288	0.00875	µg/sample

Lab ID: 19-S1023
Client ID: R1 N Cont. 5b
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/21/19

Analyte	Result	DL	Units
Mercury, CVAA	1.85	0.0368	µg/sample

Lab ID: 19-S1024
Client ID: R1 N Cont. 5c
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/21/19

Analyte	Result	DL	Units
Mercury, CVAA	0.107	0.0214	µg/sample

Lab ID: 19-S1025
Client ID: R2 N FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/22/19

Analyte	Result	DL	Units
Antimony, ICP	22.1	1.25	µg/sample
Arsenic, ICP	446.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	15.2	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	24.0	1.25	µg/sample
Lead, ICP	1,310	1.25	µg/sample
Manganese, ICP	2.14	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	3.22	0.750	µg/sample
Selenium, ICP	10.4	3.75	µg/sample

Lab ID: 19-S1026
Client ID: R2 N BH Cont. 4
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/22/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.550	µg/sample
Arsenic, ICP	48.2	0.770	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	< DL	0.044	µg/sample
Cobalt, ICP	< DL	0.055	µg/sample
Copper, ICP	< DL	0.550	µg/sample
Lead, ICP	< DL	0.550	µg/sample
Manganese, ICP	0.775	0.033	µg/sample
Mercury, CVAA	0.660	0.0398	µg/sample
Nickel, ICP	1.03	0.330	µg/sample
Selenium, ICP	123.	1.65	µg/sample

Lab ID: 19-S1027
Client ID: R2 N Cont. 5a
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/22/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0101	0.00884	µg/sample

Lab ID: 19-S1028
Client ID: R2 N Cont. 5b
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/22/19

Analyte	Result	DL	Units
Mercury, CVAA	1.13	0.0328	µg/sample

Lab ID: 19-S1029
Client ID: R2 N Cont. 5c
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/22/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0224	0.0196	µg/sample

Lab ID: 19-S1030
Client ID: R3 N FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/23/19

Analyte	Result	DL	Units
Antimony, ICP	22.0	1.25	µg/sample
Arsenic, ICP	444.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	14.9	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	22.4	1.25	µg/sample
Lead, ICP	1,120	1.25	µg/sample
Manganese, ICP	28.0	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	4.76	0.750	µg/sample
Selenium, ICP	10.7	3.75	µg/sample

Lab ID: 19-S1031
Client ID: R3 N BH Cont. 4
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/23/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.545	µg/sample
Arsenic, ICP	37.8	0.763	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	< DL	0.044	µg/sample
Cobalt, ICP	0.058	0.054	µg/sample
Copper, ICP	< DL	0.545	µg/sample
Lead, ICP	< DL	0.545	µg/sample
Manganese, ICP	0.667	0.033	µg/sample
Mercury, CVAA	0.741	0.0405	µg/sample
Nickel, ICP	0.865	0.327	µg/sample
Selenium, ICP	82.4	1.64	µg/sample

Lab ID: 19-S1032
Client ID: R3 N Cont. 5a
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/23/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0124	0.00866	µg/sample

Lab ID: 19-S1033
Client ID: R3 N Cont. 5b
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/23/19

Analyte	Result	DL	Units
Mercury, CVAA	1.36	0.0328	µg/sample

Lab ID: 19-S1034
Client ID: R3 N Cont. 5c
Site: Owens-Brockway
Source: Furnace A N
Sample Date: 5/23/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0338	0.0197	µg/sample

Lab ID: 19-S1035
Client ID: R1 S FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/21/19

Analyte	Result	DL	Units
Antimony, ICP	23.9	1.25	µg/sample
Arsenic, ICP	412.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	14.4	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	21.3	1.25	µg/sample
Lead, ICP	1,150	1.25	µg/sample
Manganese, ICP	2.08	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	2.83	0.750	µg/sample
Selenium, ICP	14.1	3.75	µg/sample

Lab ID: 19-S1036
Client ID: R1 S BH Cont. 4
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/21/19

Analyte	Result	DL	Units
Antimony, ICP	1.61	0.580	µg/sample
Arsenic, ICP	69.2	0.812	µg/sample
Beryllium, ICP	< DL	0.023	µg/sample
Cadmium, ICP	< DL	0.046	µg/sample
Cobalt, ICP	0.060	0.058	µg/sample
Copper, ICP	0.634	0.580	µg/sample
Lead, ICP	< DL	0.580	µg/sample
Manganese, ICP	0.606	0.035	µg/sample
Mercury, CVAA	1.40	0.0385	µg/sample
Nickel, ICP	1.22	0.348	µg/sample
Selenium, ICP	81.5	1.74	µg/sample

Lab ID: 19-S1037
Client ID: R1 S Cont. 5a
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/21/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0288	0.00840	µg/sample

Lab ID: 19-S1038
Client ID: R1 S Cont. 5b
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/21/19

Analyte	Result	DL	Units
Mercury, CVAA	1.14	0.0328	µg/sample

Lab ID: 19-S1039
Client ID: R1 S Cont. 5c
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/21/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0224	0.0196	µg/sample

Lab ID: 19-S1040
Client ID: R2 S FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/22/19

Analyte	Result	DL	Units
Antimony, ICP	22.2	1.25	µg/sample
Arsenic, ICP	422.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	10.7	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	20.9	1.25	µg/sample
Lead, ICP	968.	1.25	µg/sample
Manganese, ICP	2.15	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	2.92	0.750	µg/sample
Selenium, ICP	13.2	3.75	µg/sample

Lab ID: 19-S1041
Client ID: R2 S BH Cont. 4
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/22/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.555	µg/sample
Arsenic, ICP	57.1	0.777	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	0.647	0.044	µg/sample
Cobalt, ICP	0.059	0.056	µg/sample
Copper, ICP	1.04	0.555	µg/sample
Lead, ICP	1.81	0.555	µg/sample
Manganese, ICP	0.593	0.033	µg/sample
Mercury, CVAA	0.786	0.0344	µg/sample
Nickel, ICP	1.20	0.333	µg/sample
Selenium, ICP	132.	1.66	µg/sample

Lab ID: 19-S1042
Client ID: R2 S Cont. 5a
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/22/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.0102	µg/sample

Lab ID: 19-S1043
Client ID: R2 S Cont. 5b
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/22/19

Analyte	Result	DL	Units
Mercury, CVAA	1.00	0.0354	µg/sample

Lab ID: 19-S1044
Client ID: R2 S Cont. 5c
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/22/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.0200	µg/sample

Lab ID: 19-S1045
Client ID: R3 S FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/23/19

Analyte	Result	DL	Units
Antimony, ICP	23.6	1.25	µg/sample
Arsenic, ICP	454.	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	11.3	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	21.3	1.25	µg/sample
Lead, ICP	1,020	1.25	µg/sample
Manganese, ICP	1.89	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	3.51	0.750	µg/sample
Selenium, ICP	10.6	3.75	µg/sample

Lab ID: 19-S1046
Client ID: R3 S BH Cont. 4
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/23/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.555	µg/sample
Arsenic, ICP	33.4	0.777	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	< DL	0.044	µg/sample
Cobalt, ICP	0.090	0.056	µg/sample
Copper, ICP	0.971	0.555	µg/sample
Lead, ICP	< DL	0.555	µg/sample
Manganese, ICP	0.368	0.033	µg/sample
Mercury, CVAA	0.714	0.0368	µg/sample
Nickel, ICP	0.878	0.333	µg/sample
Selenium, ICP	96.0	1.66	µg/sample

Lab ID: 19-S1047
Client ID: R3 S Cont. 5a
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/23/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.00910	µg/sample

Lab ID: 19-S1048
Client ID: R3 S Cont. 5b
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/23/19

Analyte	Result	DL	Units
Mercury, CVAA	0.999	0.0359	µg/sample

Lab ID: 19-S1049
Client ID: R3 S Cont. 5c
Site: Owens-Brockway
Source: Furnace A S
Sample Date: 5/23/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0282	0.0198	µg/sample

Lab ID: 19-S1050
Client ID: R1 FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	35.8	1.25	µg/sample
Arsenic, ICP	628.	1.75	µg/sample
Beryllium, ICP	0.144	0.050	µg/sample
Cadmium, ICP	68.8	0.100	µg/sample
Cobalt, ICP	0.302	0.125	µg/sample
Copper, ICP	78.3	1.25	µg/sample
Lead, ICP	8,980	1.25	µg/sample
Manganese, ICP	27.6	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	30.5	0.750	µg/sample
Selenium, ICP	59.8	3.75	µg/sample

Lab ID: 19-S1051
Client ID: R1 BH Cont. 4
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	2.01	0.540	µg/sample
Arsenic, ICP	63.1	0.756	µg/sample
Beryllium, ICP	< DL	0.022	µg/sample
Cadmium, ICP	0.096	0.043	µg/sample
Cobalt, ICP	0.358	0.054	µg/sample
Copper, ICP	1.52	0.540	µg/sample
Lead, ICP	9.25	0.540	µg/sample
Manganese, ICP	2.41	0.032	µg/sample
Mercury, CVAA	5.54	0.0674	µg/sample
Nickel, ICP	3.26	0.324	µg/sample
Selenium, ICP	394.	1.62	µg/sample

Lab ID: 19-S1052
Client ID: R1 Cont. 5a
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0598	0.00910	µg/sample

Lab ID: 19-S1053
Client ID: R1 Cont. 5b
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	4.78	0.0328	µg/sample

Lab ID: 19-S1054
Client ID: R1 Cont. 5c
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	0.165	0.0200	µg/sample

Lab ID: 19-S1055
Client ID: R2 FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	47.6	1.25	µg/sample
Arsenic, ICP	802.	1.75	µg/sample
Beryllium, ICP	0.149	0.050	µg/sample
Cadmium, ICP	83.0	0.100	µg/sample
Cobalt, ICP	0.708	0.125	µg/sample
Copper, ICP	86.0	1.25	µg/sample
Lead, ICP	9,960	1.25	µg/sample
Manganese, ICP	16.8	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	52.4	0.750	µg/sample
Selenium, ICP	81.2	3.75	µg/sample

Lab ID: 19-S1056
Client ID: R2 BH Cont. 4
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	1.20	0.525	µg/sample
Arsenic, ICP	112.	0.735	µg/sample
Beryllium, ICP	< DL	0.021	µg/sample
Cadmium, ICP	< DL	0.042	µg/sample
Cobalt, ICP	0.203	0.052	µg/sample
Copper, ICP	2.37	0.525	µg/sample
Lead, ICP	1.46	0.525	µg/sample
Manganese, ICP	8.87	0.032	µg/sample
Mercury, CVAA	6.42	0.0700	µg/sample
Nickel, ICP	4.74	0.315	µg/sample
Selenium, ICP	494.	1.58	µg/sample

Lab ID: 19-S1057
Client ID: R2 Cont. 5a
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	0.272	0.0116	µg/sample

Lab ID: 19-S1058
Client ID: R2 Cont. 5b
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	4.75	0.0337	µg/sample

Lab ID: 19-S1059
Client ID: R2 Cont. 5c
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0285	0.0200	µg/sample

Lab ID: 19-S1060
Client ID: R3 FH Cont. 1 & 3
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19

Analyte	Result	DL	Units
Antimony, ICP	42.5	1.25	µg/sample
Arsenic, ICP	738.	1.75	µg/sample
Beryllium, ICP	0.162	0.050	µg/sample
Cadmium, ICP	84.0	0.100	µg/sample
Cobalt, ICP	0.327	0.125	µg/sample
Copper, ICP	84.7	1.25	µg/sample
Lead, ICP	9,660	1.25	µg/sample
Manganese, ICP	13.4	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	32.4	0.750	µg/sample
Selenium, ICP	71.1	3.75	µg/sample

Lab ID: 19-S1061
Client ID: R3 BH Cont. 4
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19

Analyte	Result	DL	Units
Antimony, ICP	1.17	0.525	µg/sample
Arsenic, ICP	102.	0.735	µg/sample
Beryllium, ICP	< DL	0.021	µg/sample
Cadmium, ICP	< DL	0.042	µg/sample
Cobalt, ICP	0.169	0.052	µg/sample
Copper, ICP	1.30	0.525	µg/sample
Lead, ICP	1.95	0.525	µg/sample
Manganese, ICP	1.39	0.032	µg/sample
Mercury, CVAA	5.26	0.0722	µg/sample
Nickel, ICP	2.35	0.315	µg/sample
Selenium, ICP	496.	1.58	µg/sample

Lab ID: 19-S1062
Client ID: R3 Cont. 5a
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19

Analyte	Result	DL	Units
Mercury, CVAA	0.0749	0.00971	µg/sample

Lab ID: 19-S1063
Client ID: R3 Cont. 5b
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19

Analyte	Result	DL	Units
Mercury, CVAA	3.77	0.0372	µg/sample

Lab ID: 19-S1064
Client ID: R3 Cont. 5c
Site: Owens-Brockway
Source: Furnace D
Sample Date: 5/17/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.0194	µg/sample

Lab ID: 19-S1065
Client ID: Cont 8a 0.1N HNO3 Blank
Site: Owens-Brockway
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	1.25	µg/sample
Arsenic, ICP	< DL	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	< DL	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	< DL	1.25	µg/sample
Lead, ICP	< DL	1.25	µg/sample
Manganese, ICP	< DL	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	< DL	0.750	µg/sample
Selenium, ICP	< DL	3.75	µg/sample

Lab ID: 19-S1066
Client ID: Cont 12 Filter Blank
Site: Owens-Brockway
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	1.25	µg/sample
Arsenic, ICP	< DL	1.75	µg/sample
Beryllium, ICP	< DL	0.050	µg/sample
Cadmium, ICP	< DL	0.100	µg/sample
Cobalt, ICP	< DL	0.125	µg/sample
Copper, ICP	< DL	1.25	µg/sample
Lead, ICP	< DL	1.25	µg/sample
Manganese, ICP	0.816	0.075	µg/sample
Mercury, CVAA	< DL	0.0219	µg/sample
Nickel, ICP	3.16	0.750	µg/sample
Selenium, ICP	< DL	3.75	µg/sample

Lab ID: 19-S1067
Client ID: Cont 9 H2O2/HNO3 Blank
Site: Owens-Brockway
Sample Date: 5/16/19

Analyte	Result	DL	Units
Antimony, ICP	< DL	0.630	µg/sample
Arsenic, ICP	< DL	0.882	µg/sample
Beryllium, ICP	< DL	0.025	µg/sample
Cadmium, ICP	< DL	0.050	µg/sample
Cobalt, ICP	< DL	0.063	µg/sample
Copper, ICP	< DL	0.630	µg/sample
Lead, ICP	< DL	0.630	µg/sample
Manganese, ICP	< DL	0.038	µg/sample
Mercury, CVAA	0.0192	0.0168	µg/sample
Nickel, ICP	< DL	0.378	µg/sample
Selenium, ICP	< DL	1.89	µg/sample

Lab ID: 19-S1068
Client ID: Cont 8b H2O Blank
Site: Owens-Brockway
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.00866	µg/sample

Lab ID: 19-S1069
Client ID: Cont 10 KMnO4 Blank
Site: Owens-Brockway
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.00722	µg/sample

Lab ID: 19-S1070
Client ID: Cont 11 HCl Blank
Site: Owens-Brockway
Sample Date: 5/16/19

Analyte	Result	DL	Units
Mercury, CVAA	< DL	0.0196	µg/sample

Lab ID: 19-S1071
Client ID: M29 Metals Filter Audit 051319K
Site: Owens-Brockway

Analyte	Result	DL	Units
Antimony, ICP	40.1	1.25	µg/sample
Arsenic, ICP	59.4	1.75	µg/sample
Beryllium, ICP	39.4	0.050	µg/sample
Cadmium, ICP	34.1	0.100	µg/sample
Cobalt, ICP	67.2	0.125	µg/sample
Copper, ICP	38.8	1.25	µg/sample
Lead, ICP	54.4	1.25	µg/sample
Manganese, ICP	35.5	0.075	µg/sample
Nickel, ICP	42.4	0.750	µg/sample
Selenium, ICP	32.0	3.75	µg/sample

Lab ID: 19-S1072
Client ID: M29 Metals Impinger Audit 051319K
Site: Owens-Brockway

Analyte	Result	DL	Units
Antimony, ICP	0.529	0.00100	µg/mL
Arsenic, ICP	0.263	0.00140	µg/mL
Beryllium, ICP	1.29	0.00004	µg/mL
Cadmium, ICP	2.96	0.00008	µg/mL
Cobalt, ICP	2.10	0.00010	µg/mL
Copper, ICP	0.865	0.00100	µg/mL
Lead, ICP	2.73	0.00100	µg/mL
Manganese, ICP	0.539	0.00006	µg/mL
Nickel, ICP	0.928	0.00060	µg/mL
Selenium, ICP	2.81	0.00300	µg/mL

Lab ID: 19-S1073
Client ID: M29 Hg Filter Audit 051319K
Site: Owens-Brockway

Analyte	Result	DL	Units
Mercury, CVAA	1.42	0.0219	µg/sample

Lab ID: 19-S1074
Client ID: M29 Hg Impinger Audit 051319K
Site: Owens-Brockway

Analyte	Result	DL	Units
Mercury, CVAA	5.38	0.0070	µg/L

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: UV-VIS
Sample Description: EPA 316
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. mg/L	DL Conc. mg/L
CH2O	ICB	< DL	0.030
CH2O	CCB	< DL	0.030
CH2O	CCB	< DL	0.030

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank

Calibration QC

Analyte	Sample ID	Standard Conc. mg/L	Measured Conc. mg/L	Percent Recovery
CH2O	ICV	0.500	0.522	104.4
CH2O	LL-LCS	0.100	0.107	107.0
CH2O	CCV	0.500	0.526	105.2
CH2O	CCV	0.500	0.518	103.6

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

Analyte	Sample ID	Sample Conc. mg/L	Duplicate Conc. mg/L	RPD
CH2O	19-S958	< 0.03	< 0.03	N/C #
CH2O	19-S961	< 0.03	< 0.03	N/C #
CH2O	19-S964	< 0.03	< 0.03	N/C #

RPD = {(sample-duplicate)/[(sample+duplicate)/2]}x100
N/C: RPD is not calculated when sample or duplicate is below detection limit
Duplicate Limit: 20% RPD
#: per EPA CLP protocol, control limits do not apply if sample and/or duplicate concentration is less than 5x the detection limit

Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. mg/L	Spike Conc. mg/L	Spike Amount mg/L	Percent Recovery
CH2O	19-S959	< 0.03	0.384	0.500	76.8
CH2O	19-S962	< 0.03	0.222	0.500	44.4
CH2O	19-S965	< 0.03	0.123	0.500	24.6

Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

UV-VIS RAW DATA

Available upon request

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: IC-PCR
Sample Description: CARB 425
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
Cr VI	ICB	< DL	0.010
Cr VI	CCB	< DL	0.010
Cr VI	CCB	< DL	0.010

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
Cr VI	ICV	0.500	0.504	100.8
Cr VI	LL-LCS	0.030	0.032	106.7
Cr VI	CCV	0.500	0.504	100.8
Cr VI	CCV	0.500	0.506	101.2

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

Analyte	Sample ID	Sample Conc. µg/L	Duplicate Conc. µg/L	RPD
Cr VI	19-S969	2.56	2.53	0.98
Cr VI	19-S975	1.57	1.54	1.80
Cr VI	19-S981	3.08	3.08	0.19

RPD = {(sample-duplicate)/[(sample+duplicate)/2]}x100
N/C: RPD is not calculated when sample or duplicate is below detection limit
#: per EPA CLP protocol, control limits do not apply if sample and/or
duplicate concentration is less than 5x the detection limit

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Cr VI	19-S971	1.70	4.23	2.50	101.
Cr VI	19-S977	2.13	4.69	2.50	102.
Cr VI	19-S983	1.54	4.07	2.50	101.

*: per EPA CLP protocol, control limits do not apply if spike
concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: IC-PCR
Sample Description: CARB 425
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
Cr VI	ICB	< DL	0.010
Cr VI	CCB	< DL	0.010
Cr VI	CCB	< DL	0.010

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
Cr VI	ICV	0.500	0.498	99.6
Cr VI	LL-LCS	0.030	0.030	100.0
Cr VI	CCV	0.500	0.492	98.4
Cr VI	CCV	0.500	0.510	102.0

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

Analyte	Sample ID	Sample Conc. µg/L	Duplicate Conc. µg/L	RPD
Cr VI	19-S970	0.248	0.245	1.22
Cr VI	19-S976	0.476	0.454	4.73
Cr VI	19-S982	< 0.05	< 0.05	N/C #

RPD = {(sample-duplicate)/[(sample+duplicate)/2]}x100
N/C: RPD is not calculated when sample or duplicate is below detection limit
#: per EPA CLP protocol, control limits do not apply if sample and/or duplicate concentration is less than 5x the detection limit

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Cr VI	19-S972	0.240	2.52	2.50	91.1
Cr VI	19-S978	0.212	2.48	2.50	90.7
Cr VI	19-S984	< 0.05	2.02	2.50	80.6

*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

ION CHROMATOGRAPHY RAW DATA

Available upon request

QA/QC Report

Client Name:	Montrose Air Quality Services
Project Number:	H007
Analytical Technique:	ICP - Optima 8300
Sample Description:	CARB 425
Report Number:	19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
Cr	ICB	< DL	4.00
Cr	MethBlkA	< DL	4.00
Cr	CCB	< DL	4.00
Cr	CCB	< DL	4.00
Cr	MethBlkB	< DL	4.00
Cr	CCB	< DL	4.00
Cr	CCB	< DL	4.00
Cr	CCB	< DL	4.00

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
Cr	ICV	2500	2470	98.8
Cr	LL-CCV	4.00	4.23	105.7
Cr	LL-LCS	1.50	1.59	105.9
Cr	CCV	2500	2480	99.3
Cr	CCV	2500	2460	98.3
Cr	LL-LCS	1.50	1.62	107.8
Cr	CCV	2500	2460	98.2
Cr	CCV	2500	2460	98.5
Cr	CCV	2500	2420	96.9

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

Analyte	Sample ID	Sample Conc. µg/L	Duplicate Conc. µg/L	RPD
Cr	19-S969	273.3	279.4	2.21
Cr	19-S970	212.4	222.5	4.64
Cr	19-S975	183.5	189.3	3.11
Cr	19-S976	304.4	305.9	0.49
Cr	19-S981	945.2	935.8	1.00
Cr	19-S982	197.2	195.1	1.07

RPD = {(sample-duplicate)/[(sample+duplicate)/2]}x100
N/C: RPD is not calculated when sample or duplicate is below detection limit
Duplicate Limit: 20% RPD
#: per EPA CLP protocol, control limits do not apply if sample and/or duplicate concentration is less than 5x the detection limit

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: CARB 425
Report Number: 19-219
===

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Cr	LCS	< 0.8	2300.	2500.	92.0
Cr	19-S971	341.6	2704.	2500.	94.5
Cr	19-S972	271.5	2362.	2500.	83.6
Cr	19-S977	193.5	2489.	2500.	91.8
Cr	19-S978	265.8	2351.	2500.	83.4
Cr	LCS	< 0.8	2395.	2500.	95.8
Cr	19-S983	993.5	3199.	2500.	88.2
Cr	19-S984	272.8	2374.	2500.	84.0

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

<u>ICP RAW DATA</u>

Available upon request

All masses in grams (g)			M5 filter:	MONTROSE 19-219				
Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	Net Mass*	Net Mass
date/init:	1/27/19 TP	1/28/19 JD		6/27/19 TMM	6/30/19 TMM			(mg)
time:	10:49	16:44		09:27	11:49			
			Ambient					
Rel. Humidity	36.8%	39.4%		43.0%	44.4%			
Temp (C/F)	21.4C / 70.5F	20.7C / 69.3F		21.1C / 70.0F	22.0C / 71.6F			
			Desiccator					
Rel. Humidity	0.8%	2.0%		0.5%	1.7%			
Temp (C/F)	21.0C / 69.8F	20.8C / 69.4F		20.8C / 69.4F	21.5C / 70.7F			
0.30000g QC	0.30000	0.30001		0.29999	0.30001			
3.00000g QC	3.00001	3.00003		3.00001	3.00002			
5.00000g QC	5.00001	5.00005		5.00001	4.99997			
19U82	0.48271	0.48251	0.00020	0.7161	0.7164	-0.0003	0.23339	233.39
19U83	0.47965	0.47954	0.00011	0.7040	0.7039	0.0001	0.22435	224.35
19U84	0.47597	0.47578	0.00019	0.5091	0.5094	-0.0003	0.03313	33.13
19U85	0.48003	0.47972	0.00031	0.5131	0.5136	-0.0005	0.03307	33.07
19U86	0.47172	0.47159	0.00013	0.5149	0.5153	-0.0004	0.04318	43.18
19U88	0.48245	0.48207	0.00038	0.5225	0.5228	-0.0003	0.04005	40.05
19U89	0.47084	0.47080	0.00004	0.5067	0.5066	0.0001	0.03586	35.86
19U90	0.47369	0.47354	0.00015	0.5111	0.5115	-0.0004	0.03741	37.41
19U94	0.46531	0.46514	0.00017	0.6886	0.6886	0.0000	0.22329	223.29
19U95	0.45462	0.45448	0.00014	0.45477	0.45464	0.00013	0.00015	0.15

*net mass = gross - tare (g)

Quartz tissue filters

Tare data collected electronically by proprietary BERT II software. Gross data collected manually due to hygroscopic filter deposit

All masses in grams (g) M5 Acetone: MONTROSE 19-219

Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)
date/init:	6/8/19 TP	6/13/19 TP		6/19/19 TP	6/21/19 TP		(total mass liq)	
time:	11:43	11:36		13:46	15:18			
			Ambient					
Rel. Humidity	43.5%	43.6%		41.4%	38.0%			
Temp (C/F)	20.8C / 69.4F	21.4C / 70.5F		20.9C / 69.6F	21.4C / 70.5F			
			Desiccator					
Rel. Humidity	2.0%	2.0%		0.2%	0.2%			
Temp (C/F)	20.8C / 69.4F	21.0C / 69.8F		21.5C / 70.7F	21.4C / 70.5F			
0.30000g QC	0.30000	0.30000		0.30001	0.30003			
3.00000g QC	2.99998	3.00000		2.99997	3.00000			
100.00000g QC	99.99999	99.99998		99.99996	99.99995			
Lab Blank	98.28065	98.28061	0.00004	98.28059	98.28049	0.00010	-0.00006	-0.06
Meth Blank	104.90175	104.90170	0.00005	104.90178	104.90205	-0.00027	0.00003	0.03
19-S991	102.52569	102.52589	-0.00020	102.52834	102.52824	0.00010	0.00265	2.65
19-S993	99.85032	99.85007	0.00025	99.86341	99.86354	-0.00013	0.01309	13.09
19-S994	101.23657	101.23641	0.00016	101.23840	101.23839	0.00001	0.00183	1.83
19-S996	94.95202	94.95211	-0.00009	94.95399	94.95398	0.00001	0.00197	1.97
19-S997	96.44784	96.44797	-0.00013	96.45119	96.45083	0.00036	0.00335	3.35
19-S999	94.89748	94.89766	-0.00018	94.90055	94.90045	0.00010	0.00307	3.07
19-S1000	98.28575	98.28587	-0.00012	98.28888	98.28871	0.00017	0.00313	3.13
19-S1002	100.33551	100.33599	-0.00048	100.34113	100.34094	0.00019	0.00562	5.62
19-S1003	102.47248	102.47223	0.00025	102.47471	102.47456	0.00015	0.00223	2.23
19-S1005	101.64180	101.64165	0.00015	101.64374	101.64355	0.00019	0.00194	1.94
19-S1006	101.53204	101.53219	-0.00015	101.53526	101.53506	0.00020	0.00322	3.22
19-S1008	104.04020	104.04028	-0.00008	104.04205	104.04235	-0.00030	0.00185	1.85
19-S1009	101.17494	101.17493	0.00001	101.21240	101.21290	-0.00050	0.03746	37.46
19-S1011	122.48444	122.48445	-0.00001	122.49159	122.49151	0.00008	0.00715	7.15
19-S1012	120.80252	120.80262	-0.00010	120.88172	120.88198	-0.00026	0.07920	79.20
19-S1014	126.95552	126.95567	-0.00015	126.96051	126.96080	-0.00029	0.00499	4.99
19-S1015	127.11765	127.11783	-0.00018	127.16581	127.16609	-0.00028	0.04816	48.16
19-S1017	123.32172	123.32185	-0.00013	123.32462	123.32473	-0.00011	0.00290	2.90
19-S1018	119.52984	119.53012	-0.00028	119.53070	119.53087	-0.00017	0.00086	0.86

*net mass = gross - tare (g)

100g weight: S/N 14091 certified value: 100.000048 (100.00005)

Data collected electronically by proprietary BERT II software.

All masses in grams (g) — ODEQ 5: MONTROSE 19-219

Aqueous Phase

Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g) (total mass liq)	net (mg)
date/init:	6/13/19 TP	6/14/19 TP		6/25/19 TMM	6/26/19 TMM			
time:	14:00	14:27		10:49	10:30			
Ambient								
Rel. Humidity	38.9%	38.3%		43.8%	44.3%			
Temp (C/F)	22.0C / 71.6F	22.1C / 71.8F		21.1C / 70.0F	21.2C / 70.2F			
Desiccator								
Rel. Humidity	2.0%	2.0%		0.2%	1.4%			
Temp (C/F)	21.0C / 69.8F	21.2C / 70.2F		21.0C / 69.8F	21.0C / 69.8F			
0.30000g QC	0.30001	0.29995		0.29999	0.30003			
3.00000g QC	3.00002	2.99999		3.00000	3.00001			
100.00000g QC	100.00001	99.99998		100.00000	99.99999			
Lab Blank	99.65380	99.65390	-0.00010	99.65391	99.65417	-0.00026	0.00011	0.11
Prep Blank	102.17579	102.17564	0.00015	102.17619	102.17649	-0.00030	0.00040	0.40
19-S992	101.97804	101.97811	-0.00007	102.02138	102.02113	0.00025	0.04334	43.34
19-S995	102.52437	102.52404	0.00033	102.57657	102.57638	0.00019	0.05220	52.20
19-S998	100.70272	100.70255	0.00017	100.74206	100.74172	0.00034	0.03934	39.34
19-S1001	104.44596	104.44569	0.00027	104.50770	104.50731	0.00039	0.06174	61.74
19-S1004	101.69525	101.69499	0.00026	101.73312	101.73298	0.00014	0.03787	37.87
19-S1007	101.53210	101.53187	0.00023	101.59638	101.59687	-0.00049	0.06428	64.28
19-S1010	99.37713	99.37707	0.00006	99.45147	99.45144	0.00003	0.07434	74.34
19-S1013	125.12777	125.12747	0.00030	125.19435	125.19404	0.00031	0.06658	66.58
19-S1016	99.63787	99.63779	0.00008	99.67840	99.67864	-0.00024	0.04053	40.53
19-S1019	101.03689	101.03695	-0.00006	101.03794	101.03806	-0.00012	0.00105	1.05

Data collected electronically by proprietary BERT II software.

*net mass = gross - tare (g) — 100g weight: S/N 14091 certified value: 100.000048 (100.00005)

All masses in grams (g) ODEQ 5: MONTROSE 19-219

Organic Phase

Sx ID	Tare	Tare QC	Tare - QC	Gross	Gross QC	Gross - QC	*net (g)	net (mg)*
date/init:	6/12/19 TP	6/13/19 TP		6/24/19 JD	6/25/19 TMM		(total mass liq)	
time:	15:18	08:41		13:10	11:48			
Ambient								
Rel. Humidity	42.6%	42.9%		37.5%	41.7%			
Temp (C/F)	21.9C / 71.4F	21.6C / 70.9F		22.9C / 73.2F	21.3C / 70.3F			
Desiccator								
Rel. Humidity	2.0%	2.0%		0.8%	0.2%			
Temp (C/F)	21.4C / 70.5F	21.0C / 69.8F		23.0C / 73.4F	21.0C / 69.8F			
0.30000g QC	0.30001	0.29999		0.30006	0.29999			
3.00000g QC	2.99999	3.00002		3.00007	3.00004			
100.00000g QC	99.99996	100.00000		100.00007	100.00000			
Lab Blank	101.07420	101.07449	-0.00029	101.07435	101.07438	-0.00003	0.00015	0.15
Meth Blank	102.20591	102.20599	-0.00008	102.20630	102.20627	0.00003	0.00039	0.39
19-S992	125.14952	125.14954	-0.00002	125.14965	125.14963	0.00002	0.00013	0.13
19-S995	123.15309	123.15291	0.00018	123.15275	123.15272	0.00003	-0.00034	-0.34
19-S998	122.36268	122.36255	0.00013	122.36278	122.36269	0.00009	0.00010	0.10
19-S1001	121.54195	121.54176	0.00019	121.54214	121.54220	-0.00006	0.00019	0.19
19-S1004	121.16120	121.16116	0.00004	121.16127	121.16138	-0.00011	0.00007	0.07
19-S1007	120.99567	120.99546	0.00021	120.99598	120.99614	-0.00016	0.00031	0.31
19-S1010	119.83242	119.83238	0.00004	119.83269	119.83281	-0.00012	0.00027	0.27
19-S1013	122.81421	122.81430	-0.00009	122.81449	122.81458	-0.00009	0.00028	0.28
19-S1016	121.91797	121.91783	0.00014	121.91800	121.91778	0.00022	0.00003	0.03

*net mass = gross - tare (g)

100g weight: S/N 14091 certified value: 100.000048 (100.00005)

Data collected electronically by proprietary BERT II software.

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. $\mu g/L$	DL Conc. $\mu g/L$
As	ICB	< DL	7.00
As	Meth_Blk	< DL	7.00
As	CCB	< DL	7.00
As	CCB	< DL	7.00
As	CCB	< DL	7.00
As	ICB	< DL	7.00
As	CCB	< DL	7.00
Be	ICB	< DL	0.200
Be	Meth_Blk	< DL	0.200
Be	CCB	< DL	0.200
Be	CCB	< DL	0.200
Be	CCB	< DL	0.200
Cd	ICB	< DL	0.400
Cd	Meth_Blk	< DL	0.400
Cd	CCB	< DL	0.400
Cd	CCB	< DL	0.400
Cd	CCB	< DL	0.400
Co	ICB	< DL	0.500
Co	Meth_Blk	< DL	0.500
Co	CCB	< DL	0.500
Co	CCB	< DL	0.500
Co	CCB	< DL	0.500
Cu	ICB	< DL	5.00
Cu	Meth_Blk	< DL	5.00
Cu	CCB	< DL	5.00
Cu	CCB	< DL	5.00
Cu	CCB	< DL	5.00
Mn	ICB	< DL	0.300
Mn	Meth_Blk	< DL	0.300
Mn	CCB	< DL	0.300
Mn	CCB	< DL	0.300
Mn	CCB	< DL	0.300
Ni	ICB	< DL	3.00
Ni	Meth_Blk	< DL	3.00
Ni	CCB	< DL	3.00
Ni	CCB	< DL	3.00
Ni	CCB	< DL	3.00
Pb	ICB	< DL	5.00
Pb	Meth_Blk	< DL	5.00
Pb	CCB	< DL	5.00
Pb	CCB	< DL	5.00
Pb	CCB	< DL	5.00
Sb	ICB	< DL	5.00
Sb	Meth_Blk	< DL	5.00
Sb	CCB	< DL	5.00
Sb	CCB	< DL	5.00
Sb	CCB	< DL	5.00
Se	ICB	< DL	15.0
Se	Meth_Blk	< DL	15.0
Se	CCB	< DL	15.0
Se	CCB	< DL	15.0
Se	CCB	< DL	15.0

*: Sample Media Blank (SM_Blk) concentration in μg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 19-219

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Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
As	ICV	2500	2330	93.0
As	LL-CCV	35.0	29.6	84.7
As	LL-LCS	20.0	20.3	101.3
As	CCV	2500	2300	91.8
As	CCV	2500	2280	91.3
As	CCV	2500	2280	91.4
As	ICV	2500	2440	97.8
As	LL-CCV	35.0	36.4	104.0
As	CCV	2500	2430	97.0
Be	ICV	2500	2440	97.6
Be	LL-CCV	1.00	0.876	87.6
Be	LL-LCS	0.500	0.396	79.2
Be	CCV	2500	2350	94.0
Be	CCV	2500	2330	93.3
Be	CCV	2500	2320	92.6
Cd	ICV	2500	2350	94.0
Cd	LL-CCV	2.00	2.05	102.4
Cd	LL-LCS	1.50	1.78	118.9
Cd	CCV	2500	2330	93.4
Cd	CCV	2500	2290	91.6
Cd	CCV	2500	2330	93.1
Co	ICV	2500	2350	94.1
Co	LL-CCV	2.50	2.94	117.6
Co	LL-LCS	1.50	1.91	127.1
Co	CCV	2500	2330	93.3
Co	CCV	2500	2290	91.5
Co	CCV	2500	2330	93.1
Cu	ICV	2500	2350	94.0
Cu	LL-CCV	25.0	24.2	96.7
Cu	LL-LCS	15.0	12.3	82.0
Cu	CCV	2500	2370	94.8
Cu	CCV	2500	2340	93.7
Cu	CCV	2500	2330	93.4
Mn	ICV	2500	2570	102.9
Mn	LL-CCV	1.50	1.94	129.5
Mn	LL-LCS	1.00	1.21	120.8
Mn	CCV	2500	2580	103.1
Mn	CCV	2500	2560	102.6
Mn	CCV	2500	2550	102.0
Ni	ICV	2500	2360	94.4
Ni	LL-CCV	15.0	16.2	108.3
Ni	LL-LCS	6.00	6.58	109.7
Ni	CCV	2500	2310	92.2
Ni	CCV	2500	2250	90.2
Ni	CCV	2500	2300	91.9
Pb	ICV	2500	2400	96.0
Pb	LL-CCV	25.0	27.4	109.4
Pb	LL-LCS	25.0	16.0	64.1
Pb	CCV	2500	2400	95.9
Pb	CCV	2500	2420	96.7
Pb	CCV	2500	2380	95.2
Sb	ICV	2500	2470	99.0
Sb	LL-CCV	25.0	25.9	103.6
Sb	LL-LCS	15.0	16.7	111.5
Sb	CCV	2500	2400	96.0
Sb	CCV	2500	2370	94.9

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 19-219

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Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
Sb	CCV	2500	2350	93.9
Se	ICV	2500	2410	96.5
Se	LL-CCV	75.0	77.6	103.5
Se	LL-LCS	30.0	30.9	103.0
Se	CCV	2500	2320	92.8
Se	CCV	2500	2310	92.3
Se	CCV	2500	2280	91.1

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Replicate Data

Analyte	Sample ID	Sample Conc. µg/L	Replicate Conc. µg/L	RPD
As	19-S1020	2001.	2024.	1.14
As	19-S1035	1649.	1639.	0.61
As	19-S1050	2512.	2511.	0.04
Be	19-S1020	< 0.2	< 0.2	N/C #
Be	19-S1035	< 0.2	< 0.2	N/C #
Be	19-S1050	0.577	0.542	6.26 #
Cd	19-S1020	90.92	91.82	0.99
Cd	19-S1035	57.78	57.57	0.36
Cd	19-S1050	275.2	275.2	0.00
Co	19-S1020	< 0.5	< 0.5	N/C #
Co	19-S1035	< 0.5	< 0.5	N/C #
Co	19-S1050	1.209	1.249	3.25 #
Cu	19-S1020	107.3	108.2	0.84
Cu	19-S1035	85.16	84.21	1.12
Cu	19-S1050	313.2	312.2	0.32
Mn	19-S1020	10.41	9.526	8.87
Mn	19-S1035	8.337	8.228	1.32
Mn	19-S1050	110.3	109.3	0.91
Ni	19-S1020	18.20	18.38	0.98
Ni	19-S1035	11.32	11.08	2.14 #
Ni	19-S1050	122.0	120.7	1.07
Pb	19-S1020	6012.	6060.	0.80
Pb	19-S1035	4590.	4673.	1.79
Pb	19-S1050	35900	35760	0.39
Sb	19-S1020	106.0	102.3	3.55
Sb	19-S1035	95.67	98.99	3.41
Sb	19-S1050	143.4	147.0	2.48
Se	19-S1020	39.45	43.81	10.5 #
Se	19-S1035	56.58	64.84	13.6 #
Se	19-S1050	239.3	241.6	0.96

N/C: RPD is not calculated when sample or replicate is below detection limit
Replicate Limit: 20% RPD
#: per EPA CLP protocol, control limits do not apply if sample and/or replicate concentration is less than 5x the detection limit

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 19-219

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Laboratory Control Sample/Post Digestion Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
As	LCS	< 7	2556.	2500.	102.
As	LCS	< 7	2580.	2500.	103.
As	19-S1025	1782.	4048.	2500.	90.6
As	19-S1040	1686.	4016.	2500.	93.2
As	19-S1055	3209.	7894.	5000.	93.7
Be	LCS	< 0.2	2403.	2500.	96.1
Be	LCS	< 0.2	2392.	2500.	95.7
Be	19-S1025	< 0.2	2225.	2500.	89.0
Be	19-S1040	< 0.2	2259.	2500.	90.4
Be	19-S1055	0.596	2002.	2500.	80.1
Cd	LCS	< 0.4	2633.	2500.	105.
Cd	LCS	< 0.4	2643.	2500.	106.
Cd	19-S1025	60.96	2500.	2500.	97.6
Cd	19-S1040	42.86	2488.	2500.	97.8
Cd	19-S1055	332.0	2607.	2500.	91.0
Co	LCS	< 0.5	2543.	2500.	102.
Co	LCS	< 0.5	2552.	2500.	102.
Co	19-S1025	< 0.5	2302.	2500.	92.1
Co	19-S1040	< 0.5	2312.	2500.	92.5
Co	19-S1055	2.831	2023.	2500.	80.8
Cu	LCS	< 5	2531.	2500.	101.
Cu	LCS	< 5	2541.	2500.	102.
Cu	19-S1025	96.03	2565.	2500.	98.8
Cu	19-S1040	83.52	2642.	2500.	102.
Cu	19-S1055	344.1	2538.	2500.	87.8
Mn	LCS	< 0.3	2807.	2500.	112.
Mn	LCS	< 0.3	2798.	2500.	112.
Mn	19-S1025	8.564	2618.	2500.	104.
Mn	19-S1040	8.591	2608.	2500.	104.
Mn	19-S1055	67.04	2390.	2500.	92.9
Ni	LCS	< 3	2603.	2500.	104.
Ni	LCS	< 3	2600.	2500.	104.
Ni	19-S1025	12.88	2289.	2500.	91.0
Ni	19-S1040	11.69	2336.	2500.	93.0
Ni	19-S1055	209.8	2219.	2500.	80.4
Pb	LCS	< 5	2690.	2500.	108.
Pb	LCS	< 5	2696.	2500.	108.
Pb	19-S1025	5247.	17210	12500	95.7
Pb	19-S1040	3870.	8617.	5000.	94.9
Pb	19-S1055	39820	87880	50000	96.1
Sb	LCS	< 5	2706.	2500.	108.
Sb	LCS	< 5	2705.	2500.	108.
Sb	19-S1025	88.40	2535.	2500.	97.9
Sb	19-S1040	88.83	2568.	2500.	99.2
Sb	19-S1055	190.5	2486.	2500.	91.8
Se	LCS	< 15	2645.	2500.	106.
Se	LCS	< 15	2646.	2500.	106.
Se	19-S1025	41.63	2389.	2500.	93.9
Se	19-S1040	52.60	2441.	2500.	95.5
Se	19-S1055	324.8	2653.	2500.	93.1

LCS Limit: 80% - 120% Recovery   Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 19-219

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Laboratory Control Sample Duplicate Data

Analyte	Sample ID	Spike Conc. µg/L	Duplicate Conc. µg/L	RPD
As	LCS-DUP	2560	2580	0.93
Be	LCS-DUP	2400	2390	0.46
Cd	LCS-DUP	2630	2640	0.38
Co	LCS-DUP	2540	2550	0.35
Cu	LCS-DUP	2530	2540	0.39
Mn	LCS-DUP	2810	2800	0.32
Ni	LCS-DUP	2600	2600	0.12
Pb	LCS-DUP	2690	2700	0.22
Sb	LCS-DUP	2710	2700	0.04
Se	LCS-DUP	2640	2650	0.04

Duplicate Limit: 20% RPD

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg/L	DL Conc. µg/L
As	ICB	< DL	7.00
As	Meth_Blk	< DL	7.00
As	CCB	< DL	7.00
As	CCB	< DL	7.00
As	CCB	< DL	7.00
Be	ICB	< DL	0.200
Be	Meth_Blk	< DL	0.200
Be	CCB	< DL	0.200
Be	CCB	< DL	0.200
Be	CCB	< DL	0.200
Cd	ICB	< DL	0.400
Cd	Meth_Blk	< DL	0.400
Cd	CCB	< DL	0.400
Cd	CCB	< DL	0.400
Cd	CCB	< DL	0.400
Co	ICB	< DL	0.500
Co	Meth_Blk	< DL	0.500
Co	CCB	< DL	0.500
Co	CCB	< DL	0.500
Co	CCB	< DL	0.500
Cu	ICB	< DL	5.00
Cu	Meth_Blk	< DL	5.00
Cu	CCB	< DL	5.00
Cu	CCB	< DL	5.00
Cu	CCB	< DL	5.00
Mn	ICB	< DL	0.300
Mn	Meth_Blk	< DL	0.300
Mn	CCB	< DL	0.300
Mn	CCB	< DL	0.300
Mn	CCB	< DL	0.300
Ni	ICB	< DL	3.00
Ni	Meth_Blk	< DL	3.00
Ni	CCB	< DL	3.00
Ni	CCB	< DL	3.00
Ni	CCB	< DL	3.00
Pb	ICB	< DL	5.00
Pb	Meth_Blk	< DL	5.00
Pb	CCB	< DL	5.00
Pb	CCB	< DL	5.00
Pb	CCB	< DL	5.00
Sb	ICB	< DL	5.00
Sb	Meth_Blk	< DL	5.00
Sb	CCB	< DL	5.00
Sb	CCB	< DL	5.00
Sb	CCB	< DL	5.00
Se	ICB	< DL	15.0
Se	Meth_Blk	< DL	15.0
Se	CCB	< DL	15.0
Se	CCB	< DL	15.0
Se	CCB	< DL	15.0

*: Sample Media Blank (SM_Blk) concentration in µg/filter
ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 19-219

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Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
As	ICV	2500	2420	97.0
As	LL-CCV	35.0	38.4	109.9
As	LL-LCS	20.0	19.2	95.8
As	CCV	2500	2410	96.2
As	CCV	2500	2400	96.1
As	CCV	2500	2410	96.3
Be	ICV	2500	2500	100.1
Be	LL-CCV	1.00	1.01	101.4
Be	LL-LCS	0.500	0.459	91.8
Be	CCV	2500	2460	98.6
Be	CCV	2500	2450	98.0
Be	CCV	2500	2470	98.6
Cd	ICV	2500	2500	99.9
Cd	LL-CCV	2.00	2.10	105.0
Cd	LL-LCS	1.50	1.42	94.9
Cd	CCV	2500	2500	100.0
Cd	CCV	2500	2510	100.4
Cd	CCV	2500	2430	97.2
Co	ICV	2500	2490	99.6
Co	LL-CCV	2.50	2.80	112.1
Co	LL-LCS	1.50	1.80	120.2
Co	CCV	2500	2460	98.6
Co	CCV	2500	2460	98.5
Co	CCV	2500	2480	99.4
Cu	ICV	2500	2350	93.8
Cu	LL-CCV	25.0	29.0	116.0
Cu	LL-LCS	15.0	15.2	101.3
Cu	CCV	2500	2310	92.6
Cu	CCV	2500	2300	92.2
Cu	CCV	2500	2310	92.3
Mn	ICV	2500	2570	102.9
Mn	LL-CCV	1.50	1.92	128.3
Mn	LL-LCS	1.00	1.57	156.8
Mn	CCV	2500	2570	102.9
Mn	CCV	2500	2570	102.9
Mn	CCV	2500	2500	99.9
Ni	ICV	2500	2370	94.7
Ni	LL-CCV	15.0	17.2	114.8
Ni	LL-LCS	6.00	5.98	99.6
Ni	CCV	2500	2330	93.4
Ni	CCV	2500	2300	92.2
Ni	CCV	2500	2310	92.5
Pb	ICV	2500	2460	98.2
Pb	LL-CCV	25.0	29.7	118.6
Pb	LL-LCS	15.0	15.2	101.1
Pb	CCV	2500	2450	97.9
Pb	CCV	2500	2420	96.8
Pb	CCV	2500	2430	97.2
Sb	ICV	2500	2460	98.2
Sb	LL-CCV	25.0	27.8	111.2
Sb	LL-LCS	15.0	9.44	62.9
Sb	CCV	2500	2420	96.9
Sb	CCV	2500	2420	97.0
Sb	CCV	2500	2420	96.6
Se	ICV	2500	2430	97.2
Se	LL-CCV	75.0	67.8	90.4

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 19-219

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Calibration QC

Analyte	Sample ID	Standard Conc. µg/L	Measured Conc. µg/L	Percent Recovery
Se	LL-LCS	30.0	27.8	92.8
Se	CCV	2500	2440	97.6
Se	CCV	2500	2420	96.9
Se	CCV	2500	2460	98.5

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 110% Recovery
LL-CCV (Low Level CCV) Limits: 60% - 140% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Replicate Data

Analyte	Sample ID	Sample Conc. µg/L	Replicate Conc. µg/L	RPD
As	19-S1021	449.6	448.5	0.24
As	19-S1036	596.4	603.2	1.13
As	19-S1051	584.6	580.1	0.77
Be	19-S1021	< 0.2	< 0.2	N/C #
Be	19-S1036	< 0.2	< 0.2	N/C #
Be	19-S1051	< 0.2	< 0.2	N/C #
Cd	19-S1021	5.579	5.534	0.81
Cd	19-S1036	< 0.4	< 0.4	N/C #
Cd	19-S1051	0.893	0.913	2.21 #
Co	19-S1021	0.667	0.781	15.7 #
Co	19-S1036	0.516	0.653	23.4 #
Co	19-S1051	3.316	3.213	3.16
Cu	19-S1021	< 5	< 5	N/C #
Cu	19-S1036	5.463	5.351	2.07 #
Cu	19-S1051	14.05	14.06	0.07 #
Mn	19-S1021	6.131	6.043	1.45
Mn	19-S1036	5.220	5.227	0.13
Mn	19-S1051	22.30	21.76	2.45
Ni	19-S1021	7.797	7.780	0.22 #
Ni	19-S1036	10.49	10.31	1.73 #
Ni	19-S1051	30.15	30.28	0.43
Pb	19-S1021	23.46	24.77	5.43 #
Pb	19-S1036	< 5	< 5	N/C #
Pb	19-S1051	85.63	83.19	2.89
Sb	19-S1021	< 5	< 5	N/C #
Sb	19-S1036	13.90	11.92	15.3 #
Sb	19-S1051	18.65	18.57	0.43 #
Se	19-S1021	886.1	891.2	0.57
Se	19-S1036	702.5	697.4	0.73
Se	19-S1051	3646.	3657.	0.30

N/C: RPD is not calculated when sample or replicate is below detection limit
Replicate Limit: 20% RPD
#: per EPA CLP protocol, control limits do not apply if sample and/or
replicate concentration is less than 5x the detection limit

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 19-219

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Laboratory Control Sample/Post Digestion Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
As	LCS	< 7	2497.	2500.	99.9
As	LCS	< 7	2471.	2500.	98.8
As	19-S1026	438.6	2840.	2500.	96.1
As	19-S1041	514.4	2905.	2500.	95.6
As	19-S1056	1068.	3427.	2500.	94.4
Be	LCS	< 0.2	2299.	2500.	92.0
Be	LCS	< 0.2	2313.	2500.	92.5
Be	19-S1026	< 0.2	2216.	2500.	88.6
Be	19-S1041	< 0.2	2251.	2500.	90.0
Be	19-S1056	< 0.2	2081.	2500.	83.2
Cd	LCS	< 0.4	2587.	2500.	103.
Cd	LCS	< 0.4	2552.	2500.	102.
Cd	19-S1026	< 0.4	2497.	2500.	99.9
Cd	19-S1041	5.830	2495.	2500.	99.6
Cd	19-S1056	< 0.4	2197.	2500.	87.9
Co	LCS	< 0.5	2581.	2500.	103.
Co	LCS	< 0.5	2630.	2500.	105.
Co	19-S1026	< 0.5	2390.	2500.	95.6
Co	19-S1041	0.533	2447.	2500.	97.9
Co	19-S1056	1.935	2191.	2500.	87.6
Cu	LCS	< 5	2349.	2500.	94.0
Cu	LCS	< 5	2303.	2500.	92.1
Cu	19-S1026	< 5	2336.	2500.	93.4
Cu	19-S1041	9.408	2325.	2500.	92.6
Cu	19-S1056	22.56	2156.	2500.	85.3
Mn	LCS	< 0.3	2680.	2500.	107.
Mn	LCS	< 0.3	2642.	2500.	106.
Mn	19-S1026	7.048	2552.	2500.	102.
Mn	19-S1041	5.340	2539.	2500.	101.
Mn	19-S1056	84.51	2339.	2500.	90.2
Ni	LCS	< 3	2442.	2500.	97.7
Ni	LCS	< 3	2416.	2500.	96.6
Ni	19-S1026	9.360	2317.	2500.	92.3
Ni	19-S1041	10.77	2300.	2500.	91.6
Ni	19-S1056	45.13	2158.	2500.	84.5
Pb	LCS	< 5	2528.	2500.	101.
Pb	LCS	< 5	2516.	2500.	101.
Pb	19-S1026	< 5	2388.	2500.	95.5
Pb	19-S1041	16.30	2461.	2500.	97.8
Pb	19-S1056	13.87	2120.	2500.	84.2
Sb	LCS	< 5	2523.	2500.	101.
Sb	LCS	< 5	2506.	2500.	100.
Sb	19-S1026	< 5	2334.	2500.	93.4
Sb	19-S1041	< 5	2352.	2500.	94.1
Sb	19-S1056	11.39	2135.	2500.	84.9
Se	LCS	< 15	2499.	2500.	100.
Se	LCS	< 15	2492.	2500.	99.7
Se	19-S1026	1116.	3820.	2500.	108.
Se	19-S1041	1190.	3979.	2500.	112.
Se	19-S1056	4705.	18140	12500	107.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: ICP - Optima 8300
Sample Description: EPA Method 29 Cont. 4
Report Number: 19-219

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Laboratory Control Sample Duplicate Data

Analyte	Sample ID	Spike Conc. µg/L	Duplicate Conc. µg/L	RPD
As	LCS-DUP	2500	2470	1.05
Be	LCS-DUP	2300	2310	0.61
Cd	LCS-DUP	2590	2550	1.36
Co	LCS-DUP	2580	2630	1.88
Cu	LCS-DUP	2350	2300	1.98
Mn	LCS-DUP	2680	2640	1.43
Ni	LCS-DUP	2440	2420	1.07
Pb	LCS-DUP	2530	2520	0.48
Sb	LCS-DUP	2520	2510	0.68
Se	LCS-DUP	2500	2490	0.28

Duplicate Limit: 20% RPD

ICP RAW DATA

Available upon request

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 1&3
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	Meth_Blk	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	4.90	98.0
Hg	LL-LCS	0.020	0.019	95.0
Hg	CCV	5.00	4.99	99.7
Hg	CCV	5.00	4.98	99.7
Hg	CCV	5.00	4.97	99.4
Hg	CCV	5.00	4.96	99.2

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	LCS	< 0.007	5.00	5.00	100.
Hg	LCS	< 0.007	5.08	5.00	102.
Hg	19-S1020	0.010	5.02	5.00	100.
Hg	19-S1035	< 0.007	5.00	5.00	100.
Hg	19-S1050	< 0.007	5.04	5.00	101.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

Laboratory Control Sample Duplicate Data

Analyte	Sample ID	Spike Conc. µg/L	Duplicate Conc. µg/L	RPD
Hg	LCS-DUP	5.00	5.08	1.49

Duplicate Limit: 20% RPD

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 4
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	4.97	99.4
Hg	LL-LCS	0.020	0.022	110.0
Hg	CCV	5.00	5.03	100.7
Hg	CCV	5.00	5.04	100.8
Hg	CCV	5.00	5.05	100.9

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	19-S1021	0.236	5.23	5.00	99.9
Hg	19-S1036	0.254	5.24	5.00	99.8
Hg	19-S1051	0.576	5.68	5.00	102.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 5a, 5b
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	4.88	97.5
Hg	LL-LCS	0.020	0.022	110.0
Hg	CCV	5.00	4.96	99.3
Hg	CCV	5.00	4.94	98.9
Hg	CCV	5.00	4.97	99.4
Hg	CCV	5.00	4.97	99.5

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	19-S1023	0.352	5.46	5.00	102.
Hg	19-S1038	0.244	5.38	5.00	103.
Hg	19-S1053	1.02	6.05	5.00	101.
Hg	19-S1022	0.023	5.07	5.00	101.
Hg	19-S1037	0.024	5.08	5.00	101.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

QA/QC Report

Client Name: Montrose Air Quality Services
Project Number: H007
Analytical Technique: CVAA
Sample Description: EPA Method 29 Cont. 5a, 5c
Report Number: 19-219

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Blank Data

Analyte	Sample ID	Measured Conc. µg	DL Conc. µg
Hg	ICB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007
Hg	CCB	< DL	0.007

ICB: Initial Calibration Blank CCB: Continuing Calibration Blank
Method Blank is in control if Method Blank results are <10% of sample results

Calibration QC

Analyte	Sample ID	Standard Conc. µg	Measured Conc. µg	Percent Recovery
Hg	ICV	5.00	5.00	99.9
Hg	LL-LCS	0.020	0.020	100.0
Hg	CCV	5.00	5.07	101.4
Hg	CCV	5.00	5.09	101.7
Hg	CCV	5.00	5.10	102.0
Hg	CCV	5.00	5.09	101.9

ICV: Initial Calibration Verification CCV: Continuing Calibration Verification
Calibration Verification Limits: 90% - 100% Recovery
LL-LCS Limits: 50% - 150% Recovery
LL-LCS results are not significant if sample results are >10x LL-LCS concentration

Duplicate Data

All samples analyzed in duplicate. The reported concentrations are the average of the two measurements.

Laboratory Control Sample/Matrix Spike Analysis

Analyte	Sample ID	Sample Conc. µg/L	Spike Conc. µg/L	Spike Amount µg/L	Percent Recovery
Hg	19-S1052	0.046	5.06	5.00	100.
Hg	19-S1024	0.035	5.09	5.00	101.
Hg	19-S1039	0.008	5.05	5.00	101.
Hg	19-S1054	0.058	5.11	5.00	101.

LCS Limit: 80% - 120% Recovery Spike Limit: 75% - 125% Recovery
*: per EPA CLP protocol, control limits do not apply if spike concentration is less than 25% of the sample concentration

CVAA RAW DATA

Available upon request

CHESTER LABNET

SOURCE SAMPLE RECEIPT CHECKLIST

Client	Montrose Air Quality Services	Date	5/24/19
# Runs	9 + Blk	Report #	19-219

Custody Seals Inspected, If Present	✓	
Chain-of-Custody Form Inspected	✓	
CoC present with samples?	✓	*
CoC indicate analytical methodology to be used? (eg M29 etc)	✓	!!
CoC indicate if compliance testing? (esp. M26)	Audit ✓	!!
M26 samples have Thiosulfate added in field?	NA	!!
M29 indicate FH/BH separate or combined?	Separate	!!
Has Form Been Signed?	✓	
Have Date and Time Custody Released Been Noted on Form?	✓	
All Sample Containers Inspected	✓	
Does Number of Samples Match Number on CoC Form?	✓	!!
Do All Sample ID Numbers Match Those on the CoC Form?	✓	!!
Did client mark sample volumes prior to shipment?	✓	*
If required by method, did client vent samples prior to shipment?	NO	
Are the Sample Containers Intact?	✓	!!
Are signs of leakage present?	NO	*
Chain-of-Custody Form Signed and Dated by CLN	✓	
Corrective Actions		
Client Contacted Due to Mismatching Sample ID Numbers		
Client Contacted Due to Broken Sample Container(s)		
Client Contacted Due to Leaking Sample Container(s)	5/24/19	
Client contacted for verification of methodology?	LWB	
Corrective Actions Documented?		
Corrective Actions Accomplished?		

Items marked !! shall be addressed ***prior to any analytical work being started.***
*Items marked * shall be* ***noted in case narrative*** *upon reporting of results to client.*

Signed Lisa Ball

Notes EPA 316, + CARB 425 Received close to hold time.

MONTROSE AIR QUALITY SERVICES

CHAIN OF COUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace A N/S	**Test / Analytical Method:** EPA 316
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** CH2O
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Rinse/Impingers N	5/20/19	1205	1			19-S958
R2 Rinse/Impingers N	5/20/19	1503	1			S959
R3 Rinse/Impingers N	5/20/19	1801	1			S960
R1 Rinse/Impingers S	5/20/19	1146	1			19-S961
R2 Rinse/Impingers S	5/20/19	1531	1			S962
R3 Rinse/Impingers S	5/20/19	1730	1			S963
Total Containers			6			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	~~1400~~ 1640	Ball	5/24/19	[illegible]	

COC.xlsm

MONTROSE
AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace D	**Test / Analytical Method:** EPA 316
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** CH2O
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Rinse/Impingers	5/15/19	0932	1			19-~~S958~~ S964
R2 Rinse/Impingers	5/15/19	1144	1			S965
R3 Rinse/Impingers	5/15/19	1345	1			S966
FB Rinse/Impingers	5/15/19	1730	1			S967
~~5/1 H2O~~ Blank	5/24/19	1300	1			S968
sample						
Total Containers			5			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1640		5/24/19	17:03	

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CHAIN OF CUSTODY

MONTROSE AIR QUALITY SERVICES
Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace A N/S	**Test / Analytical Method:** CARB 425
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Cr,Cr6
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filters Imp 1&2 N	5/21/19	0930	1			S970
R2 Filters Imp 1&2 N	5/22/19	0830	1			S972
R3 Filters Imp 1&2 N	5/23/19	0830	1			S974
R1 Filters Imp 1&2 S	5/21/19	0930	1			S976
R2 Filters Imp 1&2 S	5/22/19	0830	1			S978
R3 Filters Imp 1&2 S	5/23/19	0830	1			S980
R1 Probe rinse N	5/21/19	0930	1			19S969
R2 Probe rinse N	5/22/19	0830	1			S971
R3 Probe rinse N	5/23/19	0830	1			S973
R1 Probe rinse S	5/21/19	0930	1			S975
R2 Probe rinse S	5/22/19	0830	1			S977
R3 Probe rinse S	5/23/19	0830	1			S979
Total Containers			12			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	16:40		5/24/19	17:20	

MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:

Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace D	**Test / Analytical Method:** CARB 425
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Cr,Cr6
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filters Imp 1&2	5/16/19	0850	1			5982
R2 Filters Imp 1&2	5/16/19	1507	1			5984
R3 Filters Imp 1&2	5/17/19	0751	1			5986
FB Imp 1&2	5/23/19	1600	1			195988
FB Probe rinse	5/23/19	1600	1			195987
R1 Probe rinse	5/16/19	0850	1			195981
R2 Probe rinse	5/16/19	1507	1			5983
R3 Probe rinse	5/17/19	0751	1			5985
						~~5987~~
1N Bicarb Blank	5/24/19	1300	1			
.1N Bicarb Blank	5/24/19	1300	1			195989
						5990
Total Containers			**10**			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	16:40		5/24/19	17:30	

19-219

MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace A N	**Test / Analytical Method:** ODEQ 5
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:**
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filter	5/20/19	1205	1			19486
R1 F1/2 Acetone	5/20/19	1205	1			19-5991
R1 B1/2 Acetone	5/20/19	1205	1			~~5992~~ 5993
R1 Imp H2O	5/20/19	1205	1			~~5993~~ 5992
R2 Filter	5/20/19	1507	1			~~19485~~ 19488
R2 F1/2 Acetone	5/20/19	1507	1			5994
R2 B1/2 Acetone	5/20/19	1507	1			5996
R2 Imp H2O	5/20/19	1507	1			5995
R3 Filter	5/20/19	1801	1			19490
R3 F1/2 Acetone	5/20/19	1801	1			5997
R3 B1/2 Acetone	5/20/19	1801	1			5999
R3 Imp H2O	5/20/19	1801	1			5998
Total Containers			12			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
[signature]	5/24/19	1400	[signature]	5/24/19	1400	
[signature]	5/24/19	1640	[signature]	5/24/19	17:00	

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MONTROSE
AIR QUALITY SERVICES

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

CHAIN OF CUSTODY

Lab info: Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace A S	**Test / Analytical Method:** ODEQ 5
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:**
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filter	5/20/19	1146	1			19485
R1 F1/2 Acetone	5/20/19	1146	1			S1000
R1 B1/2 Acetone	5/20/19	1146	1			S1002
R1 Imp H2O	5/20/19	1146	1			S1001
R2 Filter	5/20/19	1531	1			19484
R2 F1/2 Acetone	5/20/19	1531	1			S1003
R2 B1/2 Acetone	5/20/19	1531	1			S1005
R2 Imp H2O	5/20/19	1531	1			S1004
R3 Filter	5/20/19	1731	1			19489
R3 F1/2 Acetone	5/20/19	1731	1			S1006
R3 B1/2 Acetone	5/20/19	1731	1			S1008
R3 Imp H2O	5/20/19	1731	1			S1007
Total Containers			12			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1640		5/24/19	17:00	

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MONTROSE
AIR QUALITY SERVICES

CHAIN OF COUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info: Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace D	**Test / Analytical Method:** ODEQ 5
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:**
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:** J. Ulle	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filter	5/15/19	0932	1			19482
R1 F1/2 Acetone	5/15/19	0932	1			S1009
R1 B1/2 Acetone	5/15/19	0932	1			S1011
R1 Imp H2O	5/15/19	0932	1			S1010
R2 Filter	5/15/19	1144	1			19483
R2 F1/2 Acetone	5/15/19	1144	1			S1012
R2 B1/2 Acetone	5/15/19	1144	1			~~S1013~~ S1014
R2 Imp H2O	5/15/19	1144	1			~~S1012~~ S1020
R4 Filter	5/15/19	1526	1			19494
R4 F1/2 Acetone	5/15/19	1526	1			S1015
R4 B1/2 Acetone	5/15/19	1526	1			S1017
R4 Imp H2O	5/15/19	1526	1			S1016
Acetone Blank	5/15/19	1400	1			S1018
H2O Blank	5/15/19	1400	1			S1019
Filter Blank'	5/15/19	1400	1			19495
Total Containers			15			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
J. Ulle	5/24/19	1400	[illegible]	5/24/19	1400	
[illegible]	5/24/19	1640	Lisa Bell	5/24/19	17:00	

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MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info: Chester labnet

Client / Project:	Project / Sample Location:	Test / Analytical Method:
Owens IL 006AS-596331	Furnace A N	EPA 29
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Sb,As,Be,Cd,Co,Cu,Pb,Mn,Hg,Ni,Se
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
JW R1 ~~Filters~~ Filter	5/21/19	0900	1			19S1020
R1 F1/2	5/21/19	0900	1			~~S1021~~
R1 Imp 1-3	5/21/19	0900	1			JW ~~S1022~~ 1021
R1 Imp 4	5/21/19	0900	1			~~S1023~~ S1022
R1 Imp 5-6	5/21/19	0900	1			~~S102~~ S1023
R1 Imp 5-6 HCL	5/21/19	0900	1			S1024
R2 Filter	5/22/19	0900	1			19S1025
R2 F1/2	5/22/19	0900	1			
R2 Imp 1-3	5/22/19	0900	1			S1026
R2 Imp 4	5/22/19	0900	1			S1027
R2 Imp 5-6	5/22/19	0900	1			S1028
R2 Imp 5-6 HCL	5/22/19	0900	1			S1029
Total Containers			12			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1640	Lisa Ball	5/24/19	17:00	

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MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project:	Project / Sample Location:	Test / Analytical Method:
Owens IL 006AS-596331	Furnace A N	EPA 29
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Sb,As,Be,Cd,Co,Cu,Pb,Mn,Hg,Ni,Se
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R3 Filter	5/23/19	0800	1			19-S1030
R3 F1/2	5/23/19	0800	1			↓
R3 Imp 1-3	5/23/19	0800	1			S1031
R3 Imp 4	5/23/19	0800	1			S1032
R3 Imp 5-6	5/23/19	0800	1			S1033
R3 Imp 5-6 HCL	5/23/19	0800	1			S1034
Total Containers			6			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1600	Lisa Ball	5/24/19	17:00	

CHAIN OF CUSTODY

MONTROSE AIR QUALITY SERVICES

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace A S	**Test / Analytical Method:** EPA 29
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Sb,As,Be,Cd,Co,Cu,Pb,Mn,Hg,Ni,Se
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filter	5/21/19	0930	1			19-S1035
R1 F1/2	5/21/19	0930	1			↓
R1 Imp 1-3	5/21/19	0930	1			1036
R1 Imp 4	5/21/19	0930	1			1037
R1 Imp 5-6	5/21/19	0930	1			1038
R1 Imp 5-6 HCL	5/21/19	0930	1			1039
R2 Filter	5/22/19	0830	1			19-S1040
R2 F1/2	5/22/19	0830	1			~~S1041~~ ↓
R2 Imp 1-3	5/22/19	0830	1			~~S1042~~ 1041
R2 Imp 4	5/22/19	0830	1			~~S1043~~ 1042
R2 Imp 5-6	5/22/19	0830	1			S1043
R2 Imp 5-6 HCL	5/22/19	0830	1			S1044
Total Containers			12			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1600	Lisa Ball	5/24/19	17:00	

MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace A S	**Test / Analytical Method:** EPA 29
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Sb,As,Be,Cd,Co,Cu,Pb,Mn,Hg,Ni,Se
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R3 Filter	5/23/19	0830	1			19-S1045
R3 F1/2	5/23/19	0830	1			↓
R3 Imp 1-3	5/23/19	0830	1			S1046
R3 Imp 4	5/23/19	0830	1			S1047
R3 Imp 5-6	5/23/19	0830	1			S1048
R3 Imp 5-6 HCL	5/23/19	0830	1			S1049
Audit	5/24/19	1300	1			
Metals Filter						19-S1071
Metals Imp						S1072
Hg Filter						S1073
Hg Imp						S1074
Total Containers			7			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1600	Luis Ball	5/24/19	17:00	

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MONTROSE AIR QUALITY SERVICES

CHAIN OF COUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info: Chester labnet

Client / Project:	Project / Sample Location:	Test / Analytical Method:
Owens IL 006AS-596331	Furnace D	EPA 29
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Sb,As,Be,Cd,Co,Cu,Pb,Mn,Hg,Ni,Se
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R1 Filters	5/16/19	0850	2			11-S1050
R1 F1/2	5/16/19	0850	1			↓
R1 Imp 1-3	5/16/19	0850	1			S1051
R1 Imp 4	5/16/19	0850	1			S1052
R1 Imp 5-6	5/16/19	0850	1			S1053
R1 Imp 5-6 HCL	5/16/19	0850	1			S1054
R2 Filters	5/16/19	1507	2			11-S1055
R2 F1/2	5/16/19	1507	1			↓
R2 Imp 1-3	5/16/19	1507	1			S1056
R2 Imp 4	5/16/19	1507	1			S1057
R2 Imp 5-6	5/16/19	1507	1			S1058
R2 Imp 5-6 HCL	5/16/19	1507	1			S1059
Total Containers			**14**			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1645	Lutes Ball	5/24/19	17:00	

MONTROSE AIR QUALITY SERVICES

CHAIN OF CUSTODY

Portland Location
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

Lab info:
Chester labnet

Client / Project: Owens IL 006AS-596331	**Project / Sample Location:** Furnace D	**Test / Analytical Method:** EPA 29
Project No.: 006AS-596331	**Purchase Order No:**	**Special Analysis / Reporting Instructions:** Sb,As,Be,Cd,Co,Cu,Pb,Mn,Hg,Ni,Se
Send Analytical Report To: Portland QA/QC: PortlandQA-QC@montrose-env.com jheffernan@montrose-env.com	**Sampler or PM Signature:**	

Run / Sample No.	Date	Time	Containers	Sample Fraction	Reagent	Lab / Sample ID No.
R3 Filters	5/17/19	0751	2			19-S1060
R3 F1/2	5/17/19	0751	1			~~S1060~~ S1060
R3 Imp 1-3	5/17/19	0751	1			S1061
R3 Imp 4	5/17/19	0751	1			S1062
R3 Imp 5-6	5/17/19	0751	1			S1063
R3 Imp 5-6 HCL	5/17/19	0751	1			S1064
HNO3 Blank	5/16/19	1000	1			19-S1065
5%/10% Blank	5/16/19	1000	1			19-S1067
H2O Blank	5/16/19	1000	1			19-S1068
HCL/H2O Blank	5/16/19	1000	1			19-S1070
KMNO4 Blank	5/16/19	1000	1			19-S1069
Filter Blank	5/16/19	1000	1			19-S1066
Total Containers			13			

Relinquished by	Date	Time	Received by	Date	Time	Temp.
	5/24/19	1400		5/24/19	1400	
	5/24/19	1640		5/24/19	1700	

Lisa Ball

From:	Joe Heffernan <jheffernan@montrose-env.com>
Sent:	Thursday, June 27, 2019 9:54 AM
To:	Lisa Ball
Subject:	[redacted]

client replied to a different email.
Subject omitted for client confidentiality

Please proceed with the procedure you outlined below. That seems like the best approach.

Thanks,

On Thu, Jun 27, 2019 at 10:06 AM Lisa Ball <lball@chesterlab.net> wrote:

Hi Joe,

It might be easier for one our QA/QC analysts to talk to you . However here is a quick rundown. Basically since the filters are hygroscopic, as soon as they are removed from the desiccator they start absorbing moisture from the air. So when placed on the balance the number keeps increasing. It evidentially might stabilize, but the time it takes and how much it increases is random. Our QA/QC team feels that the best result is to take a manual reading after about 10 seconds after placing the filter on the balance. This gives the balance enough time to stabilize, and we feel it also gives you the most accurate reading you will obtain from these types of samples. Our balance reads to 5 places, we only report out to 4 for results taken manually. We still would attempt a gross reweight the following day, but often they don't pass our standard of +/-0.0005 grams due to the hygroscopic issue. If you would like to discuss this further please give us a call. If this is enough information please confirm how you would like us to proceed.

Thanks,

Lisa Ball
CHESTER LabNet

12242 SW Garden Place

Tigard, OR 97223

lball@chesterlab.net

http:\\www.chesterlab.net

(503)624-2183

fax (503)624-2653

From: Joe Heffernan [mailto:jheffernan@montrose-env.com]
Sent: Thursday, June 27, 2019 8:43 AM
To: Lisa Ball <lball@chesterlab.net>
Subject: [redacted]

Lisa,

Got your guys message about the Owens IL job. How do you typically handle the hygroscopic filters? I've reached out to the QA/QC team for guidance on how to proceed. I'll be in touch.

thanks,

Joe Heffernan III, QSTI

Client Project Manager

Montrose Air Quality Services, LLC

13585 NE Whitaker Way, Portland, OR 97230

T: 503.255.5050 | M: 971.282.5336 | F: 503.255.0505

jheffernan@montrose-env.com

www.montrose-env.com

On Tue, Jun 25, 2019 at 1:51 PM Lisa Ball <lball@chesterlab.net> wrote:

Hi Joe,

Attached is your report. Please let me know if you have any questions.

Thanks,

Lisa Ball
CHESTER LabNet

12242 SW Garden Place

Tigard, OR 97223

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APPENDIX D
FACILITY PROCESS DATA

Appendix D.1
Process Data

Portland Process Data
Furnace D
May 15 - 17, 2019

	15-May	16-May	17-May
Glass production (tons/day)	177.7	177.7	177.7
Type of Glass Produced	antique green (AG)	antique green (AG)	antique green (AG)
% cullet in batch	75	75	75
Raw material feed rate (based on fusion loss) tons/day	211.5	211.5	211.5
Natural gas usage (1,000 ft3/hr)	21.63	22.42	14.29
Electric boost rate (kWh/hour)	696.6	754.5	813.6
Bridgewall Temperature (°F)	2853	2854	2846

Portland Process Data
Furnace A
May 20 - 23, 2019

	20-May	21-May	22-May	23-May
Glass production (tons/day)	202.1	202.1	202.1	202.1
Type of Glass Produced	Amber	Amber	Amber	Amber
% cullet in batch	81	81	81	81
Raw material feed rate (based on fusion loss) tons/day	242.3	242.3	242.3	242.3
Natural gas usage (1,000 ft3/hr)	149.3	154.3	145.8	145.9
Electric boost rate (kWh/hour)	885.1	997.1	793.4	827.5
Bridgewall Temperature (°F)	2785	2786	2784	2787

Portland Furnace D - 6-minute average opacity values

Date/Time	DFURNACE OPACITY Value	Date/Time	DFURNACE OPACITY Value	Date/Time	DFURNACE OPACITY Value
05/15/2019 09:00	4.2	05/16/2019 09:00	4.5	05/17/2019 09:00	4.8
05/15/2019 09:06	4.2	05/16/2019 09:06	4.5	05/17/2019 09:06	5
05/15/2019 09:12	4.4	05/16/2019 09:12	4.7	05/17/2019 09:12	5
05/15/2019 09:18	4	05/16/2019 09:18	4.7	05/17/2019 09:18	4.9
05/15/2019 09:24	4.2	05/16/2019 09:24	4.9	05/17/2019 09:24	5.1
05/15/2019 09:30	4.3	05/16/2019 09:30	4.4	05/17/2019 09:30	5.1
05/15/2019 09:36	4.4	05/16/2019 09:36	5.2	05/17/2019 09:36	5.2
05/15/2019 09:42	4.5	05/16/2019 09:42	5.1	05/17/2019 09:42	5.1
05/15/2019 09:48	4.1	05/16/2019 09:48	4.6	05/17/2019 09:48	4.7
05/15/2019 09:54	4	05/16/2019 09:54	4.6	05/17/2019 09:54	4.7
05/15/2019 10:00	4.2	05/16/2019 10:00	4.8	05/17/2019 10:00	4.9
05/15/2019 10:06	4.3	05/16/2019 10:06	5.1	05/17/2019 10:06	5.7
05/15/2019 10:12	4.4	05/16/2019 10:12	5	05/17/2019 10:12	5.9
05/15/2019 10:18	4	05/16/2019 10:18	5	05/17/2019 10:18	5.3
05/15/2019 10:24	4.3	05/16/2019 10:24	5.8	05/17/2019 10:24	5.5
05/15/2019 10:30	4.8	05/16/2019 10:30	6.5	05/17/2019 10:30	5.5
05/15/2019 10:36	5.2	05/16/2019 10:36	6.4	05/17/2019 10:36	5.4
05/15/2019 10:42	5.4	05/16/2019 10:42	6.2	05/17/2019 10:42	5.9
05/15/2019 10:48	4.2	05/16/2019 10:48	5	05/17/2019 10:48	5.2
05/15/2019 10:54	4.2	05/16/2019 10:54	5	05/17/2019 10:54	5.2
05/15/2019 11:00	4.3	05/16/2019 11:00	5.1	05/17/2019 11:00	5.3
05/15/2019 11:06	4.4	05/16/2019 11:06	5.2	05/17/2019 11:06	5.4
05/15/2019 11:12	4.7	05/16/2019 11:12	5.3	05/17/2019 11:12	5.5
05/15/2019 11:18	4.6	05/16/2019 11:18	5.4	05/17/2019 11:18	5.2
05/15/2019 11:24	4.8	05/16/2019 11:24	5.6	05/17/2019 11:24	5.2
05/15/2019 11:30	4.7	05/16/2019 11:30	5.6	05/17/2019 11:30	5.4
05/15/2019 11:36	4.7	05/16/2019 11:36	5.8	05/17/2019 11:36	5.6
05/15/2019 11:42	4.8	05/16/2019 11:42	5.9	05/17/2019 11:42	5.9
05/15/2019 11:48	4.2	05/16/2019 11:48	5.1	05/17/2019 11:48	5.2
05/15/2019 11:54	4.3	05/16/2019 11:54	5.1	05/17/2019 11:54	5.2
05/15/2019 12:00	4.5	05/16/2019 12:00	5.3	05/17/2019 12:00	5.4
05/15/2019 12:06	4.5	05/16/2019 12:06	5.5	05/17/2019 12:06	5.5
05/15/2019 12:12	4.7	05/16/2019 12:12	5.7	05/17/2019 12:12	5.6
05/15/2019 12:18	4.7	05/16/2019 12:18	5.4	05/17/2019 12:18	5.4
05/15/2019 12:24	4.9	05/16/2019 12:24	6	05/17/2019 12:24	5.8
05/15/2019 12:30	5	05/16/2019 12:30	5.9	05/17/2019 12:30	6
05/15/2019 12:36	5	05/16/2019 12:36	6.2	05/17/2019 12:36	6
05/15/2019 12:42	5.2	05/16/2019 12:42	6.2	05/17/2019 12:42	6.4
05/15/2019 12:48	4.4	05/16/2019 12:48	5.1	05/17/2019 12:48	5.5
05/15/2019 12:54	4.6	05/16/2019 12:54	5	05/17/2019 12:54	6.1
05/15/2019 13:00	4.7	05/16/2019 13:00	5.5	05/17/2019 13:00	5.6
05/15/2019 13:06	4.6	05/16/2019 13:06	5.4	05/17/2019 13:06	5.8
05/15/2019 13:12	4.7	05/16/2019 13:12	6	05/17/2019 13:12	5.9
05/15/2019 13:18	4.7	05/16/2019 13:18	5	05/17/2019 13:18	5.8
05/15/2019 13:24	4.9	05/16/2019 13:24	5.6	05/17/2019 13:24	6.1
05/15/2019 13:30	5.2	05/16/2019 13:30	6	05/17/2019 13:30	5.8
05/15/2019 13:36	5.1	05/16/2019 13:36	6.1	05/17/2019 13:36	5.8
05/15/2019 13:42	5.3	05/16/2019 13:42	6.2	05/17/2019 13:42	5.8
05/15/2019 13:48	4.2	05/16/2019 13:48	5.1	05/17/2019 13:48	5.5
05/15/2019 13:54	4.2	05/16/2019 13:54	4.9	05/17/2019 13:54	5.6
05/15/2019 14:00	4.4	05/16/2019 14:00	4.9	05/17/2019 14:00	6.2
05/15/2019 14:06	4.4	05/16/2019 14:06	5.2	05/17/2019 14:06	5.7
05/15/2019 14:12	4.5	05/16/2019 14:12	5.2	05/17/2019 14:12	5.9
05/15/2019 14:18	4.4	05/16/2019 14:18	4.9	05/17/2019 14:18	5.5
05/15/2019 14:24	4.7	05/16/2019 14:24	5.2	05/17/2019 14:24	5.6
05/15/2019 14:30	4.8	05/16/2019 14:30	5.3	05/17/2019 14:30	5.8
05/15/2019 14:36	4.7	05/16/2019 14:36	5.4	05/17/2019 14:36	5.7
05/15/2019 14:42	4.8	05/16/2019 14:42	5.6	05/17/2019 14:42	6

05/15/2019 14:48	4.1	05/16/2019 14:48	5	05/17/2019 14:48	5.4
05/15/2019 14:54	4.1	05/16/2019 14:54	5	05/17/2019 14:54	5.5
05/15/2019 15:00	4.3	05/16/2019 15:00	5.1	05/17/2019 15:00	5.6
05/15/2019 15:06	4.5	05/16/2019 15:06	5.2	05/17/2019 15:06	5.7
05/15/2019 15:12	4.6	05/16/2019 15:12	5.3	05/17/2019 15:12	5.7
05/15/2019 15:18	4.3	05/16/2019 15:18	5.3	05/17/2019 15:18	5.6
05/15/2019 15:24	4.7	05/16/2019 15:24	5.7	05/17/2019 15:24	5.6
05/15/2019 15:30	4.9	05/16/2019 15:30	5.5	05/17/2019 15:30	5.8
05/15/2019 15:36	5.1	05/16/2019 15:36	5.7	05/17/2019 15:36	5.9
05/15/2019 15:42	4.9	05/16/2019 15:42	6	05/17/2019 15:42	5.9
05/15/2019 15:48	4.3	05/16/2019 15:48	4.8	05/17/2019 15:48	5.2
05/15/2019 15:54	4.2	05/16/2019 15:54	4.9	05/17/2019 15:54	5.2
05/15/2019 16:00	4.4	05/16/2019 16:00	5.1	05/17/2019 16:00	5.3
05/15/2019 16:06	4.5	05/16/2019 16:06	5.3	05/17/2019 16:06	5.4
05/15/2019 16:12	4.5	05/16/2019 16:12	5.3	05/17/2019 16:12	5.6
05/15/2019 16:18	4.3	05/16/2019 16:18	5.2	05/17/2019 16:18	5.4
05/15/2019 16:24	4.7	05/16/2019 16:24	5.3	05/17/2019 16:24	5.5
05/15/2019 16:30	4.6	05/16/2019 16:30	5.6	05/17/2019 16:30	5.7
05/15/2019 16:36	4.7	05/16/2019 16:36	5.8	05/17/2019 16:36	5.9
05/15/2019 16:42	4.9	05/16/2019 16:42	5.8	05/17/2019 16:42	5.9
05/15/2019 16:48	4.1	05/16/2019 16:48	5	05/17/2019 16:48	5.4
05/15/2019 16:54	4.1	05/16/2019 16:54	5.3	05/17/2019 16:54	5.3
05/15/2019 17:00	4.7	05/16/2019 17:00	5.4	05/17/2019 17:00	5.4
05/15/2019 17:06	4.4	05/16/2019 17:06	5.5	05/17/2019 17:06	5.6
05/15/2019 17:12	4.5	05/16/2019 17:12	5.6	05/17/2019 17:12	5.8
05/15/2019 17:18	4.6	05/16/2019 17:18	5.4	05/17/2019 17:18	6
05/15/2019 17:24	4.5	05/16/2019 17:24	5.5	05/17/2019 17:24	6.2
05/15/2019 17:30	4.7	05/16/2019 17:30	5.7	05/17/2019 17:30	6.1
05/15/2019 17:36	4.9	05/16/2019 17:36	5.8	05/17/2019 17:36	6
05/15/2019 17:42	4.9	05/16/2019 17:42	6	05/17/2019 17:42	6
05/15/2019 17:48	4.3	05/16/2019 17:48	5	05/17/2019 17:48	5.5
05/15/2019 17:54	4.5	05/16/2019 17:54	4.9	05/17/2019 17:54	5.7
05/15/2019 18:00	4.6	05/16/2019 18:00	5	05/17/2019 18:00	5.7
05/15/2019 18:06	4.6	05/16/2019 18:06	5	05/17/2019 18:06	5.9
05/15/2019 18:12	4.6	05/16/2019 18:12	5.2	05/17/2019 18:12	6.2
05/15/2019 18:18	4.6	05/16/2019 18:18	4.9	05/17/2019 18:18	7.1
05/15/2019 18:24	4.8	05/16/2019 18:24	5.2	05/17/2019 18:24	7
05/15/2019 18:30	4.8	05/16/2019 18:30	5.2	05/17/2019 18:30	6.6
05/15/2019 18:36	5.7	05/16/2019 18:36	6	05/17/2019 18:36	7
05/15/2019 18:42	5.8	05/16/2019 18:42	6	05/17/2019 18:42	7.2
05/15/2019 18:48	4.6	05/16/2019 18:48	4.9	05/17/2019 18:48	6
05/15/2019 18:54	4.7	05/16/2019 18:54	4.9	05/17/2019 18:54	5.9
05/15/2019 19:00	5	05/16/2019 19:00	5.2	05/17/2019 19:00	5.9
05/15/2019 19:06	4.8	05/16/2019 19:06	5.2	05/17/2019 19:06	5.7
05/15/2019 19:12	4.9	05/16/2019 19:12	5.1	05/17/2019 19:12	5.6
05/15/2019 19:18	4.7	05/16/2019 19:18	4.8	05/17/2019 19:18	5.6
05/15/2019 19:24	5	05/16/2019 19:24	5	05/17/2019 19:24	5.8
05/15/2019 19:30	4.9	05/16/2019 19:30	4.9	05/17/2019 19:30	5.9
05/15/2019 19:36	5.1	05/16/2019 19:36	4.8	05/17/2019 19:36	6.1
05/15/2019 19:42	5	05/16/2019 19:42	4.9	05/17/2019 19:42	6.3
05/15/2019 19:48	4.3	05/16/2019 19:48	4.3	05/17/2019 19:48	5.3
05/15/2019 19:54	4.4	05/16/2019 19:54	4.4	05/17/2019 19:54	5.2
		05/16/2019 20:00	4.6	05/17/2019 20:00	5.2

Portland Furnace A - 6-minute average opacity values

Date/Time	AFURNACE Sourth Opacity Value	Date/Time	AFURNACE North Opacity Value
05/20/2019 09:00	2.7	05/20/2019 09:00	4
05/20/2019 09:06	1.8	05/20/2019 09:06	3.8
05/20/2019 09:12	1.9	05/20/2019 09:12	4
05/20/2019 09:18	2.1	05/20/2019 09:18	4.4
05/20/2019 09:24	2.2	05/20/2019 09:24	5
05/20/2019 09:30	2.3	05/20/2019 09:30	3.3
05/20/2019 09:36	2.9	05/20/2019 09:36	3.6
05/20/2019 09:42	3.4	05/20/2019 09:42	3.9
05/20/2019 09:48	3.9	05/20/2019 09:48	4.1
05/20/2019 09:54	4.5	05/20/2019 09:54	4.2
05/20/2019 10:00	2.6	05/20/2019 10:00	4
05/20/2019 10:06	1.8	05/20/2019 10:06	3.6
05/20/2019 10:12	1.9	05/20/2019 10:12	3.8
05/20/2019 10:18	2	05/20/2019 10:18	4.4
05/20/2019 10:24	2.1	05/20/2019 10:24	5.1
05/20/2019 10:30	2.3	05/20/2019 10:30	3.4
05/20/2019 10:36	3	05/20/2019 10:36	3.6
05/20/2019 10:42	3.6	05/20/2019 10:42	4
05/20/2019 10:48	4.1	05/20/2019 10:48	4.1
05/20/2019 10:54	4.7	05/20/2019 10:54	4.2
05/20/2019 11:00	2.7	05/20/2019 11:00	4.1
05/20/2019 11:06	1.8	05/20/2019 11:06	3.4
05/20/2019 11:12	1.9	05/20/2019 11:12	3.7
05/20/2019 11:18	2	05/20/2019 11:18	4.2
05/20/2019 11:24	2.1	05/20/2019 11:24	4.8
05/20/2019 11:30	2.3	05/20/2019 11:30	3.1
05/20/2019 11:36	3	05/20/2019 11:36	3.6
05/20/2019 11:42	3.6	05/20/2019 11:42	3.9
05/20/2019 11:48	4.1	05/20/2019 11:48	4.1
05/20/2019 11:54	4.7	05/20/2019 11:54	4.2
05/20/2019 12:00	2.8	05/20/2019 12:00	3.9
05/20/2019 12:06	1.8	05/20/2019 12:06	3.5
05/20/2019 12:12	2	05/20/2019 12:12	3.9
05/20/2019 12:18	2.1	05/20/2019 12:18	4.3
05/20/2019 12:24	2.2	05/20/2019 12:24	4.7
05/20/2019 12:30	2.4	05/20/2019 12:30	3.1
05/20/2019 12:36	3.1	05/20/2019 12:36	3.5
05/20/2019 12:42	3.5	05/20/2019 12:42	3.9
05/20/2019 12:48	4.1	05/20/2019 12:48	4.1
05/20/2019 12:54	4.9	05/20/2019 12:54	4.2
05/20/2019 13:00	2.8	05/20/2019 13:00	4
05/20/2019 13:06	1.8	05/20/2019 13:06	3.6
05/20/2019 13:12	1.9	05/20/2019 13:12	4.1

05/20/2019 13:18	2.1	05/20/2019 13:18	4.5
05/20/2019 13:24	2.1	05/20/2019 13:24	5
05/20/2019 13:30	2.4	05/20/2019 13:30	3.2
05/20/2019 13:36	3.2	05/20/2019 13:36	3.5
05/20/2019 13:42	3.9	05/20/2019 13:42	3.9
05/20/2019 13:48	4.4	05/20/2019 13:48	4.1
05/20/2019 13:54	5	05/20/2019 13:54	4.1
05/20/2019 14:00	2.8	05/20/2019 14:00	4
05/20/2019 14:06	1.8	05/20/2019 14:06	4
05/20/2019 14:12	1.9	05/20/2019 14:12	4.5
05/20/2019 14:18	2.1	05/20/2019 14:18	4.7
05/20/2019 14:24	2.1	05/20/2019 14:24	5.2
05/20/2019 14:30	2.5	05/20/2019 14:30	3.3
05/20/2019 14:36	3.2	05/20/2019 14:36	3.6
05/20/2019 14:42	3.6	05/20/2019 14:42	4
05/20/2019 14:48	4.2	05/20/2019 14:48	4.1
05/20/2019 14:54	4.8	05/20/2019 14:54	4.2
05/20/2019 15:00	2.7	05/20/2019 15:00	4.1
05/20/2019 15:06	1.8	05/20/2019 15:06	3.9
05/20/2019 15:12	1.9	05/20/2019 15:12	4.2
05/20/2019 15:18	2.1	05/20/2019 15:18	4.6
05/20/2019 15:24	2.1	05/20/2019 15:24	5.3
05/20/2019 15:30	2.5	05/20/2019 15:30	3.4
05/20/2019 15:36	3.3	05/20/2019 15:36	3.5
05/20/2019 15:42	3.8	05/20/2019 15:42	3.9
05/20/2019 15:48	4.2	05/20/2019 15:48	4.1
05/20/2019 15:54	4.8	05/20/2019 15:54	4.2
05/20/2019 16:00	2.7	05/20/2019 16:00	4.3
05/20/2019 16:06	1.7	05/20/2019 16:06	4
05/20/2019 16:12	1.9	05/20/2019 16:12	4.2
05/20/2019 16:18	2	05/20/2019 16:18	4.6
05/20/2019 16:24	2.1	05/20/2019 16:24	5.1
05/20/2019 16:30	2.4	05/20/2019 16:30	3.1
05/20/2019 16:36	3.1	05/20/2019 16:36	3.5
05/20/2019 16:42	3.5	05/20/2019 16:42	3.8
05/20/2019 16:48	3.8	05/20/2019 16:48	4
05/20/2019 16:54	4.3	05/20/2019 16:54	4.1
05/20/2019 17:00	2.5	05/20/2019 17:00	4.1
05/20/2019 17:06	1.7	05/20/2019 17:06	3.8
05/20/2019 17:12	1.8	05/20/2019 17:12	4.1
05/20/2019 17:18	2	05/20/2019 17:18	4.5
05/20/2019 17:24	2	05/20/2019 17:24	4.8
05/20/2019 17:30	2.3	05/20/2019 17:30	2.7
05/20/2019 17:36	3.1	05/20/2019 17:36	3.1
05/20/2019 17:42	3.5	05/20/2019 17:42	3.5
05/20/2019 17:48	3.8	05/20/2019 17:48	3.7
05/20/2019 17:54	4.3	05/20/2019 17:54	3.9

05/20/2019 18:00	2.5	05/20/2019 18:00	3.8
05/20/2019 18:06	1.7	05/20/2019 18:06	3.4
05/20/2019 18:12	1.8	05/20/2019 18:12	3.8
05/20/2019 18:18	1.9	05/20/2019 18:18	4.2
05/20/2019 18:24	2	05/20/2019 18:24	4.5
05/20/2019 18:30	2.4	05/20/2019 18:30	2.7
05/20/2019 18:36	3.3	05/20/2019 18:36	3.1
05/20/2019 18:42	3.7	05/20/2019 18:42	3.5
05/20/2019 18:48	4	05/20/2019 18:48	3.6
05/20/2019 18:54	4.5	05/20/2019 18:54	3.8
05/20/2019 19:00	2.6	05/20/2019 19:00	3.7
05/20/2019 19:06	1.8	05/20/2019 19:06	3.4
05/20/2019 19:12	1.9	05/20/2019 19:12	3.5
05/20/2019 19:18	1.9	05/20/2019 19:18	3.9
05/20/2019 19:24	2	05/20/2019 19:24	4.4
05/20/2019 19:30	2.5	05/20/2019 19:30	2.7
05/20/2019 19:36	3.3	05/20/2019 19:36	3.1
05/20/2019 19:42	3.7	05/20/2019 19:42	3.5
05/20/2019 19:48	3.8	05/20/2019 19:48	3.7
05/20/2019 19:54	4.3	05/20/2019 19:54	3.8
05/20/2019 20:00	2.5	05/20/2019 20:00	3.7

Portland Furnace A - 6-minute average opacity values

Date/Time	AFURNACE Sourth Opacity Value	Date/Time	AFURNACE North Opacity Value
05/21/2019 09:00	2.8	05/21/2019 09:00	4.2
05/21/2019 09:06	1.7	05/21/2019 09:06	4.1
05/21/2019 09:12	1.8	05/21/2019 09:12	4.2
05/21/2019 09:18	1.9	05/21/2019 09:18	4.6
05/21/2019 09:24	2	05/21/2019 09:24	5.3
05/21/2019 09:30	2.5	05/21/2019 09:30	3.2
05/21/2019 09:36	3.5	05/21/2019 09:36	3.3
05/21/2019 09:42	4.1	05/21/2019 09:42	3.7
05/21/2019 09:48	4.6	05/21/2019 09:48	3.9
05/21/2019 09:54	5	05/21/2019 09:54	4.1
05/21/2019 10:00	2.9	05/21/2019 10:00	4.2
05/21/2019 10:06	1.7	05/21/2019 10:06	3.9
05/21/2019 10:12	1.8	05/21/2019 10:12	4.2
05/21/2019 10:18	1.9	05/21/2019 10:18	4.6
05/21/2019 10:24	2	05/21/2019 10:24	5
05/21/2019 10:30	2.5	05/21/2019 10:30	3.1
05/21/2019 10:36	3.5	05/21/2019 10:36	3.2
05/21/2019 10:42	4.1	05/21/2019 10:42	3.7
05/21/2019 10:48	4.5	05/21/2019 10:48	4
05/21/2019 10:54	5	05/21/2019 10:54	4
05/21/2019 11:00	2.8	05/21/2019 11:00	4.3
05/21/2019 11:06	1.7	05/21/2019 11:06	3.9
05/21/2019 11:12	1.7	05/21/2019 11:12	4.2
05/21/2019 11:18	1.9	05/21/2019 11:18	4.7
05/21/2019 11:24	1.9	05/21/2019 11:24	5
05/21/2019 11:30	2.5	05/21/2019 11:30	3
05/21/2019 11:36	3.4	05/21/2019 11:36	3.4
05/21/2019 11:42	4	05/21/2019 11:42	3.7
05/21/2019 11:48	4.3	05/21/2019 11:48	4
05/21/2019 11:54	4.9	05/21/2019 11:54	4.2
05/21/2019 12:00	2.7	05/21/2019 12:00	4.3
05/21/2019 12:06	1.7	05/21/2019 12:06	4
05/21/2019 12:12	1.8	05/21/2019 12:12	4.4
05/21/2019 12:18	1.9	05/21/2019 12:18	5
05/21/2019 12:24	2	05/21/2019 12:24	5.6
05/21/2019 12:30	2.5	05/21/2019 12:30	3.2
05/21/2019 12:36	3.4	05/21/2019 12:36	3.5
05/21/2019 12:42	3.9	05/21/2019 12:42	3.9
05/21/2019 12:48	4.4	05/21/2019 12:48	4
05/21/2019 12:54	5.1	05/21/2019 12:54	4.1
05/21/2019 13:00	2.7	05/21/2019 13:00	4.4
05/21/2019 13:06	1.7	05/21/2019 13:06	4.2
05/21/2019 13:12	1.8	05/21/2019 13:12	4.2

05/21/2019 13:18	1.9	05/21/2019 13:18	4.8
05/21/2019 13:24	2	05/21/2019 13:24	5.1
05/21/2019 13:30	2.4	05/21/2019 13:30	3
05/21/2019 13:36	3.3	05/21/2019 13:36	3.4
05/21/2019 13:42	3.8	05/21/2019 13:42	3.7
05/21/2019 13:48	4.3	05/21/2019 13:48	4
05/21/2019 13:54	4.8	05/21/2019 13:54	4
05/21/2019 14:00	2.7	05/21/2019 14:00	4.2
05/21/2019 14:06	1.7	05/21/2019 14:06	3.8
05/21/2019 14:12	1.8	05/21/2019 14:12	3.9
05/21/2019 14:18	1.9	05/21/2019 14:18	4.4
05/21/2019 14:24	2	05/21/2019 14:24	5
05/21/2019 14:30	2.4	05/21/2019 14:30	2.9
05/21/2019 14:36	3.3	05/21/2019 14:36	3.4
05/21/2019 14:42	3.8	05/21/2019 14:42	3.8
05/21/2019 14:48	4.2	05/21/2019 14:48	3.9
05/21/2019 14:54	4.8	05/21/2019 14:54	4
05/21/2019 15:00	2.6	05/21/2019 15:00	4.1
05/21/2019 15:06	1.7	05/21/2019 15:06	3.7
05/21/2019 15:12	1.8	05/21/2019 15:12	4
05/21/2019 15:18	1.9	05/21/2019 15:18	4.5
05/21/2019 15:24	1.9	05/21/2019 15:24	4.9
05/21/2019 15:30	2.4	05/21/2019 15:30	3
05/21/2019 15:36	3.3	05/21/2019 15:36	3.3
05/21/2019 15:42	3.7	05/21/2019 15:42	3.7
05/21/2019 15:48	4	05/21/2019 15:48	4
05/21/2019 15:54	4.6	05/21/2019 15:54	4.1
05/21/2019 16:00	2.5	05/21/2019 16:00	4
05/21/2019 16:06	1.6	05/21/2019 16:06	3.6
05/21/2019 16:12	1.7	05/21/2019 16:12	4
05/21/2019 16:18	1.8	05/21/2019 16:18	4.5
05/21/2019 16:24	1.9	05/21/2019 16:24	5
05/21/2019 16:30	2.3	05/21/2019 16:30	3.1
05/21/2019 16:36	3.1	05/21/2019 16:36	3.4
05/21/2019 16:42	3.7	05/21/2019 16:42	3.8
05/21/2019 16:48	4.1	05/21/2019 16:48	4
05/21/2019 16:54	4.7	05/21/2019 16:54	4.1
05/21/2019 17:00	2.6	05/21/2019 17:00	4.2
05/21/2019 17:06	1.6	05/21/2019 17:06	4
05/21/2019 17:12	1.7	05/21/2019 17:12	4.2
05/21/2019 17:18	1.8	05/21/2019 17:18	4.6
05/21/2019 17:24	1.8	05/21/2019 17:24	5.3
05/21/2019 17:30	2.3	05/21/2019 17:30	3.3
05/21/2019 17:36	3.2	05/21/2019 17:36	3.6
05/21/2019 17:42	3.7	05/21/2019 17:42	4
05/21/2019 17:48	4.1	05/21/2019 17:48	4.1
05/21/2019 17:54	4.7	05/21/2019 17:54	4.2

05/21/2019 18:00	2.5	05/21/2019 18:00	4.3
05/21/2019 18:06	1.6	05/21/2019 18:06	4
05/21/2019 18:12	1.7	05/21/2019 18:12	4.3
05/21/2019 18:18	1.8	05/21/2019 18:18	4.7
05/21/2019 18:24	1.8	05/21/2019 18:24	5.3
05/21/2019 18:30	2.2	05/21/2019 18:30	3.4
05/21/2019 18:36	3.1	05/21/2019 18:36	3.6
05/21/2019 18:42	3.7	05/21/2019 18:42	3.9
05/21/2019 18:48	4	05/21/2019 18:48	4.1
05/21/2019 18:54	4.3	05/21/2019 18:54	4.2
05/21/2019 19:00	2.4	05/21/2019 19:00	4.2
05/21/2019 19:06	1.5	05/21/2019 19:06	3.9
05/21/2019 19:12	1.7	05/21/2019 19:12	4.1
05/21/2019 19:18	1.8	05/21/2019 19:18	4.5
05/21/2019 19:24	1.8	05/21/2019 19:24	4.9
05/21/2019 19:30	2.3	05/21/2019 19:30	3.1
05/21/2019 19:36	3.2	05/21/2019 19:36	3.4
05/21/2019 19:42	3.7	05/21/2019 19:42	3.9
05/21/2019 19:48	3.9	05/21/2019 19:48	4.1
05/21/2019 19:54	4.2	05/21/2019 19:54	4.3
05/21/2019 20:00	2.3	05/21/2019 20:00	4.2

Portland Furnace A - 6-minute average opacity values

Date/Time	AFURNACE Sourth Opacity Value	Date/Time	AFURNACE North Opacity Value
05/22/2019 09:00	2.6	05/22/2019 09:00	3.9
05/22/2019 09:06	1.6	05/22/2019 09:06	3.3
05/22/2019 09:12	1.7	05/22/2019 09:12	3.6
05/22/2019 09:18	1.8	05/22/2019 09:18	4
05/22/2019 09:24	1.9	05/22/2019 09:24	4.4
05/22/2019 09:30	2.2	05/22/2019 09:30	2.9
05/22/2019 09:36	3.1	05/22/2019 09:36	3.2
05/22/2019 09:42	3.5	05/22/2019 09:42	3.7
05/22/2019 09:48	4	05/22/2019 09:48	4
05/22/2019 09:54	4.5	05/22/2019 09:54	4
05/22/2019 10:00	2.6	05/22/2019 10:00	3.9
05/22/2019 10:06	1.6	05/22/2019 10:06	3.4
05/22/2019 10:12	1.7	05/22/2019 10:12	3.7
05/22/2019 10:18	1.8	05/22/2019 10:18	4
05/22/2019 10:24	1.9	05/22/2019 10:24	4.5
05/22/2019 10:30	2.2	05/22/2019 10:30	2.9
05/22/2019 10:36	3.1	05/22/2019 10:36	3.3
05/22/2019 10:42	3.5	05/22/2019 10:42	3.6
05/22/2019 10:48	4	05/22/2019 10:48	3.9
05/22/2019 10:54	4.5	05/22/2019 10:54	4
05/22/2019 11:00	2.6	05/22/2019 11:00	4
05/22/2019 11:06	1.7	05/22/2019 11:06	3.5
05/22/2019 11:12	1.7	05/22/2019 11:12	3.8
05/22/2019 11:18	1.8	05/22/2019 11:18	4.2
05/22/2019 11:24	1.9	05/22/2019 11:24	4.5
05/22/2019 11:30	2.3	05/22/2019 11:30	2.8
05/22/2019 11:36	3.1	05/22/2019 11:36	3.2
05/22/2019 11:42	3.5	05/22/2019 11:42	3.7
05/22/2019 11:48	3.9	05/22/2019 11:48	3.9
05/22/2019 11:54	4.5	05/22/2019 11:54	4
05/22/2019 12:00	2.7	05/22/2019 12:00	4
05/22/2019 12:06	1.7	05/22/2019 12:06	3.6
05/22/2019 12:12	1.8	05/22/2019 12:12	3.8
05/22/2019 12:18	1.9	05/22/2019 12:18	4.1
05/22/2019 12:24	2	05/22/2019 12:24	4.7
05/22/2019 12:30	2.3	05/22/2019 12:30	2.9
05/22/2019 12:36	3	05/22/2019 12:36	3.4
05/22/2019 12:42	3.4	05/22/2019 12:42	3.8
05/22/2019 12:48	3.7	05/22/2019 12:48	4.1
05/22/2019 12:54	4	05/22/2019 12:54	4.2
05/22/2019 13:00	2.5	05/22/2019 13:00	4.1
05/22/2019 13:06	1.7	05/22/2019 13:06	3.5
05/22/2019 13:12	1.8	05/22/2019 13:12	3.7

05/22/2019 13:18	1.9	05/22/2019 13:18	3.9
05/22/2019 13:24	2	05/22/2019 13:24	4.5
05/22/2019 13:30	2.3	05/22/2019 13:30	3.2
05/22/2019 13:36	3	05/22/2019 13:36	3.4
05/22/2019 13:42	3.4	05/22/2019 13:42	3.8
05/22/2019 13:48	3.6	05/22/2019 13:48	4.1
05/22/2019 13:54	3.8	05/22/2019 13:54	4.2
05/22/2019 14:00	2.4	05/22/2019 14:00	4
05/22/2019 14:06	1.7	05/22/2019 14:06	3.6
05/22/2019 14:12	1.8	05/22/2019 14:12	3.8
05/22/2019 14:18	2	05/22/2019 14:18	4.1
05/22/2019 14:24	2	05/22/2019 14:24	4.7
05/22/2019 14:30	2.3	05/22/2019 14:30	3.3
05/22/2019 14:36	3	05/22/2019 14:36	3.6
05/22/2019 14:42	3.5	05/22/2019 14:42	3.9
05/22/2019 14:48	3.7	05/22/2019 14:48	4.1
05/22/2019 14:54	4	05/22/2019 14:54	4.2
05/22/2019 15:00	2.4	05/22/2019 15:00	4.3
05/22/2019 15:06	1.7	05/22/2019 15:06	3.8
05/22/2019 15:12	1.8	05/22/2019 15:12	4
05/22/2019 15:18	2	05/22/2019 15:18	4.5
05/22/2019 15:24	2	05/22/2019 15:24	4.7
05/22/2019 15:30	2.3	05/22/2019 15:30	3
05/22/2019 15:36	3.1	05/22/2019 15:36	3.4
05/22/2019 15:42	3.5	05/22/2019 15:42	3.8
05/22/2019 15:48	3.7	05/22/2019 15:48	4
05/22/2019 15:54	4.1	05/22/2019 15:54	4.2
05/22/2019 16:00	2.4	05/22/2019 16:00	4.1
05/22/2019 16:06	1.7	05/22/2019 16:06	3.7
05/22/2019 16:12	1.8	05/22/2019 16:12	4
05/22/2019 16:18	1.9	05/22/2019 16:18	4.5
05/22/2019 16:24	1.9	05/22/2019 16:24	4.6
05/22/2019 16:30	2.4	05/22/2019 16:30	2.8
05/22/2019 16:36	3.2	05/22/2019 16:36	3.3
05/22/2019 16:42	3.6	05/22/2019 16:42	3.7
05/22/2019 16:48	3.9	05/22/2019 16:48	3.9
05/22/2019 16:54	4.3	05/22/2019 16:54	4
05/22/2019 17:00	2.3	05/22/2019 17:00	4
05/22/2019 17:06	1.7	05/22/2019 17:06	3.8
05/22/2019 17:12	1.8	05/22/2019 17:12	4.1
05/22/2019 17:18	1.9	05/22/2019 17:18	4.5
05/22/2019 17:24	2	05/22/2019 17:24	4.6
05/22/2019 17:30	2.4	05/22/2019 17:30	2.9
05/22/2019 17:36	3.1	05/22/2019 17:36	3.3
05/22/2019 17:42	3.4	05/22/2019 17:42	3.8
05/22/2019 17:48	3.8	05/22/2019 17:48	4
05/22/2019 17:54	3.9	05/22/2019 17:54	4.2

05/22/2019 18:00	2.3	05/22/2019 18:00	4.1
05/22/2019 18:06	1.7	05/22/2019 18:06	3.9
05/22/2019 18:12	1.8	05/22/2019 18:12	4.1
05/22/2019 18:18	1.9	05/22/2019 18:18	4.3
05/22/2019 18:24	2	05/22/2019 18:24	4.8
05/22/2019 18:30	2.4	05/22/2019 18:30	2.9
05/22/2019 18:36	3	05/22/2019 18:36	3.3
05/22/2019 18:42	3.4	05/22/2019 18:42	3.7
05/22/2019 18:48	3.7	05/22/2019 18:48	4
05/22/2019 18:54	3.9	05/22/2019 18:54	4.2
05/22/2019 19:00	2.2	05/22/2019 19:00	4.1
05/22/2019 19:06	1.6	05/22/2019 19:06	3.7
05/22/2019 19:12	1.8	05/22/2019 19:12	3.8
05/22/2019 19:18	1.9	05/22/2019 19:18	4.2
05/22/2019 19:24	2	05/22/2019 19:24	4.7
05/22/2019 19:30	2.3	05/22/2019 19:30	2.9
05/22/2019 19:36	2.9	05/22/2019 19:36	3.3
05/22/2019 19:42	3.3	05/22/2019 19:42	3.7
05/22/2019 19:48	3.5	05/22/2019 19:48	4
05/22/2019 19:54	3.8	05/22/2019 19:54	4.1
05/22/2019 20:00	2.1	05/22/2019 20:00	3.9

Portland Furnace A - 6-minute average opacity values

Date/Time	AFURNACE South Opacity Value	Date/Time	AFURNACE North Opacity Value
05/23/2019 09:00	2.2	05/23/2019 09:00	4.2
05/23/2019 09:06	1.6	05/23/2019 09:06	3.7
05/23/2019 09:12	1.7	05/23/2019 09:12	4.1
05/23/2019 09:18	1.8	05/23/2019 09:18	4.2
05/23/2019 09:24	1.9	05/23/2019 09:24	4.5
05/23/2019 09:30	2.3	05/23/2019 09:30	3
05/23/2019 09:36	3.1	05/23/2019 09:36	3.5
05/23/2019 09:42	3.5	05/23/2019 09:42	4
05/23/2019 09:48	3.8	05/23/2019 09:48	4.2
05/23/2019 09:54	4.1	05/23/2019 09:54	4.3
05/23/2019 10:00	2.3	05/23/2019 10:00	4.2
05/23/2019 10:06	1.6	05/23/2019 10:06	3.8
05/23/2019 10:12	1.7	05/23/2019 10:12	4
05/23/2019 10:18	1.8	05/23/2019 10:18	4.2
05/23/2019 10:24	1.8	05/23/2019 10:24	4.8
05/23/2019 10:30	2.2	05/23/2019 10:30	3.1
05/23/2019 10:36	3.1	05/23/2019 10:36	3.5
05/23/2019 10:42	3.5	05/23/2019 10:42	3.9
05/23/2019 10:48	3.8	05/23/2019 10:48	4
05/23/2019 10:54	4.1	05/23/2019 10:54	4.2
05/23/2019 11:00	2.4	05/23/2019 11:00	4.1
05/23/2019 11:06	1.6	05/23/2019 11:06	3.7
05/23/2019 11:12	1.6	05/23/2019 11:12	3.9
05/23/2019 11:18	1.7	05/23/2019 11:18	4.2
05/23/2019 11:24	1.8	05/23/2019 11:24	4.5
05/23/2019 11:30	2.2	05/23/2019 11:30	2.9
05/23/2019 11:36	3	05/23/2019 11:36	3.5
05/23/2019 11:42	3.5	05/23/2019 11:42	4
05/23/2019 11:48	3.7	05/23/2019 11:48	4.1
05/23/2019 11:54	3.9	05/23/2019 11:54	4.2
05/23/2019 12:00	2.2	05/23/2019 12:00	4.2
05/23/2019 12:06	1.4	05/23/2019 12:06	3.8
05/23/2019 12:12	1.5	05/23/2019 12:12	3.7
05/23/2019 12:18	1.7	05/23/2019 12:18	4.1
05/23/2019 12:24	1.8	05/23/2019 12:24	4.7
05/23/2019 12:30	2.1	05/23/2019 12:30	3.1
05/23/2019 12:36	2.9	05/23/2019 12:36	3.4
05/23/2019 12:42	3.4	05/23/2019 12:42	3.9
05/23/2019 12:48	3.4	05/23/2019 12:48	4
05/23/2019 12:54	3.7	05/23/2019 12:54	4.2
05/23/2019 13:00	2.2	05/23/2019 13:00	4.2
05/23/2019 13:06	1.4	05/23/2019 13:06	3.7
05/23/2019 13:12	1.5	05/23/2019 13:12	3.9

05/23/2019 13:18	1.7	05/23/2019 13:18	4.1
05/23/2019 13:24	1.7	05/23/2019 13:24	4.8
05/23/2019 13:30	2	05/23/2019 13:30	3.2
05/23/2019 13:36	2.7	05/23/2019 13:36	3.4
05/23/2019 13:42	3.1	05/23/2019 13:42	3.9
05/23/2019 13:48	3.3	05/23/2019 13:48	4.1
05/23/2019 13:54	3.4	05/23/2019 13:54	4.2
05/23/2019 14:00	2	05/23/2019 14:00	4.2
05/23/2019 14:06	1.4	05/23/2019 14:06	3.9
05/23/2019 14:12	1.5	05/23/2019 14:12	4.1
05/23/2019 14:18	1.7	05/23/2019 14:18	4.5
05/23/2019 14:24	1.7	05/23/2019 14:24	4.8
05/23/2019 14:30	2	05/23/2019 14:30	3.2
05/23/2019 14:36	2.8	05/23/2019 14:36	3.6
05/23/2019 14:42	3.2	05/23/2019 14:42	4
05/23/2019 14:48	3.5	05/23/2019 14:48	4.2
05/23/2019 14:54	4	05/23/2019 14:54	4.3
05/23/2019 15:00	2.3	05/23/2019 15:00	4.4
05/23/2019 15:06	1.4	05/23/2019 15:06	4
05/23/2019 15:12	1.5	05/23/2019 15:12	4.3
05/23/2019 15:18	1.7	05/23/2019 15:18	4.8
05/23/2019 15:24	1.8	05/23/2019 15:24	5.2
05/23/2019 15:30	2.1	05/23/2019 15:30	3.3
05/23/2019 15:36	3	05/23/2019 15:36	3.5
05/23/2019 15:42	3.5	05/23/2019 15:42	3.8
05/23/2019 15:48	3.8	05/23/2019 15:48	3.9
05/23/2019 15:54	4.2	05/23/2019 15:54	4.1
05/23/2019 16:00	2.3	05/23/2019 16:00	4.4
05/23/2019 16:06	1.4	05/23/2019 16:06	4.1
05/23/2019 16:12	1.5	05/23/2019 16:12	4.4
05/23/2019 16:18	1.6	05/23/2019 16:18	4.7
05/23/2019 16:24	1.7	05/23/2019 16:24	5.2
05/23/2019 16:30	2.2	05/23/2019 16:30	3.1
05/23/2019 16:36	3.1	05/23/2019 16:36	3.3
05/23/2019 16:42	3.6	05/23/2019 16:42	3.6
05/23/2019 16:48	3.9	05/23/2019 16:48	3.9
05/23/2019 16:54	4.1	05/23/2019 16:54	4
05/23/2019 17:00	2.3	05/23/2019 17:00	4.2
05/23/2019 17:06	1.5	05/23/2019 17:06	4
05/23/2019 17:12	1.6	05/23/2019 17:12	4.3
05/23/2019 17:18	1.7	05/23/2019 17:18	4.4
05/23/2019 17:24	1.7	05/23/2019 17:24	4.9
05/23/2019 17:30	2.2	05/23/2019 17:30	3.2
05/23/2019 17:36	2.9	05/23/2019 17:36	3.6
05/23/2019 17:42	3.5	05/23/2019 17:42	3.9
05/23/2019 17:48	3.7	05/23/2019 17:48	4
05/23/2019 17:54	4	05/23/2019 17:54	4.1

05/23/2019 18:00	2.2	05/23/2019 18:00	4.2
05/23/2019 18:06	1.5	05/23/2019 18:06	4
05/23/2019 18:12	1.6	05/23/2019 18:12	4.1
05/23/2019 18:18	1.7	05/23/2019 18:18	4.4
05/23/2019 18:24	1.8	05/23/2019 18:24	4.8
05/23/2019 18:30	2.2	05/23/2019 18:30	3
05/23/2019 18:36	2.8	05/23/2019 18:36	3.4
05/23/2019 18:42	3.3	05/23/2019 18:42	3.8
05/23/2019 18:48	3.7	05/23/2019 18:48	4.1
05/23/2019 18:54	3.9	05/23/2019 18:54	4.2
05/23/2019 19:00	2.1	05/23/2019 19:00	4.2
05/23/2019 19:06	1.5	05/23/2019 19:06	4
05/23/2019 19:12	1.6	05/23/2019 19:12	4.4
05/23/2019 19:18	1.8	05/23/2019 19:18	4.5
05/23/2019 19:24	1.8	05/23/2019 19:24	5.1
05/23/2019 19:30	2.2	05/23/2019 19:30	3.1
05/23/2019 19:36	2.8	05/23/2019 19:36	3.5
05/23/2019 19:42	3.2	05/23/2019 19:42	3.9
05/23/2019 19:48	3.5	05/23/2019 19:48	4.2
05/23/2019 19:54	3.8	05/23/2019 19:54	4.4
05/23/2019 20:00	2	05/23/2019 20:00	4.4

APPENDIX E
QUALITY ASSURANCE/QUALITY CONTROL

Appendix E.1
Quality Assurance Program Summary and Equipment Calibration Schedule

QUALITY ASSURANCE PROGRAM SUMMARY AND CERTIFICATIONS

Montrose Air Quality Services, LLC (Montrose) ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by internal QA personnel and encompasses seven major areas:

1. Development and use of an internal QA manual
2. QA reviews of reports, laboratory work, and field testing
3. Equipment calibration and maintenance
4. Chain of custody
5. Continuous training
6. Knowledge of current test methods
7. Audit program

Each of these areas is discussed individually below.

Quality Assurance Manual. Montrose has prepared a QA Manual according to EPA guidelines and ASTM D-7036. The manual serves to document and formalize all of Montrose's QA efforts. The manual is constantly updated, and each employee involved in technical services for emission measurements is required to read, understand its contents, and sign a statement that all work they perform will conform to its practices. The manual includes details on the other seven QA areas discussed below.

QA Reviews. Montrose 's review procedure includes review of each source test report by the QA Manager or equivalent position including data input, calculations and averages, and report text. The laboratory manager or equivalent reviews all laboratory work, and the qualified individual on-site reviews all field work and data sheets.

The most important review is the one that takes place before a test program begins. The QA Manager works with testing personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of any interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance. The equipment used to conduct the emission measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined below. The schedules for maintenance and calibrations are given in Tables A-1 and A-2.

Quality control checks are also conducted in the field for each test program. A partial list of checks made as part of each continuous analyzer system test series is included below as an example of the field QA procedures.

- Sample acquisition and conditioning system leak check
- 3-point analyzer calibrations (all analyzers)
- Complete system calibration check ("dynamic calibration" through entire sample system)

- Periodic analyzer calibration checks are conducted at the start and end of each test run. Any change between pre- and post-test readings are recorded.
- All calibrations are conducted using EPA Protocol gases certified by the manufacturer
- Calibration and continuous analyzer performance data are fully documented, and are included in each source test report

Chain of Custody. Montrose maintains full chain of custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Montrose documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.).

Samples are stored in a locked area to which only laboratory personnel have access. Neither other Montrose employees nor cleaning crews have keys to this area.

Training. Personnel training is essential to ensure quality testing. Montrose has formal and informal training programs which may include some or all of the following:

1. Attendance at EPA-sponsored training courses
2. A requirement for all technicians to read, understand, and sign Montrose 's QA Manual
3. In-house training and Montrose meetings on a regular basis
4. Maintenance of training records
5. Administration of internal qualified individual (QI) tests for all methods performed
6. Participation in the Qualified Source Testing Individual (QSTI) program administered by the Source Evaluation Society (SES)

Knowledge of Current Test Methods. With the constant updating of standard test methods and the wide variety of emerging test methods, it is essential that any qualified source tester keep abreast of new developments. Montrose subscribes to services which provide updates on EPA reference methods, and on EPA and local agency rules and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences.

Audit Program. Montrose participates in the TNI Stationary Source Audit Sample (SSAS) audit program for all methods for which audit samples are available.

TABLE A-1
SAMPLING INSTRUMENTS AND
EQUIPMENT CALIBRATION SCHEDULE

Instrument Type	Frequency of Calibration[1]	Standard of Comparison or Method of Calibration	Acceptance Limits
Orifice Meter(large)	12 months	Calibrated dry test meter	± 2% of volume measured
Dry Gas Meter	6 months or when repaired	Calibrated dry test meter	± 2% of volume measured
Critical Orifice	6 months	Calibrated dry test meter	± 0.5% of average K’
S-Type Pitot (for use with EPA-type sampling train)	6 months	EPA Method 2	Geometric measurements within method-specified ranges
Vacuum Gauges	12 months	NIST-traceable gauge	≤ 1.0 in Hg difference
Temperature Measurement (thermocouples)	12 months	NBS mercury thermometer or NBS calibrated platinum RTD	±4 °F for <400 °F ± 1.5% for >400 °F
Temperature Readout Devices	6 months	Thermocouple simulator	± 2% full scale reading
Analytical Balance	12 months (check prior to each use)	NIST-traceable weights	± 0.5 mg of stated weight
Probe Nozzles	12 months	Nozzle diameter check	Range <± 0.10 mm for micrometer three measurements
Continuous Analyzers	Every field day, Depends upon use, frequency and performance	As specified by manufacturers’ operating manuals, EPA NBS gases and/or reference methods	Satisfy all limits specified in operating specifications

[1] The tabulated calibration frequencies are minimum standards. In certain instances, calibrations are performed more frequently.

TABLE A-2
EQUIPMENT MAINTENANCE SCHEDULE
Based on Manufacturer's Specifications and Montrose's Experience

Equipment	Performance Requirement	Maintenance Interval[2]	Corrective Action
Pumps	1. Absence of leaks 2. Ability to draw manufacturer required vacuum and flow	6 months	1. Visual inspection 2. Clean 3. Replace worn parts 4. Leak check
Flow Measuring Device	1. Free mechanical movement 2. Absence of malfunction	6 months	1. Visual inspection 2. Clean 3. Calibrate
Sampling Instruments	1. Absence of malfunction 2. Proper response to zero, span gas	As required by the manufacturer	As recommended by manufacturer
Mobile Van Sampling Systems	Absence of leaks	Depends on nature of use	1. Change filters 2. Leak check 3. Check for system contamination
Sampling Lines	Sample degradation less than 2%	After each test or test series	Blow filtered air through line until dry

[2] The tabulated maintenance intervals are minimum standards. In certain instances, maintenance is performed more frequently.

Appendix E.2
ASTM D-7036 Accreditation and QI Certificates

STAC STACK TESTING ACCREDITATION COUNCIL

American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

MONTROSE AIR QUALITY SERVICES

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 5th day of March 2018.

President and CEO
For the Accreditation Council
Certificate Number 3925.01
Valid to February 29, 2020

AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION CORPORATE SEAL 1978 DISTRICT OF COLUMBIA A2LA

This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.

CERTIFICATE OF COMPLETION

Joe Heffernan

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

ODEQ Methods 4, 5, 7 & 8

Certificate Number: 006-2017-65

Tate Strickler, Accreditation Director

DATE OF ISSUE: 4/17/17

DATE OF EXPIRATION: 4/17/22

MONTROSE ENVIRONMENTAL

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 24TH DAY OF MARCH 2014 AND EFFECTIVE UNTIL MARCH 23RD, 2019

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Karen D. Kajiya-Mills

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2009-325

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

JOSEPH M. HEFFERNAN, III

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 17TH DAY OF DECEMBER 2015 AND EFFECTIVE UNTIL DECEMBER 16TH, 2020

Peter R. Westlin, QSTI/QSTO Review Board

C. David Bagwell, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills, QSTI/QSTO Review Board

Theresa M. Lowe

Theresa Lowe, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2009-325

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

CERTIFICATE OF COMPLETION

Joe Heffernan III

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

CARB Methods 421, 425, & 436

Certificate Number: 006-2019-9

Tate Strickler, Accreditation Director

DATE OF ISSUE: 7/9/19

DATE OF EXPIRATION: 7/9/24

MONTROSE ENVIRONMENTAL

CERTIFICATE OF COMPLETION

Joe Heffernan III

This document certifies that this individual has passed a comprehensive examination and is now a Qualified Individual (QI) as defined in Section 8.3 of ASTM D7036-04 for the following method(s):

EPA Method 316

Certificate Number: 006-2019-8

Tate Strickler, Accreditation Director

DATE OF ISSUE: 6/24/19

DATE OF EXPIRATION: 6/24/24

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Qualified Individual Conformance Statement

I Joe Heffernan ______, as a QI (Qualified Individual) sign this Conformance Statement to verify that each of the test projects that I perform, and each of the test projects performed under my supervision will conform with the Montrose Air Quality Services Management System, the test methods applicable to the testing, and ASTM D 7036-04.

I realize that as a Qualified Individual I have the proper knowledge to perform these tests correctly, and that I am held to a high standard of integrity.

QI Signature

3/24/17
Date

Appendix E.3
Reference Method Analyzer Calibration Data

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
Make/Model:								
25A or 7E:	7E	7E	7E	7E	25A	7E		
Voltage max:	10	10	10	10	10	10		
Voltage offset:	0	0	0	0	0	0		
Range:	10	10	10	1100	10	1035		
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852	CC278852	CC278852	CC334206	CC278852		
Zero Conc:	0	0	0	0	0	0		
Low Number:					CC203661			
Low Conc:					2.966			
Mid Number:	CC204822	CC204822	CC709787	CC287437	EB0090951	S69139281BAL		
Mid Conc:	10.02	9.949	27.45	500.2	5.044	490.2		
High Number:	EB0097045	EB0097045	CC1234022	H3-4	EB0089064	S7		
High Conc:	20.28	18.52	56.72	1066	8.517	934		
Bias Number:	CC204822	CC204822	CC709787	CC287437	EB0090951	S69139281BAL		
Bias Conc:	10.02	9.949	27.45	500.2	5.044	490.2		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11						
Make/Model:	SERVO 1400	SERVO 1400						
25A or 7E:	7E	7E						
Voltage max:	10	10						
Voltage offset:	0	0						
Range:	10	10						
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852						
Zero Conc:	0	0						
Low Number:								
Low Conc:								
Mid Number:	CC204822	CC204822						
Mid Conc:	10.02	9.949						
High Number:	EB0097045	EB0097045						
High Conc:	20.28	18.52						
Bias Number:	CC204822	CC204822						
Bias Conc:	10.02	9.949						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Calibration

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:								
	25A or 7E:	7E	7E	7E	7E	25A	7E		

Cylinder Concentrations									
	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	500.2	5.044	490.2		
	High:	20.28	18.52	56.72	1066	8.517	934.0		

Calibration Readings									
	Zero reading:	-0.015	0.138	0.342	-0.492	0.168	3.780		
	Low reading:	0.000	0.000	0.000	0.000	3.114	0.000		
	Mid reading:	9.880	9.980	28.09	511.1	5.128	490.5		
	High reading:	20.22	18.35	56.77	1069	8.637	934.5		

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	-0.074	0.745	0.603	-0.098	N/A	0.405		
Mid %Err:	**<2.0**	-0.690	0.167	1.128	1.023	N/A	0.032		
High %Err:	**<2.0**	-0.296	-0.918	0.088	0.281	N/A	0.054		

EPA Method 25A Error Calculations									
Zero Err:	**N/A**	N/A	N/A	N/A	N/A	0.168	N/A		
Low Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.148	N/A		
Mid Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.084	N/A		
High Err:	**N/A**	N/A	N/A	N/A	N/A	0.120	N/A		

MAQDAQ 1.0

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A	BOVAR 900		
	25A or 7E:	7E	7E	7E	7E	25A	7E		

Cylinder Concentrations

	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	500.2	5.044	490.2		
	High:	20.28	18.52	56.72	1066	8.517	934.0		

Calibration Readings

	Zero reading:	-0.015	0.138	0.342	-0.492	0.168	3.780		
	Low reading:	0.000	0.000	0.000	0.000	3.114	0.000		
	Mid reading:	9.880	9.980	28.09	511.1	5.128	490.5		
	High reading:	20.22	18.35	56.77	1069	8.637	934.5		

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.074	0.745	0.603	-0.098	N/A	0.405		
Mid %Err:	**<2.0**	-0.690	0.167	1.128	1.023	N/A	0.032		
High %Err:	**<2.0**	-0.296	-0.918	0.088	0.281	N/A	0.054		

EPA Method 25A Error Calculations

Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.168	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.148	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.084	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.120	N/A		

Initial Bias Data

	Zero reading:	0.283	0.145	0.506	0.132	N/A	0.631		
	Span reading:	9.843	9.873	27.56	497.6	N/A	468.5		
Zero % bias:	**<5.0**	1.469	0.038	0.289	0.059	N/A	-0.337		
Span % bias:	**<5.0**	-0.182	-0.578	-0.934	-1.266	N/A	-2.355		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11						
Make/Model:	SERVO 1400	SERVO 1400						
25A or 7E:	7E	7E						
Voltage max:	10	10						
Voltage offset:	0	0						
Range:	10	10						
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852						
Zero Conc:	0	0						
Low Number:								
Low Conc:								
Mid Number:	CC204822	CC204822						
Mid Conc:	10.02	9.949						
High Number:	EB0097045	EB0097045						
High Conc:	20.28	18.52						
Bias Number:	CC204822	CC204822						
Bias Conc:	10.02	9.949						

MONTROSE ENVIRONMENTAL

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Calibration

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.175	0.138						
	Low reading:	0.000	0.000						
	Mid reading:	9.995	9.973						
	High reading:	20.20	18.33						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.863	0.745						
Mid %Err:	**<2.0**	-0.123	0.130						
High %Err:	**<2.0**	-0.394	-1.026						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.175	0.138						
	Low reading:	0.000	0.000						
	Mid reading:	9.995	9.973						
	High reading:	20.20	18.33						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.863	0.745						
Mid %Err:	**<2.0**	-0.123	0.130						
High %Err:	**<2.0**	-0.394	-1.026						

Initial Bias Data

	Zero reading:	0.428	0.145						
	Span reading:	9.965	10.000						
Zero % bias:	**<5.0**	1.248	0.038						
Span % bias:	**<5.0**	-0.148	0.146						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11						
Make/Model:	SERVO 1400	SERVO 1400						
25A or 7E:	7E	7E						
Voltage max:	10	10						
Voltage offset:	0	0						
Range:	10	10						
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852						
Zero Conc:	0	0						
Low Number:								
Low Conc:								
Mid Number:	CC204822	CC204822						
Mid Conc:	10.02	9.949						
High Number:	EB0097045	EB0097045						
High Conc:	20.28	18.52						
Bias Number:	CC204822	CC204822						
Bias Conc:	10.02	9.949						

MAQDAQ 1.0

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Calibration

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.030	0.115						
	Low reading:	0.000	0.000						
	Mid reading:	10.04	10.14						
	High reading:	20.26	18.59						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.148	0.621						
Mid %Err:	**<2.0**	0.099	1.031						
High %Err:	**<2.0**	-0.099	0.378						

MONTROSE ENVIRONMENTAL

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace D
Run Length: 240	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: True	Ports: 1	Points per port: 3	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.030	0.115						
	Low reading:	0.000	0.000						
	Mid reading:	10.04	10.14						
	High reading:	20.26	18.59						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.148	0.621						
Mid %Err:	**<2.0**	0.099	1.031						
High %Err:	**<2.0**	-0.099	0.378						

Initial Bias Data

	Zero reading:	0.428	0.335						
	Span reading:	10.13	9.505						
Zero % bias:	**<5.0**	1.963	1.188						
Span % bias:	**<5.0**	0.444	-3.429						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
25A or 7E:	7E	7E	7E	7E	25A	7E		
Voltage max:	10	10	10	10	10	10		
Voltage offset:	0	0	0	0	0	0		
Range:	10	10	10	10	10	10		
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852	CC278852	CC278852	CC334206	CC278852		
Zero Conc:	0	0	0	0	0	0		
Low Number:					CC203661			
Low Conc:					2.966			
Mid Number:	CC204822	CC204822	CC709787	CC480868	EB0090951	RS13		
Mid Conc:	10.02	9.949	27.45	278.2	5.044	241		
High Number:	EB0097045	EB0097045	CC1234022	CC287437	EB0089064	S69139281BAL		
High Conc:	20.28	18.52	56.72	500.2	8.517	490.2		
Bias Number:	CC204822	CC204822	CC709787	CC480868	EB0090951	RS13		
Bias Conc:	10.02	9.949	27.45	278.2	5.044	241		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Calibration

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
	25A or 7E:	7E	7E	7E	7E	25A	7E		

Cylinder Concentrations

	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	278.2	5.044	241.0		
	High:	20.28	18.52	56.72	500.2	8.517	490.2		

Calibration Readings

	Zero reading:	-0.015	0.183	0.268	-1.342	0.082	2.246		
	Low reading:	0.000	0.000	0.000	0.000	3.095	0.000		
	Mid reading:	9.958	10.18	27.64	277.3	5.194	231.4		
	High reading:	20.14	18.61	55.66	502.2	8.894	488.2		

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.074	0.988	0.472	-0.268	N/A	0.458		
Mid %Err:	**<2.0**	-0.306	1.247	0.335	-0.180	N/A	-1.958		
High %Err:	**<2.0**	-0.690	0.486	-1.869	0.400	N/A	-0.408		

EPA Method 25A Error Calculations

Zero Err:	**N/A**	N/A	N/A	N/A	N/A	0.082	N/A		
Low Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.129	N/A		
Mid Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.150	N/A		
High Err:	**N/A**	N/A	N/A	N/A	N/A	0.377	N/A		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 60	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11	CO 261	NOX 695	THC 297	SO2 563		
	Make/Model:	SERVO 1400	SERVO 1400	THERMO 48I	CAI 700	JUM 3-300A			
	25A or 7E:	7E	7E	7E	7E	25A	7E		

Cylinder Concentrations

	Zero:	0.000	0.000	0.000	0.000	0.000	0.000		
	Low:					2.966			
	Mid:	10.02	9.949	27.45	278.2	5.044	241.0		
	High:	20.28	18.52	56.72	500.2	8.517	490.2		

Calibration Readings

	Zero reading:	-0.015	0.183	0.268	-1.342	0.082	2.246		
	Low reading:	0.000	0.000	0.000	0.000	3.095	0.000		
	Mid reading:	9.958	10.18	27.64	277.3	5.194	231.4		
	High reading:	20.14	18.61	55.66	502.2	8.894	488.2		

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.074	0.988	0.472	-0.268	N/A	0.458		
Mid %Err:	**<2.0**	-0.306	1.247	0.335	-0.180	N/A	-1.958		
High %Err:	**<2.0**	-0.690	0.486	-1.869	0.400	N/A	-0.408		

EPA Method 25A Error Calculations

Zero %Err:	**N/A**	N/A	N/A	N/A	N/A	0.082	N/A		
Low %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.129	N/A		
Mid %Err:	**5% of cyl**	N/A	N/A	N/A	N/A	0.150	N/A		
High %Err:	**N/A**	N/A	N/A	N/A	N/A	0.377	N/A		

Initial Bias Data

	Zero reading:	0.253	0.145	0.402	1.782	N/A	1.960		
	Span reading:	9.965	9.925	27.39	267.4	N/A	230.0		
Zero % bias:	**<5.0**	1.321	-0.205	0.236	0.625	N/A	-0.058		
Span % bias:	**<5.0**	0.035	-1.377	-0.441	-1.979	N/A	-0.286		

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11						
Make/Model:	SERVO 1400	SERVO 1400						
25A or 7E:	7E	7E						
Voltage max:	10	10						
Voltage offset:	0	0						
Range:	10	10						
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852						
Zero Conc:	0	0						
Low Number:								
Low Conc:								
Mid Number:	CC204822	CC204822						
Mid Conc:	10.02	9.949						
High Number:	EB0097045	EB0097045						
High Conc:	20.28	18.52						
Bias Number:	CC204822	CC204822						
Bias Conc:	10.02	9.949						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Calibration

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	-0.030	0.223						
	Low reading:	0.000	0.000						
	Mid reading:	9.835	10.07						
	High reading:	20.05	18.53						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.148	1.204						
Mid %Err:	**<2.0**	-0.912	0.653						
High %Err:	**<2.0**	-1.134	0.054						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	-0.030	0.223						
	Low reading:	0.000	0.000						
	Mid reading:	9.835	10.07						
	High reading:	20.05	18.53						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	-0.148	1.204						
Mid %Err:	**<2.0**	-0.912	0.653						
High %Err:	**<2.0**	-1.134	0.054						

Initial Bias Data

	Zero reading:	0.900	0.358						
	Span reading:	9.813	9.415						
Zero % bias:	**<5.0**	4.586	0.729						
Span % bias:	**<5.0**	-0.108	-3.537						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11							
Make/Model:	SERVO 1400	SERVO 1400							
25A or 7E:	7E	7E							
Voltage max:	10	10							
Voltage offset:	0	0							
Range:	10	10							
Upscale:									
Downscale:									

Cylinder Information

Zero Number:	CC278852	CC278852							
Zero Conc:	0	0							
Low Number:									
Low Conc:									
Mid Number:	CC204822	CC204822							
Mid Conc:	10.02	9.949							
High Number:	EB0097045	EB0097045							
High Conc:	20.28	18.52							
Bias Number:	EB0097045	EB0097045							
Bias Conc:	20.28	18.52							

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Calibration

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.015	0.290						
	Low reading:	0.000	0.000						
	Mid reading:	10.02	10.17						
	High reading:	20.05	18.60						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.074	1.566						
Mid %Err:	**<2.0**	0.000	1.193						
High %Err:	**<2.0**	-1.134	0.432						

MAQDAQ 1.0

Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 360	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.015	0.290						
	Low reading:	0.000	0.000						
	Mid reading:	10.02	10.17						
	High reading:	20.05	18.60						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.074	1.566						
Mid %Err:	**<2.0**	0.000	1.193						
High %Err:	**<2.0**	-1.134	0.432						

Initial Bias Data

	Zero reading:	0.465	0.283						
	Span reading:	20.09	17.89						
Zero % bias:	**<5.0**	2.219	-0.038						
Span % bias:	**<5.0**	0.197	-3.834						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Analyzer Configuration

Name:	O2 294	CO2 11						
Make/Model:	SERVO 1400	SERVO 1400						
25A or 7E:	7E	7E						
Voltage max:	10	10						
Voltage offset:	0	0						
Range:	10	10						
Upscale:								
Downscale:								

Cylinder Information

Zero Number:	CC278852	CC278852						
Zero Conc:	0	0						
Low Number:								
Low Conc:								
Mid Number:	CC204822	CC204822						
Mid Conc:	10.02	9.949						
High Number:	EB0097045	EB0097045						
High Conc:	20.28	18.52						
Bias Number:	EB0097045	EB0097045						
Bias Conc:	20.28	18.52						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

MONTROSE ENVIRONMENTAL

Calibration

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations									
	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings									
	Zero reading:	0.015	0.198						
	Low reading:	0.000	0.000						
	Mid reading:	10.01	10.14						
	High reading:	20.23	18.41						

EPA Method 7E Error Calculations									
Zero %Err:	**<2.0**	0.074	1.069						
Mid %Err:	**<2.0**	-0.049	1.031						
High %Err:	**<2.0**	-0.247	-0.594						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 480	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

Initial bias

	Name:	O2 294	CO2 11						
	Make/Model:	SERVO 1400	SERVO 1400						
	25A or 7E:	7E	7E						

Cylinder Concentrations

	Zero:	0.000	0.000						
	Low:								
	Mid:	10.02	9.949						
	High:	20.28	18.52						

Calibration Readings

	Zero reading:	0.015	0.198						
	Low reading:	0.000	0.000						
	Mid reading:	10.01	10.14						
	High reading:	20.23	18.41						

EPA Method 7E Error Calculations

Zero %Err:	**<2.0**	0.074	1.069						
Mid %Err:	**<2.0**	-0.049	1.031						
High %Err:	**<2.0**	-0.247	-0.594						

Initial Bias Data

	Zero reading:	0.450	0.520						
	Span reading:	20.22	18.01						
Zero % bias:	**<5.0**	2.145	1.739						
Span % bias:	**<5.0**	-0.049	-2.160						

MAQDAQ 1.0			
Project Name: Owens Brockway	Project Number: 006AS-596331	CEMS Operator: JH	Unit/Condition: Furnace A North/South
Run Length: 120	Record Interval: 6	Average Interval: 60	Triplicate Sampling: False
Traverse: False	Ports: N/A	Points per port: N/A	DAQ Device: DT9806(06)

NOx Converter Check

Time	NOx reading, ppm	Efficiency, %
9:52:16	47.160	92.9%
9:52:17	47.410	93.3%
9:52:18	47.210	93.0%
9:52:19	47.240	93.0%
9:52:20	47.190	92.9%
9:52:21	47.260	93.0%
9:52:22	47.230	93.0%
9:52:23	47.240	93.0%
9:52:24	47.290	93.1%
9:52:25	47.500	93.5%

Summary

Analyzer:	NOX 695
NO2 Cylinder Concentration:	50.79
NO2 Cylinder Number:	CC506997
NOx Analyzer Reading:	47.500
Efficiency:	93.5%

INTERFERENCE RESPONSE TEST

Date of Test: 1/24/02 Name: Mike Eisele
Analyzer: Type / Model: O_2 / Servomex 1400 Serial Number: 000294

Test Gas	Concentration, ppmv or %	Analyzer Output Response, %	% of Span (25 %)
SO_2	170.3 ppmv	0.0	0.0
*CO_2	10.5%	0.0	0.0
**CO	510.6 ppmv	0.0	0.0

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N2 to get a concentration of about 10% CO_2.

**Used CO mix cylinder with 2553 ppmv CO and diluted it with 100% N2 to get a concentration of about 500 ppmv.

Bias Check:

Test Gas	Concentration, %	Analyzer Output Response, %	Bias Check (%)
O_2	20.95	20.8	0.6

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO_2 was slightly lower than listed; 170.3 ppmv was the closest concentration cylinder available at the time of the interference checks.

MONTROSE AIR QUALITY SERVICES

INTERFERENCE RESPONSE TEST

Date of Test: 1/09/02 & 3/15/02 Name: Mike Eisele & Tim Hertel
Analyzer: Type / Model: CO_2 / Servomex 1440 Serial Number: 000011

Test Gas	Concentration, ppmv or %	Analyzer Output Response, %	% of Span (25%)
SO_2	170.3 ppmv	0.0	0.0
O_2	20.95 %	0.0	0.0
*CO	548 ppmv	0.0	0.0

* Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of about 500 ppmv CO.

Bias Check:

Test Gas	Concentration, %	Analyzer Output Response, %	Bias Check (%)
**CO_2	9.7	9.7	0.0

** Used bottle of CO_2 at 100% concentration and diluted it with 100% N_2 to get a concentration of about 10% CO_2.

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO_2 was slightly lower than listed; 170.3 ppmv was the closest concentration cylinder available at the time of the interference checks.

INTERFERENCE RESPONSE TEST

Date of Test: 1/25/02 Name: Mike Eisele
Analyzer: Type / Model: CO / Thermo Env. 48 Serial Number: 000261

Test Gas	Concentration, ppmv or %	Analyzer Output Response, ppmv	% of Span (1000 ppmv)
SO_2	170.3 ppmv	0	0.0
O_2	20.95 %	-0.1	0.01
*CO_2	9.7%	0	0.0

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N_2 to get a concentration of about 10% CO_2.

Bias Check:

Test Gas	Concentration, ppmv	Analyzer Output Response, ppmv	Bias Check (%)
CO	880	875	0.5

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO_2 was slightly lower than listed; 170.3 ppmv was the closest concentration cylinder available at the time of the interference checks.

INTERFERENCE RESPONSE TEST

Date of Test: 2/7/2018 Name: Sleight Halley
Analyzer: Type / Model: NO_x, O_2 / CAI 700 Series
Serial Number: 92/ PN # 1712003

Method Referenced: EPA Method 7E

NO_x Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response ppmv	Interference % of Span (127.0 ppmv)
SO_2	50.59	-0.1	0.08
O_2	21.1	-0.1	0.08
CO	24.21	-0.1	0.08
CO_2	19.43	-0.1	0.08
CH_4	909	-0.1	0.08

A Calibration Cylinder containing 127.0 ppm NO_x was used to calibrate the analyzer.

Results:

Test Gas	Sum of Absolute Differences	Sum of Individual Gases % Interferences	Max Allowable Percent of Span Interference (%)
NO_x	0.5	0.4	2.5

O_2 Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response %	Interference % of Span (21.1%)
SO_2	50.59	0.01	0.00
CO_2	19.43 / 5.05 O_2	4.97	0.38
CO.	24.21	-0.01	0.00
NO	126.2	-0.01	0.00
NO_2	50.15	0.12	0.57
CH_4	909 / 20.95 O_2	20.95	0.00

A Calibration Cylinder containing 21.1% Oxygen was used to Span Analyzer.

MONTROSE AIR QUALITY SERVICES

INTERFERENCE RESPONSE TEST

Date of Test: 1/09/02 & 4/1/02 Name: Mike Eisele & Jay Griffith
Analyzer: Type / Model: VOC / J.U.M. 3-300A Serial Number: 000297

Test Gas	Concentration, ppmv or %	Analyzer Output Response, %	% of Span (100 ppmv)
SO_2	170.3 ppmv	0.0	0.0
O_2	20.95 %	0.0	0.0
*CO_2	9.7%	0.0	0.0
**CO	540 ppmv	1.0	1.0

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N2 to get a concentration of about 10% CO_2.

**Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of about 500 ppmv CO.

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

Note: Concentration for SO_2 was slightly lower than listed; 170.3 ppmv was the closest concentration cylinder available at the time of the interference checks.

Results:

Test Gas	Sum of Absolute Differences	Sum of Individual Gases % Interferences	Max Allowable Percent of Span Interference (%)
O_2	0.20	0.95	2.5

INTERFERENCE RESPONSE TEST

Date of Test: 3/07/02 Name: Tim Hertel
Analyzer: Type / Model: SO_2 / Ametek 900 Series Serial Number: 000563

Results:

Test Gas	Concentration, ppmv or %	Analyzer Output Response, %	% of Span (180 ppmv)
O_2	20.95%	0.0	0.0
*CO_2	10%	0.0	0.0
**CO	512 ppmv	0.6	0.3

*Used bottle of CO_2 at 100% concentration and diluted it with 100% N2 to get a concentration of about 10% CO_2.

**Used CO cylinder with 5% concentration and diluted it with 100% N_2 to get a concentration of about 500 ppmv CO.

Bias Check:

Test Gas	Concentration, ppmv	Analyzer Output Response, ppmv	Bias Check (%)
SO_2	170.3	170.0	0.2

Performance Specifications:

Analyzer	EPA Ref. Method	Allowable Interference (% of analyzer span)	Gas Values To Introduce Into Analyzers (EPA Method 20)
SO_2	6C	7%	200±20 ppm
O_2	6C	7%	20.9±1 percent
CO_2	6C	7%	10±1 percent
CO	20	2%	500±50 ppm

MONTROSE AIR QUALITY SERVICES

CEMS CONFIGURATION DATA

Project Information

Client / Facility: Owens IL Portland OR — Project No. 006AS-596331

Source / Location: Furnace D outlet — Method(s) 3A 7E 6C 25A 10

Test Dates: 5/14 - 5/17 — Project Manager / Team (initials): JH/SH/AG/AK

Analyzers In Service

Please circle all applicable	O_2	CO_2	CO	NO_x	SO_2			TRS	THC
Response Time (seconds)	30	30	40	35	45				30

Filtration (circle)

Filter Type	In-Stack	Out-of-Stack	Sintered		Other
Filter Material	Glass	Quartz	Steel	N/A	Other

Sample Probe (circle)

Length	4	6'	8'	10'	12'	14'	Other
Material	Steel	Glass	Teflon	Titanium	Quartz	Inconel	Other
Heated	Yes	No					
Probe Temperature	240 °F	N/A					

Conditioner / Moisture Knock-Out (circle)

In Use?	Yes	No		
Coolant	Ice and Water	Anti-Freeze	Electric	Other
Trap Material	Steel	Glass	Teflon	Other

Leak Checks

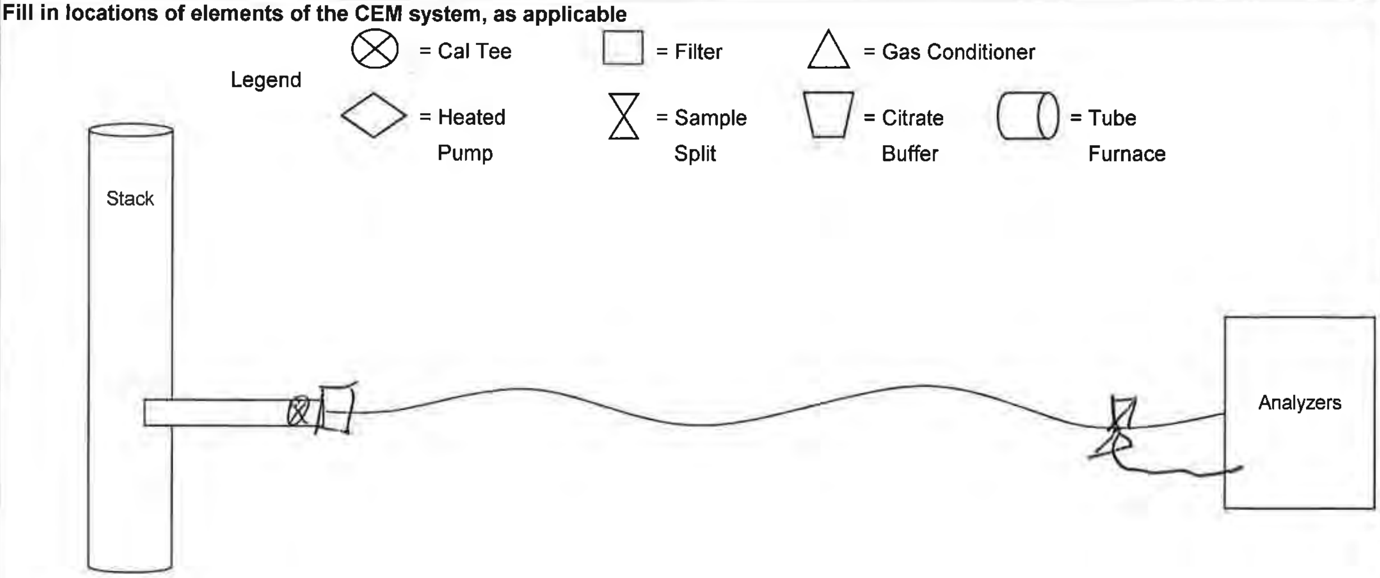
Pre-Test 0.00 cfh @ 20 in. Hg — ____ cfh @ ____ in. Hg

Post-Test 0.0 cfh @ 20 in. Hg — ____ cfh @ ____ in. Hg

System Flow Rate 5.75 cfh LPM — ____ cfh

Leak Rate Post-Test (cfh) / System Flow Rate (cfh) * 100 = ____ % — ____ %

Fill in locations of elements of the CEM system, as applicable



Upstream of conditioner		**Downstream of conditioner**	
Sample Line Length	200 feet	Sample Line Length	10 feet
Sample Line Material	TFE	Sample Line Material	TFE
Sample Line Temp.	250 deg. F	Sample Line Temp.	250 deg. F

If this information is not accurate for all runs, note exceptions here.

MONTROSE AIR QUALITY SERVICES

CEMS CONFIGURATION DATA

Project Information

Client / Facility: Owens IL Portland OR — Project No. 006AS-596331

Source / Location: Furnace A N+S — Method(s) 3A/7E/10/6C/25A

Test Dates: 5/20-5/23 — Project Manager / Team (initials): JA/GH/AG/PB/JM

Analyzers In Service

Please circle all applicable: O_2 CO_2 CO NO_x SO_2 ______ ______ TRS THC

Response Time (seconds): O_2 30, CO_2 30, CO 40, NO_x 35, SO_2 45, THC 30

Filtration (circle)

Filter Type: In-Stack, Out-of-Stack, Sintered, Other ______

Filter Material: Glass, Quartz, Steel, N/A, Other ______

Sample Probe (circle)

Length: 4', 6', 8', 10', 12', 14', Other ______

Material: Steel, Glass, Teflon, Titanium, Quartz, Inconel, Other ______

Heated: Yes, No

Probe Temperature: 250 °F, N/A

Conditioner / Moisture Knock-Out (circle)

In Use?: Yes, No

Coolant: Ice and Water, Anti-Freeze, Electric, Other ______

Trap Material: Steel, Glass, Teflon, Other ______

Leak Checks

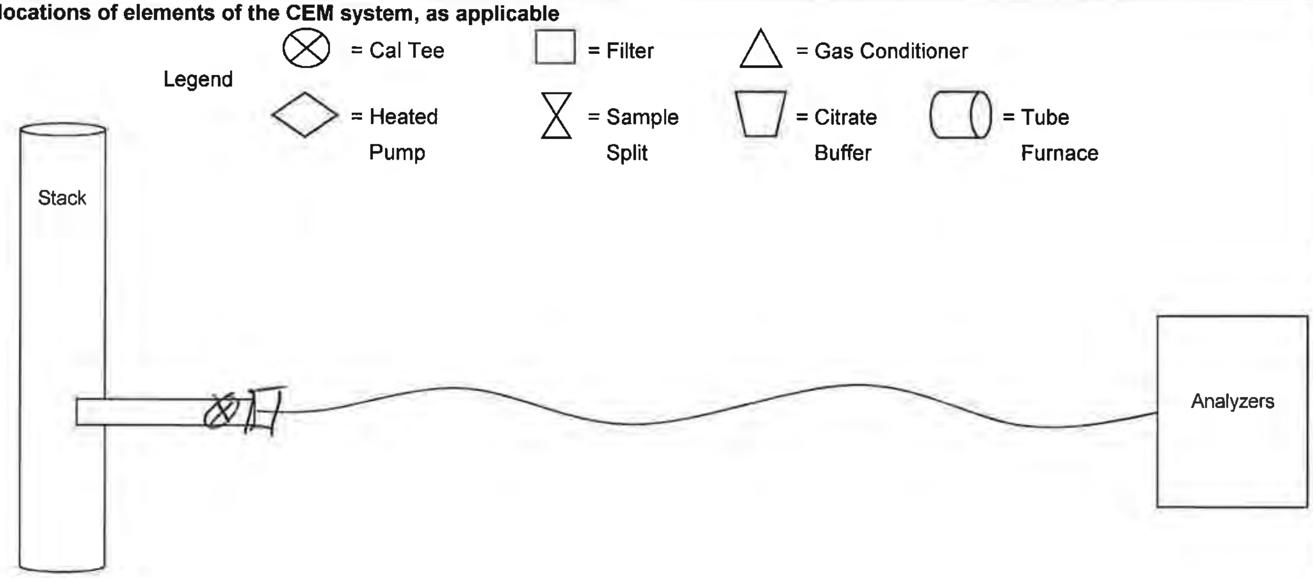
Pre-Test: 0.0 cfh @ 20 in. Hg — ______ cfh @ ______ in. Hg

Post-Test: 0.0 cfh @ 20 in. Hg — ______ cfh @ ______ in. Hg

System Flow Rate: 5 cfh LPM — ______ cfh

Leak Rate: Post-Test (cfh) / System Flow Rate (cfh) * 100 = ______ % — ______ %

Fill in locations of elements of the CEM system, as applicable



Upstream of conditioner

Sample Line Length: 200 feet

Sample Line Material: TFE

Sample Line Temp: 250 deg. F

Downstream of conditioner

Sample Line Length: 10 feet

Sample Line Material: TFE

Sample Line Temp.: 250 deg. F

If this information is not accurate for all runs, note exceptions here.

Appendix E.4
Span Gas Certificates

Airgas
an Air Liquide company

Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF BATCH ANALYSIS

Grade of Product: CEM-CAL ZERO

Part Number:	AI CZ15A	Reference Number:	153-401375459-1
Cylinder Analyzed:	CC334206	Cylinder Volume:	146.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2000 PSIG
Analysis Date:	Dec 14, 2018	Valve Outlet:	590
Lot Number:	153-401375459-1		

Expiration Date: Dec 14, 2026

ANALYTICAL RESULTS

Component		Requested Purity	Certified Concentration
AIR			
Carbon Dioxide	<	1.0 PPM	0.01 PPM
NOx	<	0.1 PPM	0.01 PPM
Sulfur Dioxide	<	0.1 PPM	0.01 PPM
THC	<	0.1 PPM	0.01 PPM
Percent Oxygen		20-21 %	20.57 %
Carbon Monoxide	<	0.5 PPM	0.01 PPM

Permanent Notes: Airgas certifies that the contents of this cylinder meet the requirements of 40 CFR 72.2

Cylinders in Batch:

ALM019227, CC334206, CC33533, EB0088889

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

Approved for Release

Airgas
an Air Liquide company

Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF BATCH ANALYSIS

Grade of Product: CEM-CAL ZERO

Part Number:	NI CZ15A	Reference Number:	153-401393761-1
Cylinder Analyzed:	CC423510	Cylinder Volume:	142.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2000 PSIG
Analysis Date:	Jan 04, 2019	Valve Outlet:	580
Lot Number:	153-401393761-1		

Expiration Date: Jan 04, 2027

ANALYTICAL RESULTS

Component		Requested Purity	Certified Concentration
NITROGEN		99.9995 %	99.9995 %
CARBON DIOXIDE	<	1.0 PPM	0.01 PPM
NOx	<	0.1 PPM	0.01 PPM
SO2	<	0.1 PPM	0.01 PPM
THC	<	0.1 PPM	0.01 PPM
CARBON MONOXIDE	<	0.5 PPM	0.01 PPM

Permanent Notes: Airgas certifies that the contents of this cylinder meet the requirements of 40 CFR 72.2

Cylinders in Batch:

ALM051658, CC19174, CC266669, CC278852, CC306610, CC342219, CC423510, CC423572, CC438725, CC476462, CC64327, CC710019, EB0091558, EB0097149, EB0098497, EB0108822

Impurities verified against analytical standards traceable to NIST by weight and/or analysis.

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI80E15A0138	Reference Number:	153-401443589-1
Cylinder Number:	CC204822	Cylinder Volume:	150.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72019	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Mar 11, 2019

Expiration Date: Mar 11, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	10.00 %	9.949 %	G1	+/- 1.0% NIST Traceable	03/11/2019
OXYGEN	10.00 %	10.02 %	G1	+/- 0.7% NIST Traceable	03/11/2019
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060628	CC413727	13.359 % CARBON DIOXIDE/NITROGEN	0.6%	May 09, 2019
NTRM	98051014	SG9162888BAL	12.05 % OXYGEN/NITROGEN	0.7%	Dec 14, 2023

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Feb 20, 2019
Horiba MPA-510 W603MM58 O2	O2 Paramagnetic (Mason)	Feb 20, 2019

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E03NI60E15A2996	Reference Number:	153-401183959-1
Cylinder Number:	EB0097045	Cylinder Volume:	158.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Apr 23, 2018

Expiration Date: Apr 23, 2026

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	19.00 %	18.52 %	G1	+/- 1% NIST Traceable	04/23/2018
OXYGEN	21.00 %	20.28 %	G1	+/- 1% NIST Traceable	04/23/2018
NITROGEN	Balance			-	

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060726	CC413742	16.939 % CARBON DIOXIDE/NITROGEN	0.6%	May 08, 2019
NTRM	09061433	CC282486	22.53 % OXYGEN/NITROGEN	0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Apr 19, 2018
Horiba MPA-510 X9A4UCL8 O2	O2 Paramagnetic (Dixon)	Apr 18, 2018

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI94E15A00F8	Reference Number:	153-401187529-1C
Cylinder Number:	CC709787	Cylinder Volume:	146.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,BALN	Certification Date:	Jun 05, 2018

Expiration Date: Jun 05, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	27.50 PPM	27.64 PPM	G1	+/- 1.4% NIST Traceable	05/29/2018, 06/05/2018
CARBON MONOXIDE	27.50 PPM	27.45 PPM	G1	+/- 0.7% NIST Traceable	05/30/2018
NITRIC OXIDE	27.50 PPM	27.63 PPM	G1	+/- 1.4% NIST Traceable	05/29/2018, 06/05/2018
CARBON DIOXIDE	5.000 %	4.972 %	G1	+/- 1.0% NIST Traceable	05/29/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14060751	CC434416	49.88 PPM CARBON MONOXIDE/NITROGEN	0.6%	Feb 22, 2020
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/NITROGEN	1.6%	May 29, 2016
NTRM	12010422	ND44485	19.94 PPM NITRIC OXIDE/NITROGEN	1.1%	Dec 14, 2019
GMIS	1114201604	CC507567	4.955 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Nov 14, 2019
NTRM	13060419	CC413607	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	Jan 14, 2019

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 CO2 HCO2	FTIR	May 11, 2018
Thermo 48i-TLE 1163640031 CO	CO NDIR (Mason)	May 10, 2018
Nicolet 6700 AHR0801550 NO LNO	FTIR	May 31, 2018
Nicolet 6700 AHR0801550 NO2 impurity	FTIR NO2 impurity	May 31, 2018

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0055	Reference Number:	153-401274149-1
Cylinder Number:	CC506997	Cylinder Volume:	144.0 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	660
Gas Code:	NO2,BALN	Certification Date:	Aug 28, 2018

Expiration Date: Aug 28, 2021

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NITROGEN DIOXIDE	50.00 PPM	50.79 PPM	G1	+/- 2%	08/21/2018, 08/28/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	7282071710	CC511229	57.89 PPM NITROGEN DIOXIDE/NITROGEN	1.1%	Dec 18, 2020
PRM	12378	D562913	100.1 PPM NITROGEN DIOXIDE/NITROGEN	1.0%	Sep 04, 2018

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS 18143349 NO2	FTIR	Aug 16, 2018

Triad Data Available Upon Request

PERMANENT NOTES: OXYGEN ADDED TO MAINTAIN STABILITY

Approved for Release

Airgas

Airgas Specialty Gases
525 North Industrial Loop Road
Tooele, UT 84074
435-241-5662 Fax: 435-241-5664
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04NI94E15A0035	Reference Number:	153-124591943-1
Cylinder Number:	CC1234022	Cylinder Volume:	146.9 CF
Laboratory:	124 - Tooele - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72016	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,BALN	Certification Date:	Dec 20, 2016

Expiration Date: Dec 20, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	55.00 PPM	54.84 PPM	G1	+/- 1.2% NIST Traceable	12/13/2016, 12/20/2016
CARBON MONOXIDE	55.00 PPM	56.72 PPM	G1	+/- 0.8% NIST Traceable	12/13/2016
NITRIC OXIDE	55.00 PPM	54.69 PPM	G1	+/- 1.1% NIST Traceable	12/13/2016, 12/20/2016
CARBON DIOXIDE	5.000 %	5.108 %	G1	+/- 1.0% NIST Traceable	12/13/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12060405	CC353866	49.49 PPM CARBON MONOXIDE/NITROGEN	0.6	Dec 20, 2017
PRM	12367	APEX1099237	10.00 PPM NITROGEN DIOXIDE/NITROGEN	1.6%	May 29, 2016
NTRM	16060631	CC442606	50.42 PPM NITRIC OXIDE/NITROGEN	0.8	Jun 27, 2020
GMIS	0315201603	CC502257	4.875 PPM NITROGEN DIOXIDE/NITROGEN	1.6	Mar 15, 2019
NTRM	97050601	SG9168816BAL	3.224 % CARBON DIOXIDE/NITROGEN	0.5	Jun 21, 2022

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801550 CO2 HCO2	FTIR	Dec 02, 2016
Nicolet 6700 AHR0801550 CO LCO	FTIR	Nov 17, 2016
Nicolet 6700 AHR0801550 NO LNO	FTIR	Nov 29, 2016
Nicolet 6700 AHR0801550 NO2 impurity	FTIR NO2 impurity	Nov 30, 2016

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E04NI94E15A00E0	Reference Number:	153-401187530-1B
Cylinder Number:	CC287437	Cylinder Volume:	146.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,BALN	Certification Date:	May 21, 2018

Expiration Date: May 21, 2026

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	500.0 PPM	500.2 PPM	G1	+/- 0.9% NIST Traceable	05/14/2018, 05/21/2018
NITRIC OXIDE	500.0 PPM	497.2 PPM	G1	+/- 0.9% NIST Traceable	05/14/2018, 05/21/2018
CARBON MONOXIDE	550.0 PPM	551.4 PPM	G1	+/- 0.6% NIST Traceable	05/15/2018
CARBON DIOXIDE	5.000 %	5.038 %	G1	+/- 0.8% NIST Traceable	05/15/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060418	CC449825	496.8 PPM NITRIC OXIDE/NITROGEN	0.5%	May 04, 2021
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/NITROGEN	1.6%	May 29, 2016
GMIS	1114201604	CC507567	4.955 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Nov 14, 2019
NTRM	15060555	CC454021	491.9 PPM CARBON MONOXIDE/NITROGEN	0.6%	Jan 08, 2021
NTRM	13060410	CC413504	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	Jan 14, 2019

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Apr 19, 2018
Horiba VIA-510 7EYAYV21 LCO	CO NDIR (Dixon)	May 10, 2018
Nicolet 6700 AHR0801550 NO MNO	FTIR	May 03, 2018
Nicolet 6700 AHR0801550 NO2 impurity	FTIR NO2 impurity	May 03, 2018

Triad Data Available Upon Request

Approved for Release

SCOTT-MARRIN, INC. PGVP Vendor ID: H12014

6531 Box Springs Blvd • Riverside, CA 92507-0725
Phone: +1(951)653-6780 • Fax: +1(951)653-2430 • www.scottmarrin.com

H3-4

Report Of Analysis
EPA Protocol Gas Mixtures

HENG01
TO: Horizon Engineering/Infrared NW
Attn: Joe Heffernan III
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

REPORT NO: 65791-01
REPORT DATE: November 26, 2014
CUSTOMER PO NO: 2149

CYLINDER SIZE: 150A (141 std cu ft)
CYLINDER PRESSURE: 2000 psig

CYLINDER NUMBER: **CC53845**

COMPONENT	CONCENTRATION (v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD		ANALYZER MAKE, MODEL, S/N, DETECTION	REPLICATE ANALYSIS DATA	
Carbon dioxide	5.01 ± 0.05 %	GMIS	SRM 1674b	Varian Model 3400	11/11/2014	
			Samp#: 7-H-39	Serial # 10680	5.01 %	
		Cyl#: CC116770	Cyl#: FF10598	Thermal Conductivity	5.01 %	
		7.99 ± 0.08 %	6.944 ± 0.013 %	Gas Chromotography	5.01 %	
		Exp: 3/18/2022	Exp: 6/17/2019	**LAST CAL DATE:** 11/10/2014 $\bar{x}$:	5.01 %	
Carbon monoxide	1097 ± 12 ppm	GMIS	SRM 1681b	Carle Insts Model 8000	11/7/2014	11/14/2014
			Samp#: 1-K-33	Serial # 8249	1095 ppm	1096 ppm
		Cyl#: AAL7017	Cyl#: CAL016258	Methanation/FID	1098 ppm	1096 ppm
		1125 ± 12 ppm	983.5 ± 3 ppmv	Gas Chromatography	1096 ppm	1098 ppm
		Exp: 11/29/2020	Exp: 4/1/2015	**LAST CAL DATE:** 10/23/2014 $\bar{x}$:	1096 ppm	1097 ppm
Nitric oxide	1066 ± 11 ppm	GMIS	SRM 2630	Bovar/W Res Model 922M	11/13/2014	11/20/2014
NOx	1066 ppm		Samp#: 46-E-23	Serial # VD92284841	1070 ppm	1064 ppm
Nitrogen dioxide	< 11 ppm	Cyl#: CC74114	Cyl#: FF20450	Continuous	1069 ppm	1062 ppm
		1845 ± 19 ppm	1487 ± 6 ppmv	UV Photometry	1062 ppm	1061 ppm
		Exp: 8/19/2021	Exp: 4/30/2018	**LAST CAL DATE:** 11/13/2014 $\bar{x}$:	1067 ppm	1062 ppm
O2-free Nitrogen	Balance					

CERTIFICATION DATE: November 11, 2014 **EPA EXPIRATION DATE:** November 12, 2022

ppm = µmole/mole **% = mole-%** **$\bar{x}$ = EPA weighted mean**

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.

The above analyses should not be used if the cylinder pressure is less than 100 psig.

ANALYST: D.C. M
D.C.Marrin

APPROVED:
J. T. Marrin

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
11711 S. Alameda Street
Los Angeles, CA 90059
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02AI99E15A1464	Reference Number:	48-401052941-1
Cylinder Number:	CC203661	Cylinder Volume:	146.2 CF
Laboratory:	124 - Los Angeles (SAP) - CA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B32017	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Nov 13, 2017

Expiration Date: Nov 13, 2025

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
PROPANE	3.000 PPM	2.966 PPM	G1	+/- 1.0% NIST Traceable	11/13/2017
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	11061010	CC322731	3.431 PPM PROPANE/AIR	+/- 0.6%	Jul 28, 2023

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801551 C3H8	FTIR	Oct 17, 2017

Triad Data Available Upon Request

Approved for Release

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02AI99E15A1471	Reference Number:	153-401126146-1
Cylinder Number:	EB0090951	Cylinder Volume:	146.2 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Feb 16, 2018

Expiration Date: Feb 16, 2026

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
PROPANE	5.000 PPM	5.044 PPM	G1	+/- 1% NIST Traceable	02/16/2018
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	14010207	ND47889	2.951 PPM PROPANE/NITROGEN	+/-0.7%	Apr 28, 2020

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900119 C3H8 LC3H8	FTIR	Jan 25, 2018

Triad Data Available Upon Request

Approved for Release

Airgas

Airgas Specialty Gases
525 North Industrial Loop Road
Tooele, UT 84074
435-241-5662 Fax: 435-241-5664
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02AI99E15A0086	Reference Number:	153-124587489-1
Cylinder Number:	EB0089064	Cylinder Volume:	146.2 CF
Laboratory:	124 - Tooele - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72016	Valve Outlet:	590
Gas Code:	PPN,BALA	Certification Date:	Nov 15, 2016

Expiration Date: Nov 15, 2024

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
PROPANE	8.600 PPM	8.517 PPM	G1	+/- 1% NIST Traceable	11/15/2016
AIR	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	10061409	CC314699	9.93 PPM PROPANE/NITROGEN	+/- 0.6%	Jun 29, 2022

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900119 C3H8 LC3H8	FTIR	Nov 10, 2016

Triad Data Available Upon Request

Approved for Release

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E02NI99E15A0646	Reference Number:	83-124359172-1
Cylinder Number:	SG9139281BAL	Cylinder Volume:	144.4 CF
Laboratory:	124 - Port Allen - LA	Cylinder Pressure:	2015 PSIG
PGVP Number:	B42013	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Feb 25, 2013

Expiration Date: Feb 25, 2021

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

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

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	500.0 PPM	490.2 PPM	G1	+/- 0.8% NIST Traceable	02/18/2013, 02/25/2013
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM/SO2	09061002	CC352201	499.3 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	May 15, 2015

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AMP0900119 SO2 MSO2	FTIR	Feb 12, 2013

Triad Data Available Upon Request

Signature on file

Approved for Release

SCOTT-MARRIN, INC. PGVP Vendor ID: H12014

6531 Box Springs Blvd • Riverside, CA 92507-0725
Phone: +1(951)653-6780 • Fax: +1(951)653-2430 • www.scottmarrin.com

Report Of Analysis
EPA Protocol Gas Mixtures

S7

HENG01
TO: Horizon Engineering/Infrared NW
Attn: David Bagwell
13585 NE Whitaker Way
Portland, OR 97230
(503) 255-5050

REPORT NO: 61941-01
REPORT DATE: October 5, 2012
CUSTOMER PO NO: 1721

CYLINDER SIZE: 150A (85 std cu ft)
CYLINDER PRESSURE: 1200 psig

CYLINDER NUMBER: **CC57702**

COMPONENT	CONCENTRATION (v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	REPLICATE ANALYSIS DATA
Sulfur dioxide	934 ± 9 ppm	GMIS CYLINDER #: CC104247 @ 1067 ppm	Bovar/W Res Model 922M Serial # 9228379-1 Continuous UV Photometry **LAST CAL DATE:** 8/30/2012	9/26/2012 935 ppm 935 ppm 935 ppm **MEAN:** 935 ppm
Nitrogen	Balance			

EPA EXPIRATION DATE: September 27, 2020

ppm = umole/mole **% = mole-%**

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA-600/R97/121, dated September 1997. Expiration dates are as amended by Table 2-3 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.
The above analyses are invalid if the cylinder pressure is less than 150 psig.

ANALYST: Mark Monson **APPROVED:** [signature]

M.J.Monson J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

Airgas
an Air Liquide company

Airgas Specialty Gases
Airgas USA, LLC
525 North Industrial Loop Road
Tooele, UT 84074
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04NI94E15A0092	Reference Number:	153-401125324-1
Cylinder Number:	CC480868	Cylinder Volume:	146.9 CF
Laboratory:	124 - Tooele (SAP) - UT	Cylinder Pressure:	2015 PSIG
PGVP Number:	B72018	Valve Outlet:	660
Gas Code:	CO,CO2,NO,NOX,BALN	Certification Date:	Feb 20, 2018

Expiration Date: Feb 20, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	275.0 PPM	278.2 PPM	G1	+/- 0.6% NIST Traceable	02/13/2018, 02/20/2018
CARBON MONOXIDE	250.0 PPM	248.2 PPM	G1	+/- 1% NIST Traceable	02/13/2018
NITRIC OXIDE	275.0 PPM	277.1 PPM	G1	+/- 0.6% NIST Traceable	02/13/2018, 02/20/2018
CARBON DIOXIDE	5.000 %	5.040 %	G1	+/- 1% NIST Traceable	02/13/2018
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	15060555	CC454021	491.9 PPM CARBON MONOXIDE/NITROGEN	0.6%	Jan 08, 2021
PRM	12367	APEX1099237	9.82 PPM NITROGEN DIOXIDE/NITROGEN	1.6%	May 29, 2016
ntrm	13010335	kal004393	243.4 PPM NITRIC OXIDE/NITROGEN	+/-0.5%	Jan 08, 2019
GMIS	1114201604	CC507567	4.955 PPM NITROGEN DIOXIDE/NITROGEN	2.0%	Nov 14, 2019
NTRM	13060410	CC413504	7.489 % CARBON DIOXIDE/NITROGEN	0.6%	Jan 14, 2019

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA-510 SV4MEUTJ CO2	CO2 NDIR (Dixon)	Feb 07, 2018
Horiba VIA-510 7EYAYV21 LCO	CO NDIR (Dixon)	Jan 25, 2018
Nicolet 6700 AMP0900119 NO MNO	FTIR	Feb 14, 2018
Nicolet 6700 AMP0900119 NO2 impurity	FTIR NO2 impurity	Feb 14, 2018

Triad Data Available Upon Request

Approved for Release

LIQUID TECHNOLOGY CORPORATION

"INDUSTRY LEADER IN SPECIALTY GASES"

Certificate of Analysis

- EPA PROTOCOL GAS -

* Extended Certificate *

RS 13

Customer	Horizon Engineering, LLC (Portland, OR)
Date	December 05, 2011
Delivery Receipt	DR-39664
Gas Standard	225 ppm Sulfur Dioxide/Nitrogen - EPA PROTOCOL
Final Analysis Date	December 05, 2011
Expiration Date	December 05, 2019

DO NOT USE BELOW 100 psig

Analytical Data

EPA Protocol, Section No. 2.2, Procedure G-1

Replicate Concentrations

Sulfur Dioxide: 241 ppm +/- 2.4 ppm

Nitrogen: Balance

Reference Standard(s):

SRM/GMIS:	GMIS	GMIS
Cylinder Number:	CC-233316	EB-0019907
Concentration:	103.73 ppm SO2/Nitrogen	507.87 ppm SO2/Nitrogen
Expiration Date:	12/01/12	04/12/13

Certification Instrumentation

Component:	Sulfur Dioxide
Make/Model:	Horiba - VIA 510
Serial Number:	XXS2J5YW
Principal of Measurement:	NDIR
Last Calibration:	November 05, 2011

Cylinder Data

Cylinder Number:	EB-0016071	Cylinder Volume:	140 Cubic Feet
Cylinder Outlet:	CGA 660	Cylinder Pressure:	2000 psig, 70°F
Expiration Date:	December 05, 2019		

Analytical uncertainty and NIST Traceability are in compliance with EPA-600/R-12/531.

Certified by: Cole Dylewski

Cole Dylewski

PGVP Vendor ID: E12013

* Extended shelf life established December 10, 2013

"UNMATCHED EXCELLENCE"
2048 APEX COURT APOPKA, FLORIDA 32703 ~ PHONE (407)-292-2990 FAX (407)-292-3313
WWW.LIQUIDTECHCORP.COM
APOPKA, FL • HOUSTON, TX

Appendix E.5
Equipment Calibration Data

MONTROSE ENVIRONMENTAL

EPA Method 5
Meter Box Calibration by Calibrated Critical Orifice, Leak Check, and Thermocouple Calibration Check
English Meter Box Units, English K' Factor

Meter box ID:	MB33
Meter ID (if applicable):	
Orifice set ID:	ND
Calibrated by:	JH
Expires:	**7/7/19**

Date:	1/7/19
Location:	PDX
No. of orifices used (min. 3)	3
Barometric pressure (in. Hg):	30.11 in. Hg
Theoretical critical vacuum	14.20 in. Hg

Yd:	**1.0058**
ΔH@:	**1.7299**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.57	15.00	844.600	850.985	6.385	60	58	63	59	48	0.3341	24.0	65	65	65.4
1.10	16.00	855.980	865.125	9.145	66	60	69	62	55	0.4475	20.0	65	64	64.8
1.70	9.00	866.100	872.935	6.835	70	62	74	64	63	0.5820	19.0	65	65	64.7

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
0.57	0.439
1.10	0.588
1.70	0.765

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
6.531
9.290
6.911

-------- ORIFICE --------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
6.583	6.512
9.410	9.297
6.885	6.802

-- DRY GAS METER --
CALIBRATION FACTOR
Yd

Value (number)	Variation (number)
1.0081	0.002
1.0130	0.007
0.9963	-0.009

-------- ORIFICE --------
CALIBRATION FACTOR
ΔH@

Value (in H2O)	Variation (in H2O)
1.706	-0.024
1.824	0.094
1.660	-0.070

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	1.0058
Average ΔH@	1.7299
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Pressure Leak Check

Test Pressure, (in H_2O):	4	Should be 5-7 in. H_2O
Leak Rate, (in H_2O/min):	0	Must be zero (manometer level stable for 1 minute)

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	0	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	25	Must be zero (meter dial stable for 1 minute)

Meter Box Thermocouple Readout Calibration Check

Input Temperature	Allowable Temp. Dev.*
25	7
75	8
125	9
225	10
325	12
375	13
425	13
475	14

Stack	Probe	Filter	Exit	Aux.	Meter In	Meter Out
27	23	24	27	27	28	28
77	73	71	77	77	77	78
127	123	123	127	127	127	128
227	224	221				
326	324	323				
376						
426						
476						

Thermocouple simulator	
Make/Model:	Altek
Serial No.	541
Cal Date:	12/10/2018

Meter Thermocouple Calibration

Ref. Temp	Allowable Temp. Dev.*	Meter In	Meter Out
62	8	63	63
62	8	63	63

Reference Thermometer	
Make/Model:	Traceable
Serial No.	1407754311
Cal Date:	4/6/2018

* Reading values must be within 1.5% of reference thermometer values (based on absolute temperature scale) for calibration to be acceptable.

Performed by: Name: JH Signature: J. Allen Date: 1/7/19

Approved by: Name: TAR Signature: [illegible] Date: 1/7/19

Meter box 6-month calibration form (orifices) R1

MONTROSE ENVIRONMENTAL

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice: Post-Test, English Meter Box Units, English K' Factor

Meter box ID:	MB33
Meter ID (if applicable):	XXXX
Orifice set ID:	TV5
Calibrated by (initials):	AG
Current 6-month calibration Yd:	1.0058
Date of 6-month calibration:	1/7/19

Date:	5/24/19
Location:	Portland
No. of runs (default 3)	3
Barometric pressure (in. Hg):	29.97 in. Hg
Theoretical critical vacuum:	14.14 in. Hg

Current Cal. Yd:	1.0058
Post-test Yd:	0.9932
Post-test Result:	PASS

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above

IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min))

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
1.30	8.00	926.204	931.255	5.051	67	66	68	67	18	0.4814	18.0	67	68	67.5
1.30	8.00	931.255	936.295	5.040	68	67	71	68	18	0.4814	18.0	68	68	68.0
1.30	12.00	936.295	943.825	7.530	71	68	68	69	18	0.4814	18.0	68	69	68.5

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
1.30	0.63
1.30	0.63
1.30	0.63

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
5.083
5.058
7.549

------ ORIFICE ------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
5.026	5.015
5.023	5.017
7.531	7.529

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
0.9887	-0.004
0.9932	0.000
0.9976	0.004

------ ORIFICE ------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.86	0.002
1.86	0.000
1.86	-0.002

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9932
Average ΔH@	1.8595
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	8	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Performed by: Name: Austin Goracke Signature: [signature] Date: 5/24/19

Approved by: Name: JH Signature: [signature] Date: 5/24/19

Meter box post-test calibration form (orifices) R3

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice, Leak Check, and Thermocouple Calibration Check English Meter Box Units, English K' Factor

MONTROSE ENVIRONMENTAL

Meter box ID:	MB30
Meter ID (if applicable):	
Orifice set ID:	ND
Calibrated by:	JH
Expires:	**7/3/19**

Date:	1/3/19
Location:	PDX
No. of orifices used (min. 3)	3
Barometric pressure (in. Hg):	30.07 in. Hg
Theoretical critical vacuum	14.18 in. Hg

Yd:	**0.9865**
ΔH@:	**1.8243**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.61	15.00	932.200	938.710	6.510	53	51	55	53	48	0.3341	24.0	52	53	52.1
1.10	20.00	944.550	956.192	11.642	57	53	58	54	55	0.4475	22.0	53	55	53.9
1.90	7.00	956.400	961.726	5.326	58	55	61	55	63	0.5820	19.0	55	56	55.6

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
0.61	0.444
1.10	0.594
1.90	0.771

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
6.741
12.012
5.487

-------- ORIFICE --------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
6.660	6.429
11.871	11.500
5.395	5.244

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
0.9879	0.001
0.9883	0.002
0.9832	-0.003

-------- ORIFICE --------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.804	-0.020
1.815	-0.009
1.854	0.030

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9865
Average ΔH@	1.8243
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Pressure Leak Check

Test Pressure, (in H_2O):	4	Should be 5-7 in. H_2O
Leak Rate, (in H_2O/min):	0	Must be zero (manometer level stable for 1 minute)

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	25	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Meter Box Thermocouple Readout Calibration Check

Input Temperature	Allowable Temp. Dev.*
25	7
75	8
125	9
175	10
225	10
325	12
425	13
475	14

Stack	Probe	Filter	Exit	Aux.	Meter In	Meter Out
25	25	26	26	25	28	25
75	74	76	76	76	78	76
125	123	125	126	126	128	126
175	175	175				
225	223	225				
325						
425						
473						

Thermocouple simulator	
Make/Model:	Altek
Serial No.	542
Cal Date:	12/10/2018

Meter Thermocouple Calibration

Ref. Temp	Allowable Temp. Dev.*	Meter In	Meter Out
49	8	50	50.9
49	8	49	50.9

Reference Thermometer	
Make/Model:	Traceable
Serial No.	140754311
Cal Date:	4/6/2018

* Reading values must be within 1.5% of reference thermometer values (based on absolute temperature scale) for calibration to be acceptable.

Performed by: Name: JH Signature: Date: 1/3/19

Approved by: Name: TAR Signature: Date: 1/3/19

Meter box 6-month calibration form (orifices) R1

MONTROSE ENVIRONMENTAL

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice: Post-Test, English Meter Box Units, English K' Factor

Meter box ID:	MB30
Meter ID (if applicable):	XXXX
Orifice set ID:	TV5
Calibrated by (initials):	AG
Current 6-month calibration Yd:	0.9865
Date of 6-month calibration:	1/3/19

Date:	5/24/19
Location:	Portland
No. of runs (default 3)	3
Barometric pressure (in. Hg):	29.97 in. Hg
Theoretical critical vacuum:	14.14 in. Hg

Current Cal. Yd:	0.9865
Post-test Yd:	0.9910
Post-test Result:	PASS

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above

IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
1.30	8.00	930.370	935.388	5.018	67	65	71	66	18	0.4814	18.0	68	69	68.5
1.30	8.00	935.388	940.444	5.056	71	66	72	67	18	0.4814	18.0	69	70	69.5
1.30	8.00	940.444	945.510	5.066	72	67	72	68	18	0.4814	18.0	70	70	70.0

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
1.30	0.63
1.30	0.63
1.30	0.63

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
5.048
5.069
5.072

------ ORIFICE ------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
5.021	5.019
5.016	5.024
5.014	5.026

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
0.9947	0.004
0.9896	-0.001
0.9886	-0.002

------ ORIFICE ------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.87	0.001
1.87	0.001
1.87	-0.001

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9910
Average ΔH@	1.8677
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	8	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Performed by: Name: Austin Goraelke Signature: [signature] Date: 5/24/19

Approved by: Name: JG Signature: [signature] Date: 5/24/19

Meter box post-test calibration form (orifices) R3

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice, Leak Check, and Thermocouple Calibration Check English Meter Box Units, English K' Factor

Meter box ID:	MB29
Meter ID (if applicable):	
Orifice set ID:	ND
Calibrated by:	BMS
Expires:	**7/18/19**

Date:	1/18/19
Location:	OFFICE
No. of orifices used (min. 3)	3
Barometric pressure (in. Hg):	30.10 in. Hg
Theoretical critical vacuum	14.20 in. Hg

Yd:	**0.9875**
ΔH@:	**1.8038**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above

IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
0.60	12.00	52.926	58.202	5.276	58	58	58	58	48	0.3341	22.0	56	56	56.0
1.90	7.00	58.202	63.529	5.327	58	58	61	59	63	0.5820	19.0	56	57	56.5
1.10	14.00	63.529	71.676	8.147	61	59	64	60	55	0.4475	21.0	57	57	57.0

— SAMPLE RATE —
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
0.60	0.443
1.90	0.771
1.10	0.592

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
5.416
5.475
8.325

------- ORIFICE -------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
5.313	5.163
5.396	5.249
8.293	8.075

-- DRY GAS METER --
CALIBRATION FACTOR
Yd

Value (number)	Variation (number)
0.9809	-0.007
0.9855	-0.002
0.9961	0.009

------- ORIFICE -------
CALIBRATION FACTOR
ΔH@

Value (in H2O)	Variation (in H2O)
1.766	-0.038
1.843	0.039
1.803	-0.001

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9875
Average ΔH@	1.8038
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Pressure Leak Check

Test Pressure, (in H_2O):	6	Should be 5-7 in. H_2O
Leak Rate, (in H_2O/min):	0	Must be zero (manometer level stable for 1 minute)

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	28	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Meter Box Thermocouple Readout Calibration Check

Input Temperature	Allowable Temp. Dev.*
25	7
75	8
125	9
225	10
275	11
375	13
425	13
500	14

Stack	Probe	Filter	Exit	Aux.	Meter In	Meter Out
26	25	26	25	25	26	24
76	75	75	75	76	75	75
125	125	125	126	126	125	125
225	226	226				
275	276	277				
374						
424						
499						

Thermocouple simulator	
Make/Model:	Altek Type K
Serial No.	541
Cal Date:	12/10/2018

Meter Thermocouple Calibration

Ref. Temp	Allowable Temp. Dev.*	Meter In	Meter Out
56	8	56	56
80	8	79	79

Reference Thermometer	
Make/Model:	traceable
Serial No.	140754311
Cal Date:	4/6/2018

* Reading values must be within 1.5% of reference thermometer values (based on absolute temperature scale) for calibration to be acceptable.

Performed by: Name: Brett Sherwood Signature: [signature] Date: 1/18/19

Approved by: Name: JH Signature: [signature] Date: 1/18/19

Meter box 6-month calibration form (orifices) R1

MONTROSE
ENVIRONMENTAL

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice: Post-Test, English Meter Box Units, English K' Factor

Meter box ID:	MB29
Meter ID (if applicable):	XXXX
Orifice set ID:	TV5
Calibrated by (initials):	NAME
Current 6-month calibration Yd:	0.9875
Date of 6-month calibration:	1/18/19

Date:	5/24/19
Location:	OFFICE
No. of runs (default 3)	3
Barometric pressure (in. Hg):	29.97 in. Hg
Theoretical critical vacuum:	14.14 in. Hg

Current Cal. Yd:	0.9875
Post-test Yd:	0.9937
Post-test Result:	PASS

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
2.00	25.00	27.835	48.390	20.555	65	64	71	69	24	0.6284	20.5	65	68	66.5
2.00	9.00	48.390	55.809	7.419	71	69	73	70	24	0.6284	20.5	68	68	68.0
2.00	9.00	55.809	63.223	7.414	75	70	75	70	24	0.6284	20.5	68	68	68.0

-- SAMPLE RATE --
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
2.00	0.82
2.00	0.82
2.00	0.82

-- DRY GAS METER --
VOLUME CORRECTED

Vm(std) (cu ft)
20.712
7.426
7.397

------- ORIFICE ------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
20.518	20.434
7.376	7.367
7.376	7.367

-- DRY GAS METER --
CALIBRATION FACTOR
Yd

Value (number)	Variation (number)
0.9907	-0.003
0.9932	0.000
0.9972	0.003

------ ORIFICE ------
CALIBRATION FACTOR
ΔH@

Value (in H2O)	Variation (in H2O)
1.68	0.004
1.67	-0.001
1.67	-0.003

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9937
Average ΔH@	1.6740
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	25	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Performed by: Name: Preston Bunder Signature: [signature] Date: 5/24/19

Approved by: Name: JH Signature: [signature] Date: 5/24/19

Meter box post-test calibration form (orifices) R3

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice, Leak Check, and Thermocouple Calibration Check English Meter Box Units, English K' Factor

Meter box ID:	MB4
Meter ID (if applicable):	
Orifice set ID:	ND
Calibrated by:	BMS
Expires:	**7/18/19**

Date:	1/18/19
Location:	OFFICE
No. of orifices used (min. 3)	3
Barometric pressure (in. Hg):	30.10 in. Hg
Theoretical critical vacuum	14.20 in. Hg

Yd:	**0.9927**
ΔH@:	**1.7773**

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above
IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
1.10	11.00	505.434	511.836	6.402	56	57	58	57	55	0.4475	21.0	56	56	56.0
1.90	11.50	511.836	520.581	8.745	58	57	60	58	63	0.5820	19.0	56	57	56.5
0.57	14.00	520.581	526.613	6.032	60	58	62	60	48	0.3341	22.0	57	57	57.0

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
1.10	0.593
1.90	0.771
0.57	0.442

-- DRY GAS METER --
VOLUME CORRECTED

Vm(std) (cu ft)
6.593
9.001
6.168

------- ORIFICE -------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
6.522	6.338
8.864	8.623
6.192	6.029

-- DRY GAS METER --
CALIBRATION FACTOR
Yd

Value (number)	Variation (number)
0.9893	-0.003
0.9848	-0.008
1.0039	0.011

------ ORIFICE ------
CALIBRATION FACTOR
ΔH@

Value (in H2O)	Variation (in H2O)
1.808	0.031
1.846	0.069
1.678	-0.100

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	0.9927
Average ΔH@	1.7773
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Pressure Leak Check

Test Pressure, (in H_2O):	7	Should be 5-7 in. H_2O
Leak Rate, (in H_2O/min):	0	Must be zero (manometer level stable for 1 minute)

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	29	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Meter Box Thermocouple Readout Calibration Check

Input Temperature	Allowable Temp. Dev.*
25	7
75	8
125	9
225	10
275	11
375	13
425	13
500	14

Stack	Probe	Filter	Exit	Aux.	Meter In	Meter Out
25	26	25	26	25	26	27
75	77	75	75	76	76	77
125	127	125	125	125	127	128
226	228	226				
276	279	277				
377						
426						
501						

Thermocouple simulator	
Make/Model:	Altek Type K
Serial No.	541
Cal Date:	12/10/2018

Meter Thermocouple Calibration

Ref. Temp	Allowable Temp. Dev.*	Meter In	Meter Out
56	8	57	56
83	8	82	82

Reference Thermometer	
Make/Model:	traceable
Serial No.	140754311
Cal Date:	4/6/2018

* Reading values must be within 1.5% of reference thermometer values (based on absolute temperature scale) for calibration to be acceptable.

Performed by: Name: Brett Sherwood Signature: [signature] Date: 1/18/19

Approved by: Name: JH Signature: [signature] Date: 1/18/19

Meter box 6-month calibration form (orifices) R1

MONTROSE ENVIRONMENTAL

EPA Method 5

Meter Box Calibration by Calibrated Critical Orifice: Post-Test, English Meter Box Units, English K' Factor

Meter box ID:	MB4
Meter ID (if applicable):	XXXX
Orifice set ID:	TV5
Calibrated by (initials):	NAME
Current 6-month calibration Yd:	0.9927
Date of 6-month calibration:	1/18/19

Date:	5/24/19
Location:	OFFICE
No. of runs (default 3)	3
Barometric pressure (in. Hg):	29.97 in. Hg
Theoretical critical vacuum:	14.14 in. Hg

Current Cal. Yd:	0.9927
Post-test Yd:	1.0087
Post-test Result:	PASS

Meter Box Orifice Calibration

IMPORTANT For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above

IMPORTANT The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

		Volume			Initial Temps.		Final Temps.		Orifice	K' Orifice		-- Ambient Temperature --		
ΔH (in H2O)	Time (min)	Initial (cu ft)	Final (cu ft)	Net (cu ft)	Inlet (deg F)	Outlet (deg F)	Inlet (deg F)	Outlet (deg F)	Serial# (number)	Coefficient (see above)	Vacuum (in Hg)	Initial (deg F)	Final (deg F)	Average (deg F)
2.00	10.00	734.250	742.364	8.114	65	64	71	69	24	0.6284	20.5	65	68	66.5
2.00	10.00	742.364	750.493	8.129	71	69	73	70	24	0.6284	20.5	68	68	68.0
2.00	12.00	750.493	760.205	9.712	75	70	75	70	24	0.6284	20.5	68	68	68.0

--- SAMPLE RATE ---
INDICATED VS. ACTUAL

ΔH (in. H2O)	Sample Rate (scfm)
2.00	0.82
2.00	0.82
2.00	0.82

--- DRY GAS METER ---
VOLUME CORRECTED

Vm(std) (cu ft)
8.176
8.137
9.689

------- ORIFICE -------

VOLUME CORRECTED Vcr(std) (cu ft)	VOLUME NOMINAL Vcr (cu ft)
8.207	8.174
8.196	8.185
9.835	9.822

-- DRY GAS METER --
CALIBRATION FACTOR Yd

Value (number)	Variation (number)
1.0038	-0.005
1.0072	-0.001
1.0150	0.006

------- ORIFICE -------
CALIBRATION FACTOR ΔH@

Value (in H2O)	Variation (in H2O)
1.68	0.004
1.67	-0.001
1.67	-0.003

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/-0.02.

For Orifice Calibration Factor ΔH@, the orifice differential pressure in inches of H20 that equates to 0.75 cfm of air at 68 F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/-0.2.

QA Criteria:	
Average Yd	1.0087
Average ΔH@	1.6740
Variation of Yd's	PASS
Variation of ΔH@	PASS
Vacuum Criteria	PASS

Meter Box Vacuum Leak Check

Test Vacuum, (in. Hg):	25	Coarse adjust valve fully open, fine adjust fully closed, sample inlet plugged
Leak Rate, (cfm):	0	Must be zero (meter dial stable for 1 minute)

Performed by: Name: Preston Baucler Signature: [signature] Date: 5/24/19

Approved by: Name: JA Signature: [signature] Date: 5/24/19

Meter box post-test calibration form (orifices) R3

Secondary Standard Calibration

DATE: 7/10/2018 Operator: Joe Camodeca

Meter Box No: 19461089				Meter Box ¯H@: 0.0000						Meter Box Yd 1.0012						Barometric Pressure: 29.69		
				Standard Meter Gas Volume			Meter Box Gas Volume (ft‹)			Std. Meter Temperature (ÞF)			Meter Box Temperature (ÞF)					
Q	P	H	Yds	Initial	Final	Vf	Initial	Final	Vf	Inlet	Outlet	Avg.	Inlet	Outlet	Avg.	Time	Yd	H@
0.38	-0.50	0.00	1.0000	0.0	5.000	5.000	60.802	65.810	5.008	71.0	71.0	71.0	72.0	72.0	72.0	13.13	1.0015	0.0000
0.38	-0.50	0.00	1.0000	0.0	5.000	5.000	65.810	70.812	5.002	71.0	71.0	71.0	72.0	72.0	72.0	13.13	1.0027	0.0000
0.37	-0.50	0.00	1.0000	0.0	5.000	5.000	70.812	75.818	5.006	71.0	71.0	71.0	72.0	72.0	72.0	13.16	1.0019	0.0000
0.62	-0.60	0.00	1.0000	0.0	5.000	5.000	79.000	84.028	5.028	71.0	71.0	71.0	72.0	72.0	72.0	8.00	0.9978	0.0000
0.62	-0.60	0.00	1.0000	0.0	5.000	5.000	84.028	89.037	5.009	71.0	71.0	71.0	72.0	72.0	72.0	8.00	1.0016	0.0000
0.62	-0.60	0.00	1.0000	0.0	5.000	5.000	89.037	94.050	5.013	71.0	71.0	71.0	72.0	72.0	72.0	8.00	1.0008	0.0000
0.81	-0.70	0.00	1.0000	0.0	5.000	5.000	96.100	101.132	5.032	71.0	71.0	71.0	72.0	72.0	72.0	6.11	0.9972	0.0000
0.81	-0.70	0.00	1.0000	0.0	13.000	13.000	101.132	114.203	13.071	71.0	71.0	71.0	72.0	72.0	72.0	15.89	0.9982	0.0000
0.80	-0.70	0.00	1.0000	0.0	7.000	7.000	114.203	121.250	7.047	71.0	71.0	71.0	72.0	72.0	72.0	8.58	0.9969	0.0000
0.99	-8.00	0.00	1.0000	0.0	5.000	5.000	123.000	128.038	5.038	71.0	71.0	71.0	72.0	72.0	72.0	4.99	1.0144	0.0000
0.99	-8.00	0.00	1.0000	0.0	5.000	5.000	128.038	133.079	5.041	71.0	71.0	71.0	72.0	72.0	72.0	4.99	1.0138	0.0000
0.99	-8.00	0.00	1.0000	0.0	5.000	5.000	133.079	138.138	5.059	71.0	71.0	71.0	72.0	72.0	72.0	4.99	1.0102	0.0000
1.23	-1.10	0.00	1.0000	0.0	5.000	5.000	42.900	47.946	5.046	71.0	71.0	71.0	72.0	72.0	72.0	4.00	0.9955	0.0000
1.23	-1.10	0.00	1.0000	0.0	5.000	5.000	47.946	53.018	5.072	71.0	71.0	71.0	72.0	72.0	72.0	4.00	0.9904	0.0000
1.24	-1.10	0.00	1.0000	0.0	5.000	5.000	53.018	58.068	5.050	71.0	71.0	71.0	72.0	72.0	72.0	3.99	0.9947	0.0000
																AVERAGE	1.0012	0.0000

Millennium Instruments Inc.
2402 Springridge Drive unit A
Spring Grove IL. 60081
PHONE#(815)675-3225
FAX#(815)675-6965
E-mail millennium@millinst.com
www.millinst.com

Signature:

Vacuum Gauge

(in. Hg)	Gauge
5.0	5.0
10.0	10.0
15.0	15.0
20.0	20.0
25.0	25.0

Critical Orifice Calibrations

Client	MONTROSE			12/11/2018 Date
Set ID	Set ND			in house Job
DGM (Y) =	1.0012	Fluke ID 526	PLC 0 at	3 inH2O
DGM ID #	19461089	Std Manometer 537	NLC 0 at	25 inHg

											JH	Calibrated
											JH	QA/QC
Dry Gas Meter			Orifice ID #	40	Orifice ID #	48	Orifice ID #	55	Orifice ID #	63	Orifice ID #	73
K' Critical Orifice Coefficient				**0.23465**		**0.33410**		**0.44746**		**0.58200**		**0.80081**
	Symbol	Units	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
Initial volume	V_i	ft²	482.710	492.710	499.070	506.870	514.220	531.675	539.835	550.470	578.550	618.200
Final Volume	V_f	ft²	492.710	499.070	506.870	514.220	531.675	539.835	550.470	558.830	618.200	638.090
Difference	V_m	ft²	10.000	6.360	7.800	7.350	17.455	8.160	10.635	8.360	39.650	19.890
Temperatures												
Ambient	T_a	°F	65.1	65.5	65.5	65.4	65.3	65.8	65.6	65.5	63.9	65.7
Absolute ambient	T_a	°R	524.77	525.17	525.17	525.07	524.97	525.47	525.27	525.17	523.57	525.37
Initial Inlet	T_i	°F	65.7	66.3	69.9	70.1	75.0	75.1	79.3	79.3	76.8	83.7
Outlet	T_f	°F	59.5	59.9	60.5	60.6	62.0	62.2	63.4	63.4	60.5	64.9
Final Inlet	T_i	°F	66.3	66.5	70.1	70.3	75.1	74.9	79.3	79.5	83.7	84.8
Outlet	T_f	°F	59.9	60.0	60.6	60.8	62.2	62.4	63.4	63.8	64.9	66.3
Avg. Temp	T_m	°R	522.52	522.845	524.945	525.12	528.245	528.32	531.02	531.17	531.1325	534.595
Time		min	33	21	18	17	30	14	14	11	38	19
		sec	0	0	0	0	0	0	0	0	0	0
			33.00	21.00	18.00	17.00	30.00	14.00	14.00	11.00	38.00	19.00
SAMPLE RATE		ACFM	0.3030	0.3029	0.4333	0.4324	0.5818	0.5829	0.7596	0.7600	1.0434	1.0468
Orifice man. rdg	dH@	in H_2O	0.31	0.31	0.67	0.67	1.30	1.30	2.20	2.20	4.10	4.10
Barometric. Pressure	Pbar	inHg	30.30	30.30	30.30	30.30	30.30	30.30	30.30	30.30	30.95	30.95
Pump vacuum		inHg	20.0	20.0	20.0	20.0	18.0	18.0	16.0	16.0	15.0	15.0
K' factor			0.2347	0.2346	0.3346	0.3337	0.4470	0.4479	0.5820	0.5820	0.8014	0.8002
K' factor Average				0.2347		0.3341		0.4475		0.5820		0.8008
% Error (+/- 0.5)		%	PASS	0.041%	PASS	0.135%	PASS	0.105%	PASS	0.005%	PASS	0.075%

Critical Orifice Calibration

Client	MONTROSE										2/6/19	Date
Set ID	TV5										in house	Job
DGM (Y) =	1.0012		Fluke ID	526		PLC	0 at		6 inH2O		PB	Calibrated
DGM ID #	19461089		Std Manometer	537		NLC	0 at		22 inHg		JH	QA/QC
Dry Gas Meter			Orifice ID #	12	Orifice ID #	16	Orifice ID #	18	Orifice ID #	24	Orifice ID #	31
K' Critical Orifice Coefficient				**0.30953**		**0.41461**		**0.48143**		**0.62836**		**0.79908**
	Symbol	Units	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
Initial volume	V_i	ft²	973.575	988.440	740.965	746.165	684.910	690.530	696.780	701.665	708.240	714.510
Final Volume	V_f	ft²	988.440	998.900	746.165	751.535	690.530	696.780	701.665	708.240	714.510	719.710
Difference	V_m	ft²	14.865	10.460	5.200	5.370	5.620	6.250	4.885	6.575	6.270	5.200
Temperatures												
Ambient	T_a	°F	56.5	57.0	55.7	55.7	54.9	54.6	54.8	54.6	54.8	54.9
Absolute ambient	T_a	°R	516.17	516.67	515.37	515.37	514.57	514.27	514.47	514.27	514.47	514.57
Initial Inlet	T_i	°F	64.8	66.1	59.7	59.7	63.5	66.1	67.3	71.4	72.1	76.7
Outlet	T_f	°F	57.1	58.6	56.1	56.1	56.8	57.1	57.5	58.4	59	59.8
Final Inlet	T_i	°F	66.1	67.2	64	64	67.1	69.1	72.1	74.3	78.1	79.5
Outlet	T_f	°F	58.6	59.1	56.2	56.2	57.1	57.5	58.1	58.8	59.6	60.4
Avg. Temp	T_m	°R	521.32	522.42	518.67	518.67	520.795	522.12	523.42	525.395	526.87	528.77
Time		min	37	26	9	10	9	10	6	8	6	5
		sec	0	0	45	0	0	0	0	0	0	0
			37.00	26.00	9.75	10.00	9.00	10.00	6.00	8.00	6.00	5.00
SAMPLE RATE		ACFM	0.3078	0.4023	0.5333	0.5370	0.6244	0.6250	0.8142	0.8219	1.0450	1.0400
Orifice man. rdg	dH@	in H_2O	0.57	0.57	1.00	1.00	1.40	1.40	2.40	2.40	4.10	4.10
Barometric. Pressure	Pbar	inHg	30.29	30.29	29.66	29.66	29.66	29.66	29.66	29.66	29.66	29.66
Pump vacuum		inHg	21.0	21.0	18.0	18.0	16.5	16.5	15.0	15.0	14.0	14.0
K' factor			0.3096	0.3095	0.4132	0.4160	0.4819	0.4810	0.6266	0.6301	0.8024	0.7958
K' factor Average				0.3095		0.4146		0.4814		0.6284		0.7991
% Error (+/- 0.5)		%	PASS	0.013%	PASS	0.343%	PASS	0.097%	PASS	0.273%	PASS	0.415%

MONTROSE ENVIRONMENTAL

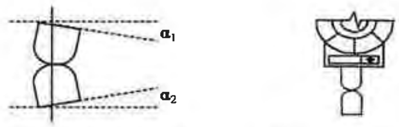
Pitot Tube Calibration Data Sheet

Calibration Date:	February 21, 2019	**Performed by:**	Austin Goracke	**Expiration Date:**	N/A
		ID No.:	S P-3 S4	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	S P-3 S4	**No damage:**	Yes
Probe Description:	Self Supporting Probe (SP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?	Yes	**Thermocouple passed calibration?**	Yes		

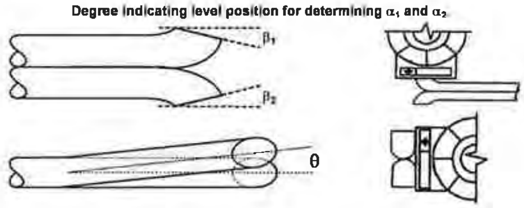
Protractor or Digital Angle Finder ID: 703
Measuring Tape ID: —
Caliper ID: ~~500-133~~ 39744 S4

Calibration performed using the procedures of EPA Method 2, Section 10.1

Alignment and Tubing Dimensions

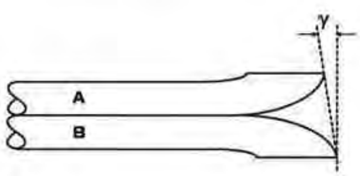


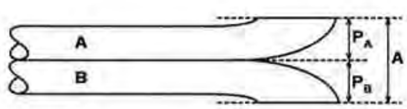
Degree indicating level position for determining α_1 and α_2



Degree indicating level position for determining θ.

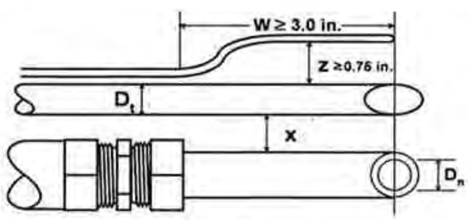
α_1 $(-10° < \alpha_1 < +10°)$	1.1	
α_2 $(-10° < \alpha_2 < +10°)$	1.4	
β_1 $(-5° < \beta_1 < +5°)$	1.5	
β_2 $(-5° < \beta_2 < +5°)$	1.3	
γ	0.1	
θ	1.7	
A	0.9165	
z= A tan γ (± 0.125")	0.0016	Pass
w= A tan θ (± 0.03125")	0.0272	Pass
D_t (0.1875" < D_t < 0.375")	0.3660	Pass
P_A $(1.05D_t < P_A < 1.5D_t)$	0.4850	Pass
P_B $(1.05D_t < P_B < 1.5D_t)$	0.4660	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0190	Pass



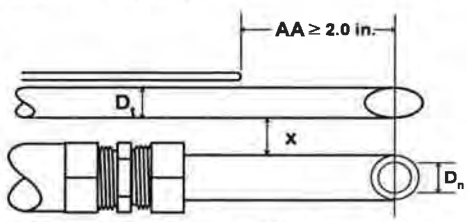


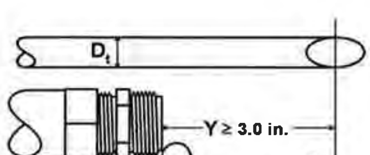
Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	6.050		Offset TC only
-or- AA (≥ 2.0")	N/A		Setback TC only
X	1.225		
D_n	0.370		
X / D_n (≥ 1.5)	3.315	Pass	
Y (≥ 3.0")	3.500	Pass	
Z ≥ 0.75"	1.679	Pass	Offset TC only





Performed By: Austin Goracke Signature: [signature] Date: 2/21/19

Approved By: JB Signature: [signature] Date: 2/25/19

MONTROSE ENVIRONMENTAL

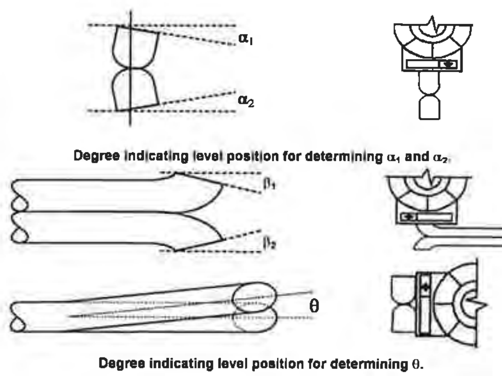
Pitot Tube Calibration Data Sheet

Calibration Date:	May 28, 2019	**Performed by:**	Preston Bauder	**Expiration Date:**	November 28, 2019
		ID No.:	SP-3	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	SP-3-SP-4	**No damage:**	Yes
Probe Description:	Self Supporting Probe (SP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?	Yes	**Thermocouple passed calibration?**	Yes		

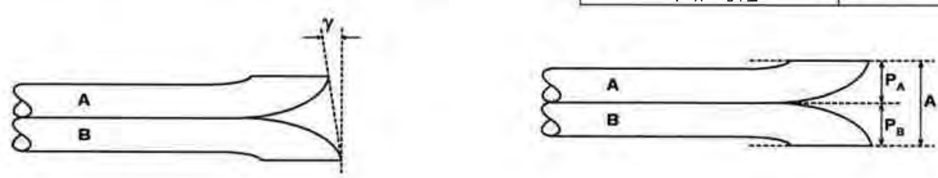
Protractor or Digital Angle Finder ID: 712
Measuring Tape ID: 720
Caliper ID: 702

Calibration performed using the procedures of EPA Method 2, Section 10.1

Alignment and Tubing Dimensions

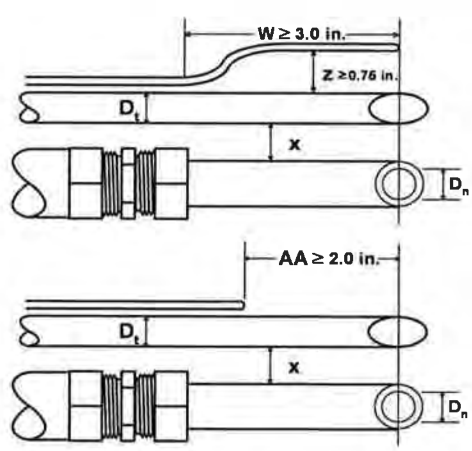


α_1 $(-10° < \alpha_1 < +10°)$	0.9	
α_2 $(-10° < \alpha_2 < +10°)$	1.3	
β_1 $(-5° < \beta_1 < +5°)$	1.4	
β_2 $(-5° < \beta_2 < +5°)$	0.7	
γ	0.6	
θ	1.8	
A	0.9330	
z= A tan γ (± 0.125")	0.0098	Pass
w= A tan θ (± 0.03125")	0.0293	Pass
D_t (0.1875" < D_t < 0.375")	0.3740	Pass
P_A (1.05D_t < P_A < 1.5D_t)	0.4540	Pass
P_B (1.05D_t < P_B < 1.5D_t)	0.4520	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0020	Pass

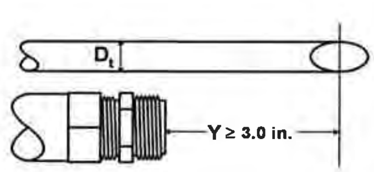


Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	6.902	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	1.620		
D_n	0.212		
X / D_n (≥ 1.5)	7.642	Pass	
Y (≥ 3.0")	4.012	Pass	
Z ≥ 0.75"	0.965	Pass	Offset TC only



Performed By: Preston Bauder Signature: [signature] Date: 5/28/19

Approved By: M WALLACE Signature: [signature] Date: 5/28/19

MONTROSE ENVIRONMENTAL

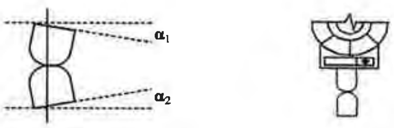
Pitot Tube Calibration Data Sheet

Calibration Date:	April 15, 2019	**Performed by:**	Brett Sherwood	**Expiration Date:**	
		ID No.:		**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	4-14	**No damage:**	Yes
Probe Description:	Nonself Supporting Probe (NP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?	Yes	**Thermocouple passed calibration?**	Yes		

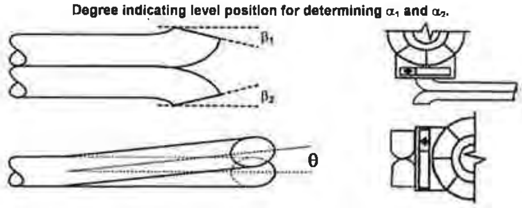
Protractor or Digital Angle Finder ID: 712
Measuring Tape ID: 713
Caliper ID: 702

Calibration performed using the procedures of EPA Method 2, Section 10.1

Alignment and Tubing Dimensions

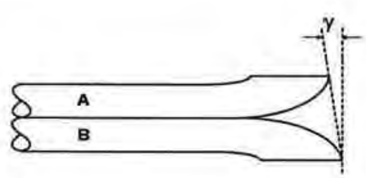


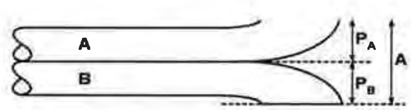
Degree indicating level position for determining α_1 and α_2.



Degree indicating level position for determining θ.

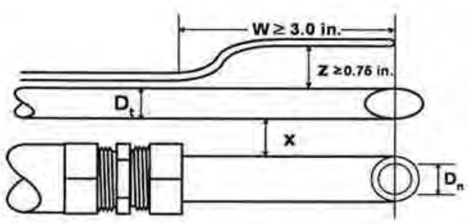
α_1 $(-10° < \alpha_1 < +10°)$	2.0	
α_2 $(-10° < \alpha_2 < +10°)$	3.0	
β_1 $(-5° < \beta_1 < +5°)$	2.0	
β_2 $(-5° < \beta_2 < +5°)$	1.0	
γ	0.0	
θ	0.0	
A	0.9345	
z= A tan γ (± 0.125")	0.0000	Pass
w= A tan θ (± 0.03125")	0.0000	Pass
D_t (0.1875" < D_t < 0.375")	0.3735	Pass
P_A (1.05D_t < P_A < 1.5D_t)	0.4605	Pass
P_B (1.05D_t < P_B < 1.5D_t)	0.4610	Pass
$\lvert P_A - P_B \rvert \le 0.0625$	-0.0005	Pass



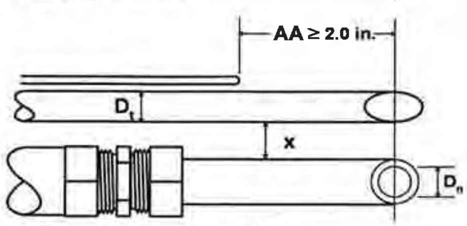


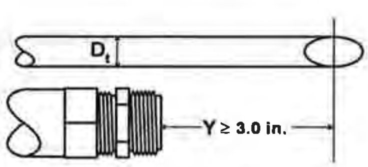
Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	5.750	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.791		
D_n	0.500		
X / D_n (≥ 1.5)	1.582	Pass	
Y (≥ 3.0")	3.950	Pass	
Z ≥ 0.75"	0.820	Pass	Offset TC only





Performed By: Brett Sherwood Signature: [signature] Date: 4/15/19

Approved By: [initials] Signature: [signature] Date: 4/15/19

Pitot Tube Measurement Calibration Sheet Revision: 2 Created: 3/16/15 by E Last revised: 5/11/18 by AV

MONTROSE ENVIRONMENTAL

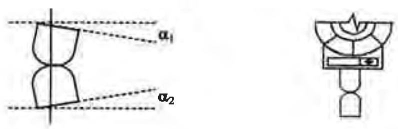
Pitot Tube Calibration Data Sheet

Calibration Date:	May 28, 2019	**Performed by:**	Preston Bauder	**Expiration Date:**	November 28, 2019
		ID No.:	4-14	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	4-14-SP-4	**No damage:**	Yes
Probe Description:	Self Supporting Probe (SP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?		Yes	**Thermocouple passed calibration?**		Yes

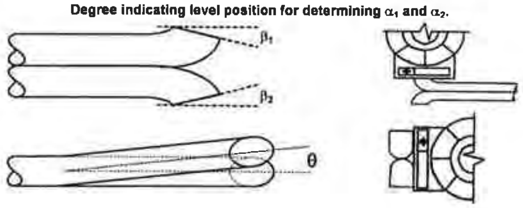
Protractor or Digital Angle Finder ID: 712
Measuring Tape ID: 720
Caliper ID: 702

Calibration performed using the procedures of EPA Method 2, Section 10 1

Alignment and Tubing Dimensions

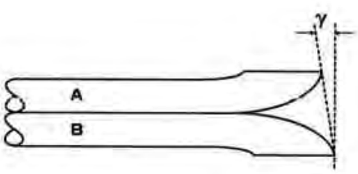


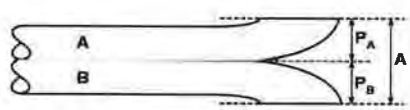
Degree indicating level position for determining α_1 and α_2.



Degree indicating level position for determining θ.

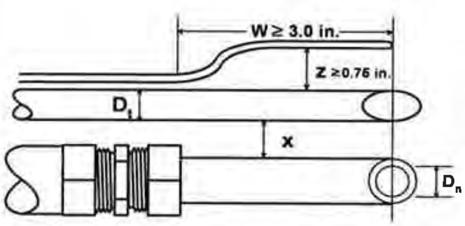
α_1 $(-10° < \alpha_1 < +10°)$	4.2	
α_2 $(-10° < \alpha_2 < +10°)$	3.4	
β_1 $(-5° < \beta_1 < +5°)$	0.6	
β_2 $(-5° < \beta_2 < +5°)$	0.8	
γ	1.8	
θ	1.5	
A	0.9430	
z= A tan γ (± 0.125")	0.0296	Pass
w= A tan θ (± 0.03125")	0.0247	Pass
D_t (0.1875" < D_t < 0.375")	0.3700	Pass
P_A (1.05D_t < P_A < 1.5D_t)	0.4540	Pass
P_B (1.05D_t < P_B < 1.5D_t)	0.4520	Pass
$\lvert P_A - P_B \rvert \leq 0.0625$	0.0020	Pass



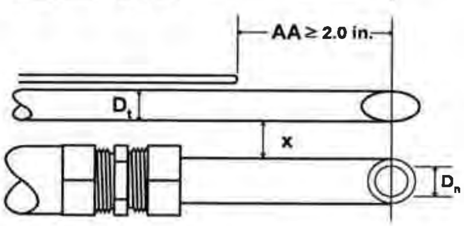


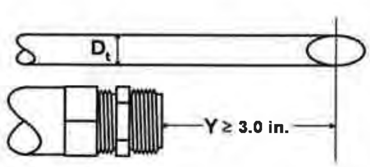
Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	6.947	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.719		
D_n	0.209		
X / D_n (≥ 1.5)	3.440	Pass	
Y (≥ 3.0")	4.057	Pass	
Z ≥ 0.75"	1.158	Pass	Offset TC only





Performed By: Preston Bauder Signature: [signature] Date: 5/28/19

Approved By: M WALLACE Signature: [signature] Date: 5/28/19

MONTROSE ENVIRONMENTAL

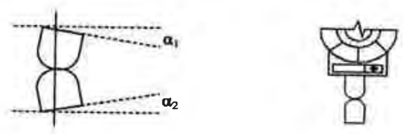
Pitot Tube Calibration Data Sheet

Calibration Date:	May 28, 2019	**Performed by:**	Preston Bauder	**Expiration Date:**	November 28, 2019
		ID No.:	117-NP-4	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	117-NP-4-SP-4	**No damage:**	Yes
Probe Description:	Self Supporting Probe (SP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?	Yes	**Thermocouple passed calibration?**	Yes		

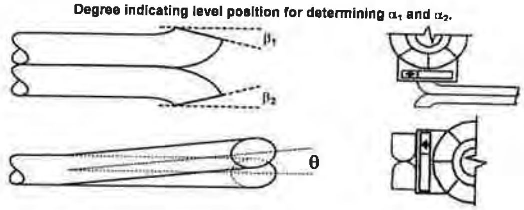
Protractor or Digital Angle Finder ID: 712
Measuring Tape ID: 720
Caliper ID: 702

Calibration performed using the procedures of EPA Method 2, Section 10.1

Alignment and Tubing Dimensions

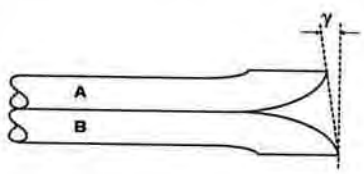


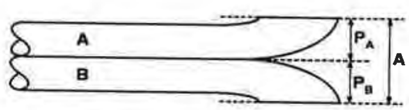
Degree indicating level position for determining α_1 and α_2.



Degree indicating level position for determining θ.

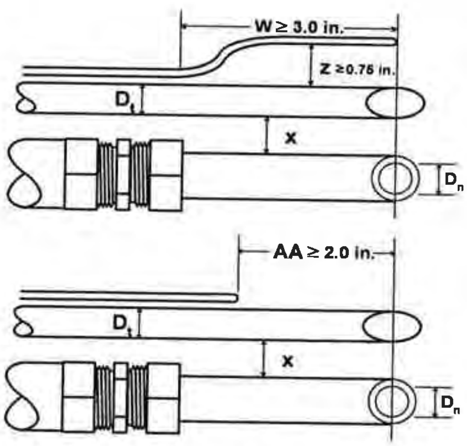
α_1 $(-10° < \alpha_1 < +10°)$	1.5	
α_2 $(-10° < \alpha_2 < +10°)$	1.8	
β_1 $(-5° < \beta_1 < +5°)$	1.1	
β_2 $(-5° < \beta_2 < +5°)$	2.6	
γ	2.1	
θ	1.0	
A	0.9090	
z= A tan γ (± 0.125")	0.0333	Pass
w= A tan θ (± 0.03125")	0.0159	Pass
D_t (0.1875" < D_t < 0.375")	0.3740	Pass
P_A $(1.05D_t < P_A < 1.5D_t)$	0.4540	Pass
P_B $(1.05D_t < P_B < 1.5D_t)$	0.4520	Pass
$\mid P_A - P_B \mid \leq 0.0625$	0.0020	Pass



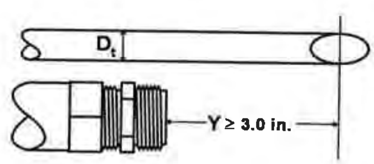


Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	6.123	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.624		
D_n	0.209		
X / D_n (≥ 1.5)	2.986	Pass	
Y (≥ 3.0")	4.616	Pass	
Z ≥ 0.75"	1.581	Pass	Offset TC only



Performed By: Preston Bauder Signature: [signature] Date: 5/28/19

Approved By: MWALLACE Signature: [signature] Date: 5/28/19

MONTROSE
ENVIRONMENTAL

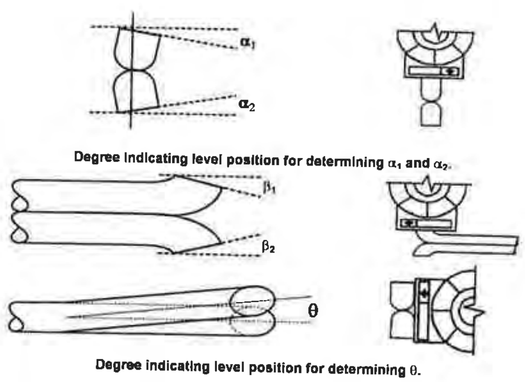
Pitot Tube Calibration Data Sheet

Calibration Date:	May 28, 2019	**Performed by:**	Preston Bauder	**Expiration Date:**	November 28, 2019
		ID No.:	118-NP-4	**No obstructions:**	Yes
Calibrated Pitot Tube:	S-type	**Probe/Pitot ID No:**	118-NP-4-SP-4	**No damage:**	Yes
Probe Description:	Self Supporting Probe (SP)	**Effective Length (ft):**	4	**Level and Perpendicular:**	Yes
Thermocouple calibration performed?		Yes	**Thermocouple passed calibration?**		Yes

Protractor or Digital Angle Finder ID: 712
Measuring Tape ID: 720
Caliper ID: 702

Calibration performed using the procedures of EPA Method 2, Section 10.1

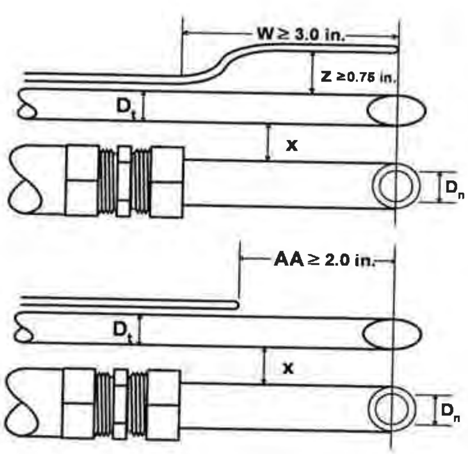
Alignment and Tubing Dimensions



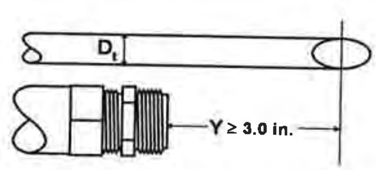
α_1 $(-10° < \alpha_1 < +10°)$	1.4	
α_2 $(-10° < \alpha_2 < +10°)$	3.2	
β_1 $(-5° < \beta_1 < +5°)$	0.9	
β_2 $(-5° < \beta_2 < +5°)$	2.7	
γ	1.1	
θ	1.8	
A	0.9220	
z= A tan γ (± 0.125")	0.0177	Pass
w= A tan θ (± 0.03125")	0.0290	Pass
D_t (0.1875" < D_t < 0.375")	0.3730	Pass
P_A ($1.05D_t < P_A < 1.5D_t$)	0.4540	Pass
P_B ($1.05D_t < P_B < 1.5D_t$)	0.4520	Pass
$\mid P_A - P_B \mid \leq 0.0625$	0.0020	Pass

Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



W (≥ 3.0")	6.108	Pass	Offset TC only
-or- AA (≥ 2.0")			Setback TC only
X	0.775		
D_n	0.209		
X / D_n (≥ 1.5)	3.708	Pass	
Y (≥ 3.0")	4.401	Pass	
Z ≥ 0.75"	2.142	Pass	Offset TC only



Performed By: Preston Bauder Signature: [signature] Date: 5/28/19
Approved By: MWALLACE Signature: [signature] Date: 5/28/19

Calibration
Certificate No. 1750.01

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4339-7950026

Traceable® Certificate of Calibration for Water-Proof Thermometer °F/°C

PT

Instrument Identification:

Model: 4339 S/N: 160753511 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Temperature Calibration Bath TC-231	A79341		
Temperature Probe	3039	3/09/17	6-A6E0D-20-1
Thermistor Module	A27129	11/13/16	1000383431
Temperature Calibration Bath TC-218	A73332		
Temperature Probe	128	3/09/17	6-A6E0D-40-1
Thermistor Module	A17118	3/10/17	1000388932

Certificate Information:

Technician: 104 Procedure: CAL-03 Cal Date: 9/12/16 Due Date: 9/12/18
Test Conditions: 23.8°C 55.0 %RH 1016 mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
°C		N.A.		0.000	-0.3	Y	-1.0	1.0	0.059	>4:1
°C		N.A.		100.000	100.0	Y	99.0	101.0	0.059	>4:1

This Instrument was calibrated using Instruments Traceable to National Institute of Standards and Technology.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ±U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min = As Left Nominal(Rounded) - Tolerance; Max = As Left Nominal(Rounded) + Tolerance; Date=MM/DD/YY

Nicol Rodriguez
Nicol Rodriguez, Quality Manager

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Water-Proof Thermometer °F/°C should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Water-Proof Thermometer °F/°Cs change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 service@control3.com www.control3.com

Control Company is an ISO 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01.
Control Company is ISO 9001:2008 Quality Certified by (DNV) Det Norske Veritas, Certificate No. CERT-01805-2006-AQ-HOU-RvA.
International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

Certified Calibration Service, LLC

917 Industry Drive
Tukwila,WA 98188 USA
1-425-255-1485

Z540.3 Calibration

Certificate of Calibration

Report Date 10/11/2018

Certificate No 181011-03

ID MAQS-ST2

Manufacturer CONTROL COMPANY
Description Thermometer + Probe
Model No. 4039
Gage S/N ST2
Calibration Location C.C.S Metrology Lab

Customer

Montrose Environmental
4150B Place NW Suite 106
Auburn, WA 98001

PO No Credit Card
Order Date 05 Oct 2018

Certification Statement

Certified Calibration Service, LLC Quality Management Systems (QMS) is in accordance with the requirements of ISO/IEC 17025:2017/Option A/Testing/Calibration, ANSI/NCSL Z540.3-2006 and the technical requirements of the customer's order. The measurement standards used are traceable to the National Institute of Standards and Technology (NIST), and through NIST to the International system of units (SI), fundamental or natural physical constants with values assigned or accepted by NIST. The Test Uncertainty Ratio (TUR) for each calibration parameter is at least 4:1 or greater unless otherwise indicated. The results relate only to the item calibrated and are certified to user/client supplied maximum permissible error (MPE), original equipment manufacturer supplied MPE or the American Society for Testing and Materials (ASTM) standard MPE. The calibration due date and calibration interval are calculated as per user/client agreement. Presented in simplified format in accordance with client contract or quality agreement, the uncertainty of measurement associated with the measurement results reported in this certificate is available upon request. This certificate may not be reproduced, except in full, without the written approval of Certified Calibration Service, LLC. This calibration shall not be used to claim product endorsement. Calibration certificates without signature are not valid

Statement

This calibration meets all user/client requirements

Calibration Date 10/9/2018
Due Due 10/9/2019
Calibration Interval 1.00 Years

As Found In
Approved Yes

Environmental Conditions
Temperature 21 Deg C
Humidity 52 %Rh

Procedure

CCS-0005-CALSOP TEMP INDICATING DEVICES-GENERAL

Standard Used

CCS-0537 Due 26 MAR 2020 CERT -180066-00
CCS-0406 Due-11 DEC 2018 CERT-171211-01

		Maximum Permissible Error			Unit Under Test						
Test Point Range	Units	Minimum	Nominal	Maximum	As Found	Difference	Fail	As Left	Difference	Fail	TUR
A) 0 °C	°C	-1.3	0.0	1.3	0.3	0.30	No	0.3	0.30	No	4:1
B) 50 °C	°C	48.7	50.0	51.3	51.3	1.30	No	51.3	1.30	No	4:1

Calibration By: Victor Wolff - Technical Sup Mgr.

Reviewed By: Ineke Wolff - QA Mgr

Established 1974

QUALITY CONTROL SERVICES

LABORATORY EQUIPMENT • SALES • SERVICE • CALIBRATION • REPAIRS
2340 SE 11TH Ave. Portland, Oregon 97214 • Box 14831 Portland, Oregon 97293
(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com

Montrose Environmental Group PDX
13585 N.E. Whitaker Way
Portland, OR 97230

CERTIFICATE OF CALIBRATION

Certificate Date: 1/7/19

The instruments listed below have been serviced and calibrated by Quality Control Services on the date indicated. Service consists of accuracy tests, adjusting to manufacturer or customer specifications and complete calibration with standards traceable to the National Institute of Standards(NIST).

Item	Make Model	Serial Number Customer's ID	Location	Contact	Calibration Date	Calibration Due Date
Balance	Sartorius TE4101	17750271	Lab	Matt Caron	1/7/19	1/2020
Balance	Sartorius TE4101	23350312	Lab	Matt Caron	1/7/19	1/2020
Balance	AND EJ-1500	5A2826864	Lab	Joe Heffeman	1/7/19	1/2020

STANDARDS

Item	Make	Model	Serial #	NIST ID	Cal Date	Cal Due
Weight Set	Rice Lake	20 kg to 1mg	2831W	20172422	1/3/18	1/2019

17750271 HE681

23351212 HE710

5A2826864 HE711

Technician: J. Colacchio

Signature:

PTID: HORE01

QUALITY CONTROL SERVICES
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(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com
Established 1974

ACCREDITED
CERTIFICATE #1550.01

Report of Calibration

Firm: Montrose Environmental Group PDX
Address: 13585 N.E. Whitaker Way
City/State/Zip: Portland, OR 97230

Test Completed: 01/15/19
Submitted By: Joe Heffernan
Traceable Number: 20182545

Test Item: 500 g Individual Weights
Serial No.: Listed in Table

Manufacturer: Rice Lake

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.607 to 21.923	758.69 to 758.76	46.23 to 48.36

Conventional Mass Value

Nominal Value	As Found Value (g)	As Found Correction (mg)	Uncertainty (mg)	Tolerance (mg)
500 g 4-dot, 10639	500.00143	1.43	0.11	10
500 g 5-dot, 10640	500.00103	1.03	0.11	10
500 g 6-dot, 10641	500.00103	1.03	0.11	10

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: These weights were received in good condition and were within ASTM Class 4 tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories.* This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 01/15/19

Signature David S. Thompson

MONTROSE
AIR QUALITY SERVICES

Caliper Calibration Sheet

Date: 5/6/2019 **Initials:** PB

Caliper (Tolerance: ± 0.001")

Reference CLP ID: DJ0094

	Reading 1 (")	Reading 2 (")	Reading 3 (")	AVG
Reference Nozzle 1	0.2055	0.205	0.2055	0.205
Reference Nozzle 2	0.3735	0.374	0.3745	0.374
Reference Nozzle 3	0.5015	0.501	0.5015	0.501

Caliper ID: 39744

	As Found Reading 1 (")	As found Reading 2 (")	As Found Reading 3 (")	AVG	Tolerance (Pass/Fail)
Reference Nozzle 1	0.204	0.2045	0.205	0.205	[illegible]
Reference Nozzle 2	0.374	0.374	0.3745	0.374	[illegible]
Reference Nozzle 3	0.501	0.5015	0.502	0.502	[illegible]

Barometric Pressure Determination

Date: 05/15/19

Time: 0:00

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&stat

Reference Barometer ID	**Current conditions at**
Reference Barometer Location	Portland, Portland International Airport (KPDX)
Reference Barometer Other Info.	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Indication, corrected to sea level	29.75
Reference Barometer Reference Elevation	20
Reference Barometer Actual Pressure	29.73
Test Barometer Location/Site	PDX
Location/Site Elevation	20
Location/Site Barometric Pressure	29.73
Sampling Location Height (above/below site elevation)	60
Sampling Location Barometric Pressure	**29.67**

Barometric Pressure Determination

Date: 05/16/19

Time: 0858

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&stat

Reference Barometer ID	**Current conditions at**
Reference Barometer Location	Portland, Portland International Airport (KPDX)
Reference Barometer Other Info.	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Indication, corrected to sea level	29.54
Reference Barometer Reference Elevation	20
Reference Barometer Actual Pressure	29.52
Test Barometer Location/Site	PDX
Location/Site Elevation	20
Location/Site Barometric Pressure	29.52
Sampling Location Height (above/below site elevation)	60
Sampling Location Barometric Pressure	**29.46**

Barometric Pressure Determination

Date: 05/17/19

Time: 0858

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&stat

Reference Barometer ID	**Current conditions at**
Reference Barometer Location	Portland, Portland International Airport (KPDX)
Reference Barometer Other Info.	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Indication, corrected to sea level	29.89
Reference Barometer Reference Elevation	20
Reference Barometer Actual Pressure	29.87
Test Barometer Location/Site	PDX
Location/Site Elevation	20
Location/Site Barometric Pressure	29.87
Sampling Location Height (above/below site elevation)	60
Sampling Location Barometric Pressure	**29.81**

Barometric Pressure Determination

Date: 05/21/19

Time: 0823

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&stat

Reference Barometer ID	**Current conditions at**
Reference Barometer Location	Portland, Portland International Airport (KPDX)
Reference Barometer Other Info.	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Indication, corrected to sea level	**29.68**
Reference Barometer Reference Elevation	**20**
Reference Barometer Actual Pressure	29.66
Test Barometer Location/Site	**PDX**
Location/Site Elevation	**20**
Location/Site Barometric Pressure	29.66
Sampling Location Height (above/below site elevation)	**60**
Sampling Location Barometric Pressure	**29.60**

Barometric Pressure Determination

Date: 05/22/19

Time: 0715

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&state

Reference Barometer ID	**Current conditions at**
Reference Barometer Location	Portland, Portland International Airport (KPDX)
Reference Barometer Other Info.	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Indication, corrected to sea level	**30.06**
Reference Barometer Reference Elevation	**20**
Reference Barometer Actual Pressure	30.04
Test Barometer Location/Site	**PDX**
Location/Site Elevation	**20**
Location/Site Barometric Pressure	30.04
Sampling Location Height (above/below site elevation)	**60**
Sampling Location Barometric Pressure	**29.98**

Barometric Pressure Determination

Date: 05/23/19

Time: 0823

Data By: JH

Reference: http://forecast.weather.gov/MapClick.php?CityName=Orange&stat

Reference Barometer ID	**Current conditions at**
Reference Barometer Location	Portland, Portland International Airport (KPDX)
Reference Barometer Other Info.	Lat: 45.59578°NLon: 122.60917°WElev: 20ft.
Reference Barometer Indication, corrected to sea level	**30.05**
Reference Barometer Reference Elevation	**20**
Reference Barometer Actual Pressure	30.03
Test Barometer Location/Site	**PDX**
Location/Site Elevation	**20**
Location/Site Barometric Pressure	30.03
Sampling Location Height (above/below site elevation)	**60**
Sampling Location Barometric Pressure	**29.97**

APPENDIX F
MISCELLANEOUS INFORMATION

Appendix F.1
Agency Correspondence

Oregon

May 13, 2019

Dennis Buenger, CHMM
Owens-Brockway Glass Container
9710 NE Glass Plant Road
Portland, OR 97220

Re: Owens-Brockway Glass Container, Inc.
Title V Permit 26-1876
Source Test Plan

Mr. Buenger:

The revised source test plan received on May 9, 2019 for testing at the Owens-Brockway Glass Container facility located in Portland, OR has been reviewed. DEQ understands that Glass Melting Furnaces A (GM1) and D (GM4) will be tested.

For any source test data to be used for a Cleaner Air Oregon (CAO) risk assessment(s), DEQ will need to better understand the products manufactured, glass formulations (including chromium content), and how various production variables affect emissions. Therefore, DEQ does not accept the Source Test Plan submitted on May 9, 2019 as the only Source Test Plan required to meet CAO requirements. DEQ will require that data used for CAO risk assessment purposes result from source tests conducted under typical worst-case conditions that generate the highest emissions. Consistent with DEQ's Source Sampling Manual, it will be imperative to describe in detail the proposed process conditions that generate such "worst-case conditions". Because the facility has a number of variable process conditions (e.g. % cullet, type of cullet, natural gas usage, electric boost rate) and manufactures a different colors of glass with variable chromium and other metal HAP content, multiple source testing events may be required for DEQ to understand the facility's hazardous air pollutant emissions and approve a risk assessment. The source tests proposed in the May 9, 2019 plan represent an appropriate first step. DEQ would welcome the opportunity to meet with Owens-Brockway to discuss the May 2019 source test results, better understand the company's operations, and discuss additional CAO data needs.

The test plan submitted by Owens-Brockway on May 9, 2019 is approved with the following conditions:

GENERAL PROCESS CONDITIONS

1. Only regular operating staff may adjust the production process and emission control parameters during the source performance tests and within two (2) hours prior to the tests. Any operating adjustments made during the source performance tests, which are a result of consultation during the tests with source testing personnel, equipment vendors or consultants, may render the source performance test invalid.
2. Sampling replicate(s) will not be accepted if separated by duration of twenty-four (24) hours or more, unless prior authorization is granted by DEQ.
3. The DEQ must be notified of any changes in the source test plan and/or the specified methods prior to testing. Significant changes not acknowledged by the DEQ could be the basis for invalidating a test run and potentially the entire testing program. Documentation

of any deviations must include an evaluation of the impact of the deviation on the test data.

4. Method-specific quality assurance/quality control (QA/QC) procedures must be performed to ensure that the data is valid for determining source compliance. This must be done whether or not DEQ representatives are on-site to observe the testing and whether or not a QA/QC requirement has been specifically acknowledged and approved by DEQ. Only method-specific requirements explicitly exempted by the EPA and/or DEQ need not be performed. Documentation of the procedures and results shall be presented in the source test report for review. Omission of this critical information will result in rejection of the data, requiring a retest.

5. It is acceptable to postpone a scheduled test or suspend a test in progress if the discontinuation is due to equipment failure beyond the facility's control, construction delays beyond the facility's control, severe meteorological conditions, and situations that would jeopardize the safety of the testing contractors and/or operators. If the test is underway, the permittee should make every effort to complete the test run. All recoverable test information (process & sample data) must be available for DEQ review.

   It is unacceptable to postpone or suspend a test run in progress if it is discontinued because the source is not able to comply with an emission limit or verify an emission factor. The permittee must provide DEQ written documentation explaining the reasons for the postponement or stoppage, and any data collected prior to the stoppage.

6. In general, the unanalyzed portions (aliquots) of the source test samples must be preserved up to the maximum holding times as specified by test method. Sample filters gravimetrically analyzed for particulate matter are to be archived for a minimum of 6 months. However, sample archiving specifications pertaining to laboratory glassware is left to the discretion of the analyzing laboratory and the testing contractor.

7. For demonstrating compliance with emission standards, the stack test must successfully demonstrate that a facility is capable of complying with the applicable standard under all normal operating conditions. Therefore, an owner or operator should conduct the source test while operating under typical worst-case conditions that generate the highest emissions. The process material(s) and fuel(s) that generate the highest emissions for the pollutant(s) being tested should be used during the testing.

8. Source testing should be done at the highest achievable operating rate but shall not be less than 90% of the maximum operating rate.

9. For Furnace D, per 40 CFR 63.11452(a)(3)(i) "You must conduct the performance test while the furnace is producing glass that has the greatest potential to emit the glass manufacturing metal HAP from among the glass formulations that are used in any of the identical furnaces." Testing shall be repeated if green glass with a greater potential to emit chromium is produced in the future.

10. During source testing the following process parameters must be monitored and recorded (as applicable). All process parameters are to be reported for each individual test run and averaged for all test runs if appropriate.
    - Glass production rate
    - Type of glass produced
    - Recycled-to-raw material ratio (% cullet)
    - % of each cullet type used
    - Raw material addition rates
    - Natural gas usage

- Electric boost rate
- Bridgewall temperature
- COMS data

11. For source testing on a furnace that spans several days, care should be taken to ensure that the process is running at a consistent rate over the several days of the testing.

EPA METHODS 1-4 CONDITIONS

12. The exhaust duct flow measurements must meet the EPA Methods 1 & 2 criteria. Documentation including clear diagrams must be provided in the source test report.
13. Cyclonic flow shall be checked prior to the start of the test.
14. Each Method 3A sampling system must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leak check are to be documented within the test report.
15. Measured emissions should be between 20 to 100 percent of the calibration span.
16. Moisture content of the exhaust stack gas must be determined by EPA Method 4 for each test run.

EPA/ODEQ METHOD 5 CONDITIONS (Filterable, Condensable &Total PM)

17. The minimum sample volume is 31.8 dscf.
18. During sampling, make sure other sampling probes are not interfering with isokinetic sampling.
19. Sample gas temperature exiting the filter shall be maintained at 120 ± 14 °C (248 ± 25 °F).
20. For ODEQ Method 5, the method quantifiable limit (MQL) is 7 mg of PM, which should be taken into consideration when targeting a minimum sample volume and when calculating results. Since emission factors and compliance with permit limits are to be determined, it is very important that 7 mg or more is collected. If less than 7 mg is collected, compliance limit calculations shall be based not on the actual mass of PM collected but on the MQL of 7 mg as a "less than quantifiable limit" value. If that is the case, then the calculated grain loading concentrations reported will most likely be greater than the true concentrations. To avoid this situation, the sampling times should be long enough to collect a sample volume large enough to obtain at least 7 mg of PM per test run.
21. Filterable, condensable and total PM test results must be reported as follows for each test run and averaged for all three test runs. Complete example calculations must be provided for at least one test run.
    - gr/dscf
    - lb/hour
    - lb/ton of glass (g/kg of glass)

EPA METHOD 6C CONDITIONS

22. Each Method 6C sampling system must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leak check are to be documented within the test report.
23. A stratification check specifically for SO_2 must be performed. Stratification may not be determined for SO_2 based on a diluent or other pollutant.
24. Measured emissions should be between 20 to 100 percent of the calibration span.

25. For compliance limits and/or emission factor verification, SO_2 emissions must be reported as indicated below for each individual test run and averaged for all three test runs. Hand calculations must be provided for at least one test run.
    - ppmvd
    - lb/hr
    - lb/ton of glass

EPA METHOD 7E CONDITIONS

26. The converter efficiency check of the NOx analyzer shall be performed on site and documented within the test report.
27. Each Method 7E sampling system must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leak check are to be documented within the test report.
28. A stratification check specifically for NO_x must be performed. Stratification may not be determined for NO_x based on a diluent or other pollutant.
29. Measured emissions should be between 20 to 100 percent of the calibration span.
30. For compliance limits and/or emission factor verification, NO_X emissions must be reported as indicated below for each individual test run and averaged for all three test runs. Hand calculations must be provided for at least one test run.
    - ppmvd
    - lb/hr
    - lb/ton of glass

EPA METHOD 10 CONDITIONS

31. The Method 10 sampling system must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leak check are to be documented within the test report.
32. A stratification check specifically for CO must be performed. Stratification may not be determined for CO based on a diluent or other pollutant.
33. Measured emissions should be between 20 to 100 percent of the calibration span.
34. For compliance limits and/or emission factor verification, CO emissions must be reported as indicated below for each individual test run and averaged for all three test runs. Hand calculations must be provided for at least one test run.
    - ppmvd
    - lb/hr
    - lb/ton of glass

EPA METHOD 25A CONDITIONS

35. Each Method 25A sampling system must be leak-checked before and after the testing program (before the first run and after the last run). Results of the leak check are to be documented within the test report.
36. The span of the analyzer used to perform EPA Method 25A should be equivalent to 1.5 to 2.5 times the expected concentration.
37. Results may not be drift corrected.
38. If the calibration drift is more than 3% of the span value the test must be repeated.

39. The calibration gases shall be the following percent of the instrument's span.
    - zero < 0.1%
    - low level = 25-35%
    - mid level = 45-55%
    - high level = 80-90%

40. VOC emissions must be reported as indicated below for each individual test run and averaged for all three test runs. Hand calculations must be provided for at least one test run.
    - ppmvd as propane
    - lb/hr
    - lb/ton of glass

EPA METHOD 29 CONDITIONS

41. An audit sample must be obtained from an EPA approved audit sample provider and be analyzed with the samples. The DEQ SSAS ID is R0032.

42. During metals testing, oxygen and carbon dioxide content of the stack gas shall be determined by EPA Method 3A.

43. A minimum of 120 dscf shall be collected.

44. If the values measured are below the detection limit of the method, results shall be reported as less than the detection limit.

45. During sampling, make sure other sampling probes are not interfering with isokinetic sampling.

46. Sample gas temperature exiting the filter shall be maintained at 120 ± 14 °C (248 ± 25 °F).

47. Test results must be reported as follows for each test run and averaged for all three test runs. Example calculations should be provided for at least one test run.
    - mg/dscm
    - lb/hr
    - lb/ton of glass

EPA METHOD 205 CONDITIONS

48. If a gas dilution system is to be used to provide calibration gases for other source test methods, then the system shall be evaluated once during the source test in accordance with the requirements of EPA method 205 to make sure it meets specifications.

EPA METHOD 316 CONDITIONS

49. During sampling, make sure other sampling probes are not interfering with isokinetic sampling.

50. Isokinetic sampling rate shall be below 28 l/min (1.0 cfm).

51. Follow sample storage and handling procedures outlined in sections 8.7.1 and 8.7.2.

52. Reagent and Field Blank Samples are required as outlined in the test method.

53. Lab Blank Samples, Lab Duplicate Samples, and Lab Matrix Spike samples are required as outlined in the test method.

54. If the values measured are below the detection limit of the method, results shall be reported as less than the detection limit.

55. Formaldehyde emissions must be reported as indicated below for each individual test run and averaged for all three test runs. Results should include example calculations must be provided for at least one test run.
    - ppmvd
    - mg/dscm
    - lbs/hr
    - lb/ton of glass

CARB METHOD 425 CONDITIONS

56. During sampling, make sure other sampling probes are not interfering with isokinetic sampling.
57. All surfaces which may come in contact with sample shall be glass, quartz, Teflon, or other similar non-metallic inert material.
58. At all times during sampling and transport of the samples, the pH of the probe rinse and impinger solutions shall be maintained above a pH of 8.0. Documentation of this shall be included in the report.
59. Rinse the probe with at least 100 mL of 0.1 N NaOH. Measure and record the probe rinse volume. We recommend that a pre-measured volume of rinse (e.g., 100 mL) be provided to the sample recovery person so that the same amount of rinse is used for each test.
60. Take steps to make sure the level of hexavalent chromium in the NaOH reagent is as low as possible before testing begins.
61. Meticulously follow the procedures in section 8.1 to make sure the sampling trains are free of contaminants.
62. Field Blank Samples are required as outlined in section 12.3.
63. Samples shall be maintained at or below 4°C.
64. The hexavalent chromium analyses are to be completed within 14 days of sample collection (Section 4.1 of the method).
65. If the values measured are below the detection limit of the method, results shall be reported as less than the detection limit.
66. Hexavalent and total chromium test results must be reported as follows for each test run and averaged for all three test runs. Example calculations should be provided for at least one test run.
    - mg/dscm
    - lb/hr
    - lb/ton of glass (g/kg of glass)

GENERAL TESTING CONDITIONS

67. A copy of a completed Source Test Audit Report (STAR) for all applicable Methods performed must accompany the submittal of the Source Test Report. A copy of the STAR forms is available electronically from the regional source test coordinator.
68. In an attempt to conserve natural resources and to minimize storage space requirements, the test report should be printed on both sides of each page within the document. DEQ recognizes this may not be feasible for some supporting documentation (i.e. figures, maps, etc.).
69. The source test report must be submitted to the DEQ by July 21, 2019.

DEQ understands that testing is to begin on May 15, 2019. Please let me know if the schedule changes. I plan to observe these tests.

If you have any questions or concerns, please contact me at 503-229-5534 or my cell number is (503) 679-5480.

Sincerely,

Thomas Rhodes
Source Test Coordinator

cc: George Yun, DEQ
Suzanne Blackburn, DEQ
Jonathan Giska, DEQ
Becka Puskas, DEQ

SOURCE TEST PLAN
2019 CIVIL PENALTY ORDER RESPONSE COMPLIANCE TESTING
OWENS-BROCKWAY GLASS CONTAINER FURNACE A AND FURNACE D
PORTLAND, OREGON

Prepared For:

Owens-Brockway Glass Container Inc.
9710 NE Glass Plant Road
Portland, OR 97220

For Submittal To:

Oregon Department of Environmental Quality
4026 Fairview Industrial Drive SE
Salem, OR 97302

Prepared By:

Montrose Air Quality Services, LLC
4150 B Place NW, Suite 106
Auburn, WA 98001

Document Number:	**W006AS-596331-PP-17**
Proposed Test Dates:	**May 15-22, 2019**
Original Submittal Date:	**May 6, 2019**
Revision Submittal Date:	**May 9, 2019**

STAC
STACK TESTING ACCREDITATION COUNCIL

A2LA ACCREDITED
TO ASTM D7036 ONLY
CERT #3925.01

MONTROSE
AIR QUALITY SERVICES

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1.0 OBJECTIVES AND SUMMARY OF TEST PROGRAM

1.1 PROGRAM OBJECTIVES

Montrose Air Quality Services, LLC (Montrose) has been contracted by Owens-Brockway Glass Container (Owens-Brockway) to perform a series of air emission tests at the facility located in Portland, Oregon. The tests will be conducted to determine compliance with the testing terms outlined in the Notice of Civil Penalty Assessment and Order Case No. AQ/V-NWR-2019-016. Tests are scheduled to be conducted on May 15-16 and May 20-22, 2019. Montrose will perform the tests to measure the following emission parameters:

- Emission Compliance:
  - CO (ppm volume dry, lb/hr, lb/ton)
  - NO_x (ppm volume dry, lb/hr, lb/ton)
  - VOC (ppm volume dry, lb/hr, lb/ton)
  - SO_2 (ppm volume dry, lb/hr, lb/ton)
  - PM (total) as PM_{10} (gr/dscf, lb/hr, lb/ton, g/kg glass)
  - Formaldehyde (mg/dscm, lb/hr)
  - Chromium (VI) and Total Chromium (mg/dscm, lb/hr, lb/ton)
  - Antimony, Arsenic, Beryllium, Cadmium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, and Selenium (mg/dscm, lb/hr, lb/ton, g/kg glass)
- O_2 and CO_2 (% volume dry) – for molecular weight
- Stack volumetric flow rate (dscfm) and moisture content (% by volume)

Montrose will provide the test personnel and the necessary equipment to measure emissions as outlined in this test plan. Facility personnel will provide the process and production data to be included in the final report. A summary of the test program and proposed schedule is presented below in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM AND PROPOSED SCHEDULE

Date	Unit ID/ Source Name	Activity/ Pollutants	Test Methods	No. Runs	Duration
May 14, 2019	--	Mobilize, site safety, setup Furnace D	--	--	--
May 15, 2019	Furnace D	Formaldehyde PM SO_2 NO_x CO TGOC	EPA 316 ODEQ 5 EPA 6C EPA 7E EPA 10 EPA 25A	1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3	60 minutes 60 minutes 60 minutes 60 minutes 60 minutes 60 minutes
May 16, 2019	Furnace D	Cr, Cr^{+6} Metals	CARB 425[1] EPA 29	1, 2 1, 2	240 minutes 240 minutes
May 17, 2019	Furnace D	Cr, Cr^{+6} Metals Setup Furnace A	CARB 425[1] EPA 29 --	3 3 --	240 minutes 240 minutes --
May 20, 2019	Furnace A	Formaldehyde PM SO_2 NO_x CO TGOC	EPA 316 ODEQ 5 EPA 6C EPA 7E EPA 10 EPA 25A	1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3	60 minutes 60 minutes 60 minutes 60 minutes 60 minutes 60 minutes
May 21, 2019	Furnace A	Cr, Cr^{+6} Metals	CARB 425[1] EPA 29	1 1	240 minutes 240 minutes
May 22, 2019	Furnace A	Cr, Cr^{+6} Metals	CARB 425[1] EPA 29	2 2	240 minutes 240 minutes
May 23, 2019	Furnace A	Cr, Cr^{+6} Metals	CARB 425[1] EPA 29	3 3	240 minutes 240 minutes
90 days after consent order is final	Furnaces A & D	Final Report Submittal Deadline			

[1]We are requesting ODEQ allow the use of CARB 425 in lieu of SW-846 0061 due to the elevated stack temperatures at the furnace exits.

Notes: EPA Methods 1, 2, 3A, and 4 will be performed during all testing listed above.

Operation on Furnace A switches between the North and South stack every 30 minutes, Montrose will collect one 120-minute test run on each of the Furnace A stacks. Results will be presented individually and as an average of the two in the final test report.

1.2 APPLICABLE REGULATIONS AND PERMIT LIMITS

The results from this test program will be presented in units consistent with those listed in the permit or subpart. The limits are presented in Table 1-2:

TABLE 1-2
EMISSION LIMITS

Emission Parameter	Units of Measurement	Permit Limits	Emission Limit Reference
Particulate Matter	g/kg of glass produced gr/dscf tons/year	0.5 0.10 N/A	AQ/V-NWR-2019-016 Permit Condition 12 Permit Condition 36
SO_2	tons/year	N/A	Permit Condition 36
NO_x	tons/year	N/A	Permit Condition 36
CO	tons/year	N/A	Permit Condition 36
VOC	tons/year	N/A	Permit Condition 36
Formaldehyde	mg/dscm lb/hr	N/A	AQ/V-NWR-2019-016
Cr	g/kg of glass produced	0.01	40 CFR 63.11451 & Table 1 to Subpart SSSSSS of 40 CFR 63
As, Cd, Cr, Cr^{+6}, Pb, Mn, Ni, An, Be, Co, Cu, Hg, Se	mg/dscm lb/hr	N/A	AQ/V-NWR-2019-016

1.3 PROJECT CONTACTS

A list of project participants is included below:

Facility Information

Source Location:	Owens-Brockway Glass Container 9710 NE Glass Plant Road Portland, OR 97220
Project Contact:	Dennis Buenger, CHMM
Role:	Global Environmental Technical Leader
Telephone:	567-336-7519
Email:	Dennis.buenger@o-i.com

Agency Information

Regulatory Agency:	Oregon Department of Environmental Quality
Agency Contact:	Suzanne Blackburn
Telephone:	503-378-5034
Email:	Suzanne.blackburn@state.or.us

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC (Montrose)	
Contact:	Jeremiah Hicks	Joe Heffernan
Title:	Project Coordinator	Client Project Manager
Telephone:	440-340-8189	971-282-5336
Email:	jhicks@montrose-env.com	jheffernan@montrose-env.com

Laboratory Information

Laboratory:	Chester LabNet[1]
City, State:	Tigard, OR

1.3.1 Test Personnel and Responsibilities

The test team will consist of one Client Project Manager and four Field Technicians for Furnace D and five Field Technicians for Furnace A. The Field Project Manager is responsible for overseeing sample and data collection, while the Field Technician works at the sample location. It is anticipated that Joe Heffernan, QSTI (1-4) will be assigned to the role of Field Project Manager. The staff assignment for the Field Technician positions have not been finalized as of the date of this test plan. The team will be fully qualified to perform all test methods listed in this test plan. At least one team member will hold current QSTI and/or QI certifications for all test methods included in this test program.

1.3.2 Quality Statement

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association

1 Montrose reserves the right to select a different laboratory than the one stated here.

for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is presented in Section 4.0 of this document.

2.0 SOURCE DESCRIPTION

2.1 FACILITY AND SOURCE DESCRIPTION

The Portland facility is located at 9710 NE Glass Plant Road Portland, Oregon. Owens-Brockway Glass Container Inc. - Plant No. 21 in Portland, Oregon, produces a variety of glass bottles and jars from post-consumer recycled glass with other essential raw materials. The glass manufacturing comprises of the following areas of operations: raw material and cullet receiving and storage, materials blending and transport, glass melting furnaces, glass forming, final bottle treatment, and the maintenance and support systems such as boiler and storage tanks. The plant has four glass melting furnaces (EU4) at their Portland, Oregon, facility (Plant No. 21), but Furnaces B (GM2) and C (GM3) are no longer in operation. The furnaces to be tested are Glass Melting Furnaces A (GM1) and D (GM4) with estimated maximum capacities of 230 tons per day and 190 tons per day, respectively.

2.2 SAMPLING LOCATIONS AND ACCESS

Information regarding the sampling locations is presented below:

Sample location ID:	Furnace D Exhaust Duct
Configuration:	Cylindrical, vertical
Dimensions:	29 inches internal diameter
Port locations:	Appx. 348" (~12 duct diameters) upstream from the stack exit Appx. 60" (~2.1 duct diameters) downstream from the nearest stack disturbance
Port access:	Permanent platform

Sample location ID:	Furnace A North Exhaust Duct
Configuration:	Cylindrical, vertical
Dimensions:	44.5 inches internal diameter
Port locations:	Appx. 180" (~4.1 duct diameters) upstream from the stack exit Appx. 108" (~2.4 duct diameters) downstream from the nearest stack disturbance
Port access:	Permanent platform

Sample location ID:	Furnace A South Exhaust Duct
Configuration:	Elliptical, vertical
Dimensions:	44.0 x 44.5 inches
Port locations:	Appx. 180" (~4.0 duct diameters) upstream from the stack exit Appx. 110" (~2.5 duct diameters) downstream from the nearest stack disturbance
Port access:	Permanent platform or a temporary scaffolding arrangement

Traverse point information is presented below:

- Particulate tests - 24 points total, 12 from each of 2 ports located 90 degrees apart from one another
- Gaseous emission tests – stratification test and sampling point selection to be performed per EPA Method 7E

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests will be performed while the source/units and air pollution control devices are operating at the conditions required by the permit. The units will be tested when operating normally.

Plant personnel will establish the test conditions and will collect all applicable unit-operating data. Montrose will monitor the collection of process data and will provide additional data collection as necessary to document operation. Data collected will include the following parameters:

- Hourly production data and all glass colors for the previous 12 months
- Glass production
- Recycled-to-raw material ratios (% cullet)
- Natural gas usage
- Electric boost rate
- Bridgewall temperature

2.4 PLANT SAFETY

Safety is a priority at Montrose. A discussion of the field safety measures which will be employed on this project are detailed below. A detailed Site Safety Plan is attached to this test plan in Appendix S.

2.4.1 Safety Responsibilities

As per 40 CFR 60 Subpart A, Section 60.8, the facility should provide the following provisions at each sample location:

- Sampling ports, which meet EPA minimum requirements for testing. The caps should be removed or be hand-tight.
- Safe sampling platforms
- Safe access to the platforms and test ports, including any scaffolding or man lifts
- Sufficient utilities to perform all necessary testing

Montrose will comply with all safety requirements at the facility. The facility plant safety coordinator is responsible for ensuring routine compliance with plant entry, health, and safety requirements. The facility plant site safety coordinator has the authority to impose or waive facility restrictions. The Montrose test team leader has the authority to negotiate any deviations from the facility restrictions with the plant site safety coordinator. Any deviations must be documented.

2.4.2 Safety Program

Montrose has a comprehensive health and safety program that satisfies State and Federal OSHA requirements. The program includes an Illness and Injury Prevention Program, site-specific safety meetings, and training in safety awareness and procedures. The basic elements include:

- Written policies and procedures
- Routine training of employees and supervisors
- Medical monitoring as necessary, including Hearing Conservation
- Use of personal protection equipment (PPE)
- Hazard communication
- Pre-test and daily safety meetings
- Routine surveillance and inspection of on-going work
- Near-miss and accident reporting procedures
- Following Federal Motor Carrier Safety Administration (FMCSA) regulations, as applicable

Montrose will provide all PPE to its employees. The PPE will include, but is not limited to; hard hats, safety shoes, safety glasses with side shields (or goggles), hearing protection, and hand protection.

2.4.3 Safety Requirements

All on-site personnel will adhere to the following standard safety measures:

- All OSHA and facility mandated safety training and accreditation will be completed before arrival. This will include MSHA, OSHA 10-hr, TWIC, Aerial Work Platform, etc., as required.
- Complete any site-specific training as necessary
- Complete Site Safety Plan before work activities begin
- Daily Tool Box Meetings
- Confine themselves to the testing and administration areas only
- Wear all mandated PPE
- Know the location of first aid equipment and fire extinguishers
- Smoke only in designated areas

3.0 TEST METHOD DETAILS

3.1 LIST OF TEST METHODS

The test procedures for this test program are summarized in Table 3-1 below. Additional information regarding specific applications or modifications to standard procedures is presented in the following sub-sections.

TABLE 3-1
TEST PROCEDURES

Parameter	Measurement Principle	Reference Method
Volumetric flow rate	Pitot/temperature traverse	EPA 1, 2
O_2	Paramagnetism	EPA 3A
CO_2	Non-dispersive infrared	EPA 3A
SO_2	UV Fluorescence	EPA 6C
NO_x	Chemiluminescence	EPA 7E
CO	Gas filter correlation NDIR	EPA 10
VOC	Flame ionization detection	EPA 25A
Moisture	Impinger weight gain	EPA 4
Filterable & Condensable PM	Gravimetry with condensable analysis	ODEQ 5
Formaldehyde	Spectrophotometrically	EPA 316
Cr and Cr^{+6}	Ion chromatographic-colorimetric	CARB 425[1]
Metals (As, Cd, Pb, Mn, Hg, Ni, Be, An, Co, Cu, Se)	ICP and CVAA	EPA 29

[1]We are requesting ODEQ allow the use of CARB 425 in lieu of SW-846 0061 due to the elevated stack temperatures at the furnace exits.

3.1.1 EPA Method 1 – Traverse Points

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance. An EPA Method 1 diagram is included in the final report.

Method-specific options are detailed below: N/A

Any project-specific exceptions are detailed below: N/A

Quality control procedures for this method include:

- A check for cyclonic flow is made by measuring null angles using a protractor and pitot tube
- Pre- and post-test leak checks of the pitot tube lines

3.1.2 EPA Method 2 - Velocity

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1. The molecular weight of the gas stream is determined from independent measurements of O_2, CO_2, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Method-specific options are listed below:

- S-type pitot tube coefficient is 0.84
- Inclined manometer or Shortridge multimeter may be used to measure velocity

Any project-specific exceptions are listed below:

Velocity and volumetric flow rate are reported in the following units:

- feet per second (fps) or feet per minute (fpm)
- actual cubic feet per minute (acfm)
- dry standard cubic feet per minute (dscfm)

Quality control procedures for this method include:

- Pre- and post-test leak checks of the pitot tube lines
- Pitot tubes are examined before and after each use to confirm that they are in alignment
- Stack gas temperatures thermocouples are checked using EPA Alternate Method 011 (ALT-011). A single-point calibration is performed using a NIST-traceable thermometer. Temperatures must agree within ± 2° F.
- Thermocouples are checked at ambient temperature before heaters are turned on

3.1.3 Alternative EPA Method 2 Thermocouple Calibration Procedure (ALT-011)

Approved Alternative Method 011 (ALT-011) is used as an alternative to the EPA Method 2 two-point thermocouple calibration. This procedure involves a single-point in-field check using a reference thermometer to confirm that the thermocouple system is operating properly. The temperatures of the thermocouple and reference thermometers shall agree to within ±2 °F.

3.1.4 EPA Method 4 – Moisture Content

Stack gas moisture content will be determined using EPA Method 4 in conjunction with every particulate test run/wet chemical test run. The impingers are connected in series and contain reagents as listed in the applicable method descriptions. The impingers are contained in an ice bath to assure condensation of the flue gas stream moisture. Any moisture that is not condensed in the impingers is captured in the silica gel; therefore, all moisture is weighed and entered into moisture content calculations.

3.1.5 Determination of Sampling Traverse Points (Gaseous Sampling)

Sampling traverse points for gaseous methods are determined in accordance with EPA Method 7E. Source gas will be sampled for at least 60 minutes during each run.

3.1.6 Gaseous Emissions

Concentrations of the gaseous constituents of stack gas (O_2, CO_2, NO_X, CO, SO_2) are measured using Montrose's dry extractive reference method (RM) monitor system in accordance with EPA Method 7E. This system meets the requirements of EPA methods for gaseous species. Pertinent information regarding the performance of the method is presented below:

- Method Deviations: None
- Method Options: N/A
- Detection Limits: 2% of calibration span

3.1.7 Volatile Organic Compounds

Concentrations of total hydrocarbons (THCs) are measured using EPA Method 25A. A flame ionization detector (FID) analyzer is used for measurement of the concentrations as described in that method.

The sampling apparatus for each system includes a stainless steel probe and heated Teflon line connected to the inlet port of the analyzer. The analyzers include internal sampling pumps and heated oven/analysis sections that keep the sample gas at a minimum of 180 degrees Celsius (356 °F). The heated lines are maintained at a minimum of 135 degrees Celsius (275 °F) during the test program. The heated line temperatures are monitored during each test run.

The calibrations and operation of the analyzer systems are conducted according to EPA Method 25A.

3.1.8 Particulate Matter Emissions

The emissions of total particulate matter (TPM) will be measured using ODEQ Method 5. Triplicate test runs will be performed. The apparatus includes a heated sampling probe attached to an oven containing a cyclone followed by a heated glass filter holder and filter. The filter holder is connected by a length of Teflon tubing to the impinger train. The impinger train is connected to the control box, which contains the sampling pump and dry gas meter. The sampling rate and nozzle size are chosen to allow isokinetic sampling.

The filterable "front-half" PM is recovered from the sampling apparatus as described in the method. The sample includes the probe and nozzle wash, filter, and rinses from the front-half of the filter holder. The sample is analyzed gravimetrically to determine the concentration of filterable PM.

The condensable "back-half" contents are recovered and analyzed as described in the method. A separate sample container is used to collect the impinger contents and rinses, and the back-half filter holder wash. Each sample is extracted with dichloromethane in a separatory funnel. The analysis includes gravimetric measurement of the residue from the aqueous and organic fractions. The corrected results are used to determine the concentration of condensable particulate matter.

Please note that if the total particulate matter (TPM) mass is less than 7 mg, then an MDL of 7 mg (0.0070 g) will be assigned to the TPM sample, and is labeled BDL. ODEQ specifies that the method quantifiable limit (MQL) for ODEQ Method 5 is 7 milligrams (mg) of TPM.

3.1.9 Total Chromium and Hexavalent Chromium

Total chromium and hexavalent chromium (Cr^{+6}) are determined using CARB Method 425 in lieu of SW-846 0061. The elevated temperatures at the furnace exit make the proper operation of a SW-846 0061 train impossible. Triplicate test runs will be performed and the sampling will be performed isokinetically with a multi-point traverse of the sampling plane.

Minimum Sample Volume: 60 dscf

Detection Limit: 0.02 µg/L[2]

If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit is the concentration value in lieu of a measured concentration.

3.1.10 Formaldehyde

Concentrations of formaldehyde are determined using EPA Method 316. Gaseous and particulate pollutants are withdrawn isokinetically from an emission source and are collected in high purity water. The high purity water containing formaldehyde is then analyzed using the modified pararosaniline method. The intensity of the purple color, formed from the reaction of the formaldehyde with acidic pararosaniline and sodium sulfite is measured spectrophotometrically and provides an accurate measurement of the sample's formaldehyde concentration.

[2] Based on historical data, it is anticipated that the in-stack concentrations will be at or above 5 times the detection limit in most or all cases. An exception may be if there is interference in a sample that may require the dilution of samples which will raise the detection limit for those samples.

Minimum Sample Volume: 30 cu ft

Detection Limit: 0.03 mg/L

There is no historical data available for formaldehyde. Montrose intends to collect a minimum sample volume of 30 cubic feet over the course of a 60 minute test run as per EPA Method 316 minimum requirements.

If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit is the concentration value in lieu of a measured concentration.

3.1.11 Metals

Select trace metals will be measured at the exhaust stacks using EPA Method 29. Triplicate test runs will be 120 minutes in duration and the sampling will be performed isokinetically with a multi-point traverse of the sampling plane. The samples will be analyzed for selected trace metals from Method 29 metals including Arsenic (As), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), and Selenium (Se).

At each test location, one field blank will be prepared, recovered and analyzed according to the method. Reagent blanks will also be collected.

Minimum Sample Volume: 120 dscf

TABLE 3-2
EPA METHOD 29 DETECTION LIMITS

Metal	Detection Limit (µg/L)	Front Half Detection Limit (µg)	Back Half Detection Limit (µg)
Arsenic (As)	7	1.75	0.70
Beryllium (Be)*	0.2	0.05	0.02
Cadmium (Cd)*	0.5	0.13	0.05
Chromium (Cr)	0.5	0.13	0.05
Cobalt (Co)*	0.5	0.13	0.05
Copper (Cu)**	5.0	1.25	0.50
Lead (Pb)*	5.0	1.25	0.50
Manganese (Mn)	0.30	0.08	0.03
Mercury (Hg)*	0.007	0.022	0.009
Nickel (Ni)	1.00	0.25	0.10
Selenium (Se)	10.00	2.50	1.00

*It is anticipated that these metals may be below five times the detection limit of the test method. The originally planned run time of 120 minutes has been doubled to 240 minutes to collect a minimum of 120 dscf and in an effort to meet the detection limit requirements of Section 2.7.a of the ODEQ Source Sampling Manual

**There is no historical data available for Copper.

If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit as the concentration value in lieu of a measured concentration.

If a concentration is below the minimum detection limit of the applicable analytical method then the mass emission rates will be calculated using the applicable minimum detection limit is the concentration value in lieu of a measured concentration.

4.0 QUALITY ASSURANCE AND REPORTING

4.1 SAMPLING AND ANALYTICAL QA/QC

Montrose has instituted a rigorous QA/QC program for its air quality testing. Quality assurance audits are performed as part of the test program to ensure that the results are calculated using the highest quality data available. This program ensures that the emissions data we report are as accurate as possible. The procedures included in the cited reference methods are followed during preparation, sampling, calibration, and analysis. Montrose will be responsible for preparation, calibration, and cleaning of the sampling apparatus. Montrose will also perform the sampling, sample recovery, storage, and shipping. Approved contract laboratories may perform some of the preparation and sample analyses, as needed.

4.2 QUALITY CONTROL PROCEDURES

Montrose calibrates and maintains equipment as required by the methods performed and applicable regulatory guidance. Montrose follows internal procedures to prevent the use of malfunctioning or inoperable equipment in test programs. All equipment is operated by trained personnel. Any incidence of nonconforming work encountered during testing is reported and addressed through the corrective action system.

4.2.1 Equipment Inspection and Maintenance

- Each piece of field equipment that requires calibration is assigned a unique identification number to allow tracking of its calibration history
- All field equipment is visually inspected prior to testing and includes pre-test calibration checks as required by the test method or regulatory agency

4.2.2 Audit Samples

When required by the test method (EPA Method 29), Montrose obtains EPA TNI SSAS audit samples from an accredited provider for analysis along with the samples. The audit samples are stored, shipped, and analyzed along with the emissions samples collected during the test program. The audit sample results are reported along with the emissions sample results.

4.3 DATA ANALYSIS AND VALIDATION

Montrose converts the raw field, laboratory, and process data to reporting units consistent with the permit or subpart. Calculations are made using proprietary computer spreadsheets or data acquisition systems. One run of each test method is also verified using a separate example calculation. The example calculations are checked against the spreadsheet results and are included in the final report. The "Standard Conditions" for this project are 29.92 inches of mercury and 68 °F.

4.4 REPORTING

Montrose will prepare a final report to present the test data, calculations/equations, descriptions, and results. Prior to release by Montrose, each report will be reviewed and certified by the project manager and their supervisor, or a peer. Source test reports will be submitted to the facility within 90 days of the date of the Notice of Civil Penalty Assessment and Order Case No. AQ/V-NWR-2019-016. The order was dated April 22, 2019, the final report will be submitted to ODEQ 90 days after the order is final. The report will include a series of appendices to present copies of the intermediate calculations and example calculations, raw field data, laboratory analysis data, process data, and equipment calibration data.

4.4.1 Example Report Format

The report will be divided into various sections describing the different aspects of the source testing program. Table 4-1 presents a typical Table of Contents for the final report.

TABLE 4-1
TYPICAL REPORT FORMAT

Cover Page

Certification of Report

Table of Contents

Section

1.0 SUMMARY OF TEST PROGRAM AND RESULTS

2.0 SOURCE DESCRIPTION

3.0 TEST METHOD DETAILS

4.0 TEST RESULTS AND OVERVIEW

Appendices

APPENDIX A - CALCULATIONS

APPENDIX B - FIELD AND COMPUTER-GENERATED DATA

APPENDIX C - LABORATORY ANALYSIS DATA

APPENDIX D - FACILITY CEMS AND PROCESS DATA

APPENDIX E - QUALITY ASSURANCE/QUALITY CONTROL

APPENDIX F - MISCELLANEOUS INFORMATION

4.4.2 Example Data Presentation Format

Table 4-2 presents the typical tabular format that will be used to summarize the results in the final source test report. Separate tables will outline the results for each target analyte and compare them to their respective emissions limits.

**TABLE 4-2
RESULTS SUMMARY GASEOUS EMISSIONS
OWENS-BROCKWAY GLASS CONTAINER
FURNACE D**

Run Number:	1	2	3	Average
Date:	X	X	X	--
Time:	X	X	X	--
Process Data:				
Parameter 1	X	X	X	X
Parameter 2	X	X	X	X
Flue Gas:				
O_2, % volume dry	X	X	X	X
CO_2, % volume dry	X	X	X	X
Flue gas temperature °F	X	X	X	X
Moisture content, % volume	X	X	X	X
Volumetric flow rate, dscfm	X	X	X	X
NO_X Emissions:				
ppm volume dry	X	X	X	X
lb/hr	X	X	X	X
lb/ton	X	X	X	X
CO Emissions:				
ppm volume dry	X	X	X	X
lb/hr	X	X	X	X
lb/ton	X	X	X	X
SO_2 Emissions:				
ppm volume dry	X	X	X	X
lb/hr	X	X	X	X
lb/ton	X	X	X	X
VOC Emissions:				
ppm volume dry	X	X	X	X
lb/hr	X	X	X	X
lb/ton	X	X	X	X

Appendix F.2
Permit Excerpts

CATEGORY	DIV. 1	DIV. 2
CAA	#21 Portland	Permit

OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY
OREGON TITLE V OPERATING PERMIT

Northwest Region
2020 SW 4th, Suite 400
Portland, OR 97201
Telephone: (503) 229-5263

Issued in accordance with the provisions of
ORS 468A.040 and based on the land use compatibility findings included in the permit record.

ISSUED TO:

Owens-Brockway Glass Container Inc.
P.O. Box 20067
Portland, OR 97294-0067

INFORMATION RELIED UPON:

Application Number: 021919
Received: 06/29/2006

PLANT SITE LOCATION:

9710 N.E. Glass Plant Road
Portland, OR 97220

LAND USE COMPATIBILITY STATEMENT:

From: City of Portland
Dated: 03/14/1995

ISSUED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Cory Ann Wind, NWR AQ Manager

Date

Nature of Business: Glass Manufacturing
Primary SIC: 3221

RESPONSIBLE OFFICIAL:

Name: Mr. Dean Harris
Title: Plant Manager

FACILITY CONTACT PERSON:

Name: Mr. Andrew Frankowski
Title: Plant Engineer
Phone: (503) 251-9415

TABLE OF CONTENTS

LIST OF ABBREVIATIONS THAT MAYBE USED IN THIS PERMIT

ACDP	Air Contaminant Discharge Permit
acfm	actual cubic foot per minute
AQMA	Air quality management area
ASTM	American Society of Testing and Materials
Btu	British thermal unit
CFR	Code of Federal Regulations
CO	Carbon monoxide
CO_2	Carbon dioxide
DEQ/ODEQ	Oregon Department of Environmental Quality
dscf	dry standard cubic foot
EF	emission factor
EPA	US Environmental Protection Agency
EU	Emissions unit
FBR	Free Board Ratio
FCAA	Federal Clean Air Act
ft^3	cubic feet
gr/dscf	grain per dry standard cubic foot
HAP	Hazardous Air Pollutant as defined by OAR 340-032-0130
HCFC	Hydro-chloro-fluoro-carbons
H_2S	Hydrogen Sulfide
ID	Identification number
I&M	Inspection and maintenance
LPG	Liquefied petroleum gas
MB	Material balance
mg/l	milligrams per liter
mvac	Motor vehicle air conditioner
NG	Natural gas
NO_x	Oxides of nitrogen
O_2	Oxygen
OAR	Oregon Administrative Rules
ORS	Oregon Revised Statutes
O&M	Operation and maintenance
Pb	Lead
PCD	Pollution control device
PM	Particulate matter
PM_{10}	Particulate mater less than 10 microns in size
ppm	Part per million
PSD	Prevention of Significant Deterioration
PSEL	Plant Site Emission Limit
RACT	Reasonably Available Control Technology
scf	Standard cubic foot
SERP	Source Emission Reduction Plan
SIP	State Implementation Plan
SNAP	Significant New Alternative Policy
SO_2	Sulfur dioxide
ST	Source test
VE	Visible emissions
VMT	Vehicle miles traveled
VOC	Volatile organic compound

Table-II. Emissions Unit Specific Requirements

EU / EU Device, or PCD ID.	Applicable Requirements		Pollutant/ Parameter	Limit/ Standard	Monitoring Requirements	
	OAR / 40 CFR	Cond. No.			Method	Cond No.
GM1 & GM4	340-208-0110	11	Opacity	< 20%, 3 min.	COMS	13
GM1 & GM4	340-226-0210	12	PM/PM_{10}	0.1 gr/scf		
GM1 & GM4	40 CFR 60.293 (b)	14	PM/PM_{10}	1lb PM/ton glass	Source Testing	15
GM1 & GM4	40 CFR 60.293 (c)	16 & 17	Opacity	n/a	COMS	16 & 17
EU6, EU7	340-208-0110	18	Opacity	< 20%, 3 min.	VE Recordkeeping	23
GM2, GM3	340-208-0110	18	Opacity	< 20%, 3 min.	VE Recordkeeping	24
RMBH-1, RMBH-2, HEST-A, & MRD-1	340-208-0600	19	Opacity	< 20%, 30 sec.	VE Recordkeeping	23
EU7, GM2, GM3	340-228-0210	20	PM/PM_{10}	0.2 gr/scf	VE Recordkeeping	23, 24
RMBH-2, MRD-1	340-226-0210	21	PM/PM_{10}	0.2 gr/scf	VE Recordkeeping	23
RMBH-1 & HEST-A	340-226-0210	22	PM/PM_{10}	0.1 gr/scf	VE Recordkeeping	23
EU4 and EU7.	340-228-0110	25	Distillate oil sulfur content	0.3% by weight 0.5% by weight	%S Analysis / Recordkeeping	26
SOT-1	340-208-0630	27	SO_2	< 1,000 ppm	MB/Recordkeeping	28

11. **REQUIREMENT FOR GM1 & GM4:** The permittee shall not cause or allow the emissions of any air contaminant into the atmosphere for a period or periods aggregating more than three (3) minutes in any one hour that is equal to or greater than 20% opacity, excluding uncombined water, from glass melting furnaces GM1 and GM4. Opacity shall be measured in accordance with condition 13. [OAR 340-208-0110(2), 340-208-0110(3)(a)]

12. **REQUIREMENT FOR GM1 & GM4:** The permittee shall not cause or allow the emissions of particulate matter in excess of 0.1 grain per standard cubic foot, from glass melting furnaces GM1 and GM4 that were modified after June 1, 1970. Particulate matter emissions shall be measured in accordance with condition 40. [OAR 340-226-0210(1)(b)]

13. **MONITOR AND RECORD:** The permittee shall monitor visible emissions from the glass-melting furnaces GM1 and GM4 in accordance with the procedures, test methods, and frequencies specified in this condition.

    13.a. The opacity reading obtained from the continuous opacity monitoring system (COMS) shall be used to demonstrate compliance with the applicable 20% opacity limit.

    13.b. On a daily basis, the COMS shall be calibrated according to the manufacturer's specifications.

    13.c. All opacity meter readings and records of exceedances of the 20% opacity standard shall be kept at the plant site for inspection. Indicate the number of exceedance period(s) aggregating more than 3 minutes in any one-hour, which is equal to, or greater than 20% opacity, and the corresponding date(s), if any.

14. **PARTICULATE MATTER (PM) EMISSIONS STANDARD FOR GM1 & GM4:** The emissions of particulate matter from glass melting furnace GM1 or GM4 shall not exceed 0.5 grams per kilogram of glass produced (1 lb PM/ton glass), as measure in accordance with methods and procedures specified in condition 15. [40 CFR 60.293 (b)(1)]

15. **TESTING REQUIREMENT FOR GM1 & GM4:** At least once during the permit term, except as noted in condition 15.d, the permittee shall determine the PM emissions from glass melting furnace GM1 and GM4 in accordance with the following methods and procedures:

15.a. Compute the PM emission rate from each furnace using the following equation:

$$E = (c_s Q_{sd} - A) / P$$

where:
E = emission rate of particulate matter, g/kg
c_s = concentration of particulate matter, g/dscm
Q_{sd} = volumetric flow rate, dscm/hr
A = zero production rate correction, 227 g/hr
P = glass production rate, kg/hr

15.b. Use EPA method 5 to determine the PM concentration (c_s) and volumetric flow rate (Q_{sd}) of the effluent gas. The sampling time and sample volume for each run shall be at least 60 minutes and 0.90 dscm (31.8 dscf).

15.c. Use direct measurement or material balance using good engineering practice to determine the amount of glass pulled during the performance test.

15.d. The source test performed within 12-months prior to the date of this permit issuance, and conducted in accordance with the methods and procedures specified in NSPS subpart CC, satisfies the testing requirement of this condition and no further testing is required during this permit term.

16. **OPACITY MONITORING REQUIREMENT FOR GM1 & GM4:** The permittee shall use continuous opacity monitoring system (COMS) to measure the opacity value of visible emissions discharged into the atmosphere from the glass-melting furnaces GM1 and GM4. [40 CFR 60.293 (c)]

16.a. The opacity value from each furnace shall be measured based on 6-minute averaging.

16.b. On a daily basis, calibrate the COMS according to the manufacturer's specifications.

16.c. On an annual basis, calibrate the COMS according to the procedures specified in 40 CFR 60, Appendix B, Performance Specification 1 (PS-1). The alternative procedures must be approved by the Department in writing.

16.d. All opacity readings including the records of "excess emissions" shall be compiled and readily accessible for inspection by the Department staff.

16.e. **Opacity Value:** During the source testing conducted per condition **15**, calculate 6-minute opacity average from 24 or more data points equally spaced over each 6-minute period during the test runs using COMS. For each furnace A and D, determine the Opacity Value corresponding to the 99 percent upper confidence level of a normal distribution of 6-minute average opacity values.

16.f. **Opacity Value:** The permittee may reset the Opacity Value for either furnace A or D determined in condition **16.e** by subsequent source testing in accordance with 40 CFR 60.293 (e).

16.g. **Report** the **Opacity Value** determined through source testing conducted per condition 16.e or 16.f within 45-days of testing as specified in Condition 39.c.

17. **REPORTING REQUIREMENT FOR GM1 & GM4:** The permittee shall report to EPA of all "excess emissions" determined from COMS readings of condition **16** in accordance with the procedures specified in this condition. [40 CFR 60.7 (d) & (e)]

17.a. For the purpose of the notification required under this condition, "excess emissions" are all of the opacity values based on 6-minute average that exceed the Opacity Value corresponding to the 99 percent upper confidence level determined in condition **16.e** or **16.f**.

17.b. For the first year, submit quarterly report (every 3-month, starting with January through March) that include summary of excess emissions, if any, for the preceding quarter:

17.b.i. Title-V reporting form **R1002-A** signed by responsible official;
17.b.ii. Duration of excess emissions (minutes) and corresponding date and time;
17.b.iii. explanation of the cause of excess emissions such as startup/shutdown, process problems, and/or other known and unknown causes;
17.b.iv. total duration of excess emissions during the reporting period;
17.b.v. total operating time of each corresponding furnace GM1 or GM4;
17.b.vi. the percentage (%) of excess emissions in comparison to total furnace operating time;
17.b.vii. the percentage (%) of COMS downtime, if any, in comparison to total furnace operating time.
17.b.viii. Submit the quarterly report by no later than 30 days after the end of preceding quarter.

17.c. Reduce the frequency of excess emission reporting to semi-annually, which may coincide with the semi-annual reporting specified in conditions 44 and 45.a, if the following conditions are met: [40 CFR 60.7 (e)(1)]

17.c.i. The total duration of excess emissions determined in condition **17.b.vi** is less than 1% of the total furnace operating time for the entire year; and
17.c.ii. COMS downtime determined in condition **17.b.vii** for the same period is less than 5% of the total furnace operating time.

17.d. If total duration of excess emissions or COMS downtime determined in condition **17.b.vi** or **17.b.vii** is equal to or greater than their respective percentage limit, increase the frequency of excess emission reporting to quarterly. In addition, the excess emission reporting shall conform to requirements specified in 40 CFR 60.7(c), in lieu of summary report described in condition **17.b**.

17.e. Condition 54 lists the mailing address of EPA.

PLANT SITE EMISSION LIMITS

36. **ANNUAL PSEL REQUIREMENT:** The annual plant site emissions based on 12-month rolling average shall not exceed the amount (tons/year) specified in this condition: [OAR 340-222-0020 and 340-222-0040]:

Emission source	PM_{10}	SO_2	NO_x	CO	VOC	Pb
Plant Site Basis	132	313	711	99	39	0.5
Aggregate Insignificant Activities	1	1	1	1	1	--

37. **MONITOR AND RECORD:** The permittee shall determine compliance with the Plant Site Emissions Limits specified in condition 36 in accordance with the procedures, test methods, and frequencies identified in this condition. The permittee shall retain records of all parameters used to determine compliance with the PSEL:

37.a. The permittee shall monitor and maintain monthly and annual records of the following material and process parameters:

Operating Parameter (P_i)		EU/Device ID	Min. frequency	Method
Raw materials (tons) processed, excluding cullet.	P_1	EU1	monthly	Recordkeeping
Inhouse & post-consumer Cullet (tons) processed.	P_2	EU2	monthly	Recordkeeping
Raw materials (tons) processed.	P_3	EU3	monthly	Recordkeeping
Glass (tons) melted * Natural Gas (10^6 ft^3) burned Fuel Oil (gallons) burned	P_4	EU4	monthly	Production Records, Fuel usage estimates from meter/gauge readings.
Swab materials (lbs) used (MS1-4). MBTT (tons) used (HEST1-4). SO_2 (lbs) used (SOT-1).	P_5	EU5	monthly	Recordkeeping
* Natural Gas (10^6 ft^3) burned	P_6	EU6	monthly	Fuel usage estimates from meter/gauge readings.
* Natural Gas (10^6 ft^3) burned Fuel Oil (gallons) burned	P_7	EU7	monthly	
Estimated hours of operations.	P_{10}	EU10	monthly	Recordkeeping

* The permittee is allowed to switch from/to NG to/from Propane (LPG) at anytime.

37.b. At the end of each month, calculate the monthly emissions from each of the emissions units identified by applying operating parameter (P_i) identified in condition 37.a and the emission factors identified for that unit and specific pollutant specified in this condition 37.b below:

$$E_{MO,i} = P_i \, EF_{i,j} \, K$$

where: $E_{MO,i}$ = monthly pollutant emissions from individual EU_i; lbs/month, or tons/month.
P_i = operating parameters identified in condition 37.a.
$EF_{i,j}$ = emission factor for the pollutant and EU identified in this condition.
K = Conversion factor; 1 ton/2,000 lbs or 2,000 lbs/2,000 lbs

49. Excess Emissions Reporting [OAR 340-214-0300 through 340-214-0360]

49.a. The permittee shall report all excess emissions in accordance with OAR 340-214-0300 through 340-214-0360. In summary, the permittee shall immediately (i.e., as soon as possible but in no case more than one hour after the beginning of the excess emission period) notify the Department by telephone or in person of any excess emission, other than pre-approved startup, shutdown, or scheduled maintenance. Notification shall, to the extent reasonably ascertainable at the time of notification, include the source name, nature of the emissions problem, name of the person making the report, name and telephone number of the contact person for further information, date and time of the onset of the upset condition, whether or not the incident was planned, the cause of the excess emission (e.g., startup, shutdown, maintenance, breakdown, or other), equipment involved in the upset, estimated type and quantity of excess emissions, estimated time of return to normal operations, efforts made to minimize emissions, and a description of remedial actions to be taken. Follow-up reporting shall be made in accordance with Department direction and OAR 340-214-0330(2) and 340-214-0340.

49.b. In the event of any excess emissions which are of a nature that could endanger public health and occur during non-business hours, weekends, or holidays, the permittee shall immediately notify the Department by calling the Oregon Accident Response System at 1-800-452-0311.

49.c. If startups, shutdowns, or scheduled maintenance may result in excess emissions, the permittee shall submit startup, shutdown, or scheduled maintenance procedures used to minimize excess emissions to the Department for prior authorization, as required in OAR 340-214-0310 and 340-214-0320. New or modified procedures shall be received by the Department in writing at least 72 hours prior to the first occurrence of the excess emission event. The permittee shall abide by the approved procedures and have a copy available at all times.

49.d. The permittee shall notify the Department of planned startup/shutdown or scheduled maintenance events only if required by permit condition or if the source is located in a nonattainment area for a pollutant which may be emitted in excess of applicable standards.

49.e. The permittee shall maintain and submit to the Department a log of planned and unplanned excess emissions, on Department approved forms, in accordance with OAR 340-214-0340.

50. The permittee shall promptly report deviations from permit requirements that do not cause excess emissions, including those attributable to upset conditions, as defined in the permit, the probable cause of such deviations, and any corrective actions or preventive measures taken. "Prompt" means within seven (7) days of the deviation. Deviations that cause excess emissions, as specified in OAR 340-214-0300 through 340-214-0360 shall be reported in accordance with OAR 340-214-0340. [OAR 340-218-0050(3)(c)(B)]

51. The permittee shall submit any required source test report within 30 days after the source test; unless otherwise approved in the source test plan. [OAR 340-218-0050(3)(c)(C) and 340-212-0120]

52. All required reports shall be certified by a responsible official consistent with OAR 340-218-0040(5); OAR [OAR 340-218-0050(3)(c)(D)]

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If you have any questions, please contact one of the following individuals by email or phone.

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