

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:

March 15, 2024

Name:

John Nestor

Title:

District Manager

RECEIVED
MAR 19 2024
AIR QUALITY DIVISION

Table of Contents

<u>Section</u>	<u>Page</u>
1.0 Introduction	5
1.1 Summary of Test Program	5
1.2 Key Personnel	7
2.0 Plant and Sampling Location Descriptions.....	9
2.1 Process Description, Operation, and Control Equipment.....	9
2.2 Flue Gas Sampling Locations.....	9
2.3 Operating Conditions and Process Data	9
3.0 Sampling and Analytical Procedures	10
3.1 Test Methods	10
3.1.1 EPA Method 1.....	10
3.1.2 EPA Method 2.....	10
3.1.3 EPA Method 3A.....	11
3.1.4 EPA Method 4.....	11
3.1.5 EPA Method 7E.....	12
3.1.6 EPA Methods 25A and 18.....	13
3.1.7 EPA Method 201A	15
3.2 Process Test Methods.....	16
4.0 Test Discussion and Results.....	17
4.1 Field Test Deviations and Exceptions.....	17
4.2 Presentation of Results.....	17
5.0 Internal QA/QC Activities	23
5.1 QA/QC Audits.....	23
5.2 QA/QC Discussion.....	23
5.3 Quality Statement	23

List of Appendices

A Field Data and Calculations	24
A.1 Sampling Locations.....	25
A.2 Data Sheets.....	32
A.3 Instrumental Test Method Data	65
A.4 Calculations/Results.....	142
A.5 Example Calculations	195
B Facility Process Data.....	223
C Laboratory Analysis Data	226
D Quality Assurance/Quality Control	251
D.1 Units and Abbreviations	252

D.2 Manual Test Method QA/QC Data	260
D.3 Instrumental Test Method QA/QC Data	277
D.4 Accreditation Information/Certifications	353
E Regulatory Information	359
E.1 EGLE Approval Letter	360
E.2 Test Protocol.....	39

List of Tables

1-1 Summary of Test Program	5
1-2 Summary of Average Compliance Results – EU-POURING (Combined Stack Vents).....	6
1-3 Summary of Average Compliance Results – EU-POURING.....	6
1-4 Test Personnel and Observers.....	8
2-1 Sampling Locations	9
4-1 NO _x , VOC, PM ₁₀ , and PM _{2.5} Emissions Results - EU-POURING Combined Stack Vents..	18
4-2 NO _x , VOC, PM ₁₀ , and PM _{2.5} Emissions Results - EU-POURING Stack Vent 1	19
4-3 NO _x , VOC, PM ₁₀ , and PM _{2.5} Emissions Results - EU-POURING Stack Vent 2	20
4-4 NO _x , VOC, PM ₁₀ , and PM _{2.5} Emissions Results - EU-POURING Stack Vent 3	21
4-5 NO _x , VOC, PM ₁₀ , and PM _{2.5} Emissions Results - EU-POURING Stack Vent 4	22

List of Figures

3-1 EPA Method 3A, 7E, 18 (Bag), and 25A Sampling Train.....	14
3-2 EPA Method 201A Sampling Train.....	16

1.0 Introduction

1.1 Summary of Test Program

Kautex Textron, CWC Division (CWC Textron) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the Iron Pouring Operation (EU-POURING) at the CWC Textron facility (State Registration No.: B1909) located in Muskegon, Michigan. The test was conducted on January 17-18, 2024, to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, & Energy (EGLE) Renewable Operating Permit No. MI-ROP-B1909-2019A.

The specific objectives were to:

- Simultaneously determine the emissions of particulate matter (PM) under 10- μm (PM_{10}), PM under 2.5- μm ($\text{PM}_{2.5}$), nitrogen oxides (NO_x) (as NO_2), and volatile organic compounds (VOC) at the four stack vents (SV-POUR1, SV-POUR2, SV-POUR3, and SV-POUR4) serving EU-POURING
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

Table 1-1
Summary of Test Program

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs*	Duration (Minutes)
1/17/2024- 1/18/2024	EU-POURING SV-POUR1, SV-POUR2 SV-POUR3, SV-POUR4	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	240
		O ₂ , CO ₂	EPA 3A	3	240
		Moisture	EPA 4	3	240
		NO _x	EPA 7E	3	240
		THC	EPA 25A	3	240
		PM _{2.5} , PM ₁₀	EPA 201A [†]	3	240

* Number of runs performed at each stack vent (SV) location.

[†] Stack vent temperatures were $\leq 85^\circ\text{F}$; therefore, it was not necessary to collect a condensable PM fraction (EPA Method 202).

To simplify this report, a list of Units and Abbreviations is included in Appendix D.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

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 Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The testing was conducted by the Montrose personnel listed in Table 1-3. The tests were conducted according to the test plan (protocol) dated December 15, 2023, that was submitted to and approved by the EGLE.

Table 1-2
Summary of Average Compliance Results – EU-POURING (Combined Stack Vents)
January 17-18, 2024

Parameter/Units	Average Results	Emission Limits
Particulate Matter Under 10-μm (PM₁₀)		
lb/ton of metal	0.08	0.15
Particulate Matter Under 2.5-μm (PM_{2.5})		
lb/ton of metal	0.06	0.08
Nitrogen Oxides (NO_x) (as NO₂)		
lb/ton of metal	0.08	0.01
Volatile Organic Compounds (VOC), as propane		
lb/ton of metal *	<0.14	0.14

* Below the Detection Limit. See Section 4.2 for details.

CWC and EGLE have come to an agreement on a request for modification (APP-2023-0269) of the emission limits NO_x and VOCs and it is expected that the updated permit will be issued shortly after the release of this report. The following increases to NO_x and VOC have been added to the permit.

Table 1-3 **Summary of Average Compliance Results – EU-POURING**
January 17-18, 2024

Parameter/Units	Average Results	Emission Limits
Nitrogen Oxides (NO_x) (as NO₂)		
lb/ton of metal	0.08	0.14
Volatile Organic Compounds (VOC), as propane		
lb/ton of metal *	<0.14	0.5

* Below the Detection Limit. See Section 4.2 for details.

1.2 Key Personnel

A list of project participants is included below:

Facility Information

Source Location: Kautex Textron, CWC Division
1085 West Sherman Boulevard
Muskegon, MI 49441

Project Contact: Robert Meacham
Role: Sr. Engineer Environmental & Facilities CWC
Company: CWC Textron
Telephone: 231-739-2794
Email: bob.meacham@kautex.com

Agency Information

Regulatory Agency: EGLE
Agency Contact: Jeremy Howe
Telephone: 231-878-6687
Email: HoweJ1@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	John Nestor	Matthew Libman
Title:	District Manager	Regional Vice President
Telephone:	248-765-5032	630-860-4740 Ext. 14202
Email:	jonestor@montrose-env.com	mllibman@montrose-env.com

Laboratory Information

Laboratory: Montrose-Wauconda
City, State: Wauconda, Illinois
Method: EPA Method 18

Laboratory: Montrose-Royal Oak
City, State: Royal Oak, Michigan
Method: EPA Methods 201A

Test personnel and observers are summarized in Table 1-3.

Table 1-4
Test Personnel and Observers

Name	Affiliation	Role/Responsibility
John Nestor	Montrose	Project Manager/Qualified Individual (QI)
Scott Dater	Montrose	Field Project Manager/Qualified Individual (QI)
James Christ	Montrose	Client Project Manager/Field Support
John Ziber	Montrose	Senior Technician/Field Support
Chris Ziber	Montrose	Technician/Field Support
Carlos Sandoval	Montrose	Shop Manager/Field Support
Cody Hubbard	Montrose	Technician/Field Support
Roy Zimmer	Montrose	Technician/Field Support
Ryan Soehren	Montrose	Technician/Field Support
Ethan Wernikoff	Montrose	Technician/Field Support
Susan Swanson	Montrose	Calculations and Report preparation
Robert Meacham	CWC Textron	Test Coordinator
Trevor Drost	EGLE	Observer

2.0 Plant and Sampling Location Descriptions

2.1 Process Description, Operation, and Control Equipment

CWC Textron is a gray/ductile iron foundry that manufactures engine camshafts. Raw materials and fluxes are added to a melting furnace. Slag is removed, and the molten metal is poured into molds. The Iron Pouring Operation (EU-POURING) is performed both manually and automatically. Once the metal cools, a shaking table is used to remove the mold sand from the casting.

2.2 Flue Gas Sampling Locations

Information regarding the sampling locations is presented in Table 2-1.

Table 2-1
Sampling Locations

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EU-POURING Stack Vent 1	96.0	204/2.1	48/0.5	Isokinetic: 12 (6/port) Gaseous: 1
EU-POURING Stack Vent 2	50.0	204/4.1	48/1.0	Isokinetic: 12 (6/port) Gaseous: 1
EU-POURING Stack Vent 3	96.0	204/2.1	48/0.5	Isokinetic: 12 (6/port) Gaseous: 1
EU-POURING Stack Vent 4	50.0	204/4.1	48/1.0	Isokinetic: 12 (6/port) Gaseous: 1

The sample locations were verified in the field to conform to EPA Method 1. Acceptable cyclonic flow conditions were confirmed prior to testing using EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 Operating Conditions and Process Data

Emission tests were performed while the source/units and air pollution control devices were operating at the conditions required by the permit. The unit(s) were tested when operating normally.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Part weight, lbs
- Total number of molds poured, #
- The average weight of metal poured over the run, lb/hr

3.0 Sampling and Analytical Procedures

3.1 Test Methods

The test methods for this test program have been presented in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative samples or 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.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - None
- Method Exceptions:
 - None

The sample port and traverse point locations are detailed in Appendix A.

3.1.2 EPA Method 2, Determination of Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

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 O₂, CO₂, 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.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - S-type pitot tube coefficient is 0.84
 - Flow rate measurements are performed as part of the pollutant sample trains

- Method Exceptions:
 - Stack gas temperatures thermocouples are checked using EPA Alternate Method 011 (ALT-011). A single-point calibration is performed using a NIST-traceable thermometer

The typical sampling system is detailed in Figure 3-2.

3.1.3 EPA Method 3A, Determination of Oxygen and Carbon Dioxide in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O₂ and CO₂ in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentrations of O₂ and CO₂. The performance requirements of the method must be met to validate data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - Single-point sampling is performed if O₂ and CO₂ measurements are for molecular weight calculations only
 - The Stack Vent 1 and Stack Vent 2 calibration span values are 21.10% O₂ and 9.956% CO₂, and Stack Vent 3 and Stack Vent 4 calibration span values are 24.99% O₂ and 24.36% CO₂
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 240 minutes

The typical sampling system is detailed in Figure 3-1.

3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - Moisture sampling is performed as part of the pollutant sample trains
 - Since it is theoretically impossible for measured moisture to be higher than psychrometric moisture, the psychrometric moisture is also calculated, and the lower moisture value is used in the calculations

- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 240 minutes
- Target and/or Minimum Required Sample Volume: 21 scf

The typical sampling system is detailed in Figure 3-2.

3.1.5 EPA Method 7E, Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 7E is an instrumental test method used to continuously measure emissions of NO_x as NO_2 . Conditioned gas is sent to a chemiluminescent analyzer to measure the concentration of NO_x . NO and NO_2 can be measured separately or simultaneously together but, for the purposes of this method, NO_x is the sum of NO and NO_2 . The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - A dry extractive sampling system is used to report emissions on a dry basis
 - The Stack Vent 1 and Stack Vent 2 calibration span value is 46.52 ppmvd NO_x , and the Stack Vent 3 and Stack Vent 4 calibration span value is 50.23 ppmvd NO_x
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 240 minutes

The typical sampling system is detailed in Figure 3-1.

3.1.6 EPA Methods 25A and 18, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer and Measurement of Gaseous Organic Compound Emissions by Gas Chromatography

EPA Method 25A is an instrumental test method used for the determination of total gaseous organic concentration of vapors in stack gas. A gas sample is extracted from the source through a heated sample line and glass fiber filter to an FIA. Results are reported as THC as volume concentration equivalents of the calibration gas, typically propane, or as carbon equivalents.

EPA Method 18 is used to measure gaseous organic compounds from stationary sources. The major organic components of a gas mixture are separated by GC and are individually quantified using a FID, PID, ECD, or other appropriate detection principles. The retention times of each separated component are compared with those of known compounds under identical conditions. The GC analyst confirms the identity and approximate concentrations of the organic emission components beforehand. With this information, the analyst then prepares or purchases commercially available standard mixtures to calibrate the GC under conditions identical to those of the samples. The analyst also determines the need for sample dilution to avoid detector saturation, gas stream filtration to eliminate particulate matter, and prevention of moisture condensation.

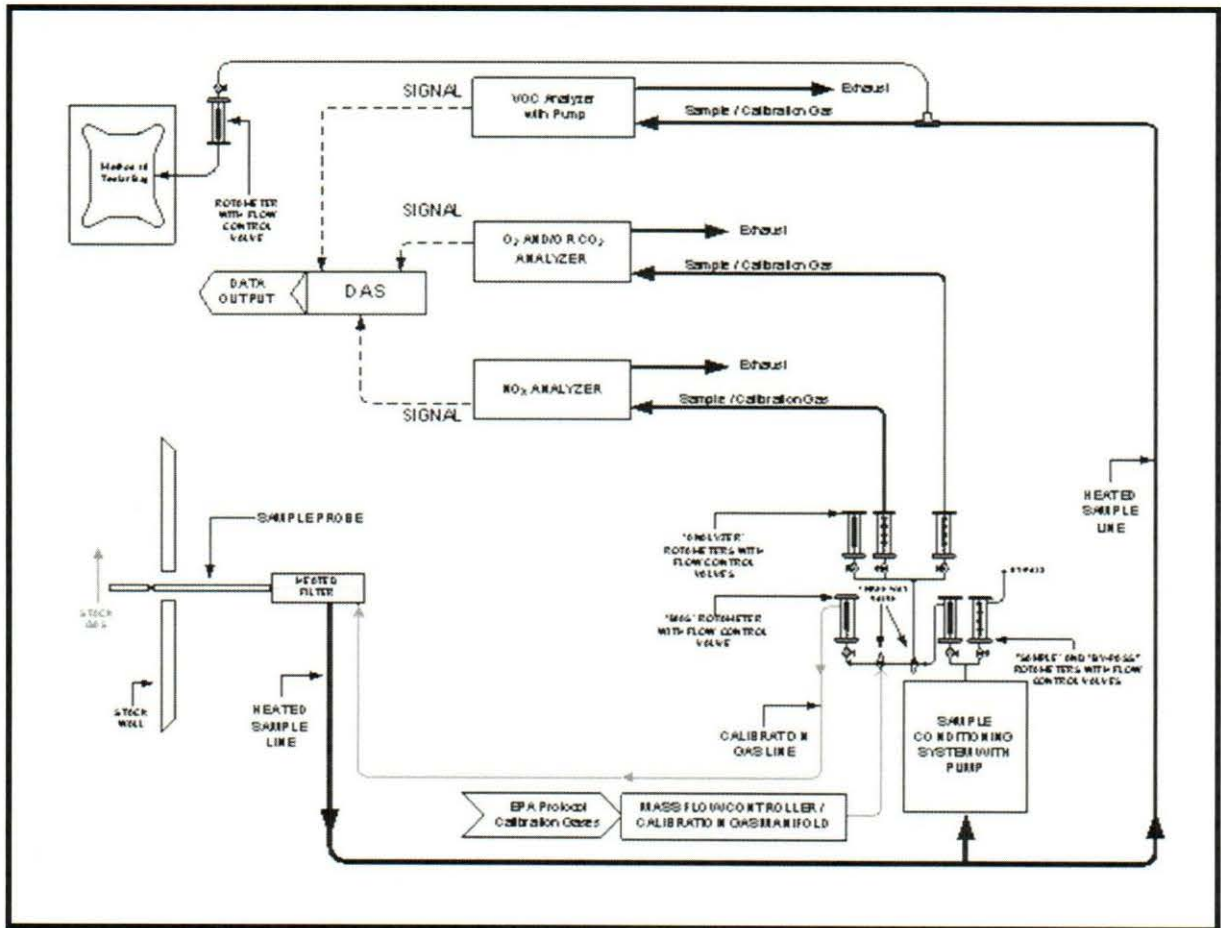
Total non-methane/non-ethane hydrocarbons (VOC) concentrations are determined by subtracting methane and ethane from THC.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - Results are reported in terms of propane
 - The Stack Vent 1 and Stack Vent 2 calibration span value for THC is 111.0 ppmvw, and the Stack Vent 3 and Stack Vent 4 calibration span value for THC is 113.0 ppmvw
 - To convert CH₄ emissions to a C₃H₈ basis, multiply by a factor of 1/3
 - To convert C₂H₆ emissions to a C₃H₈ basis, multiply by a factor of 2/3
 - Integrated bag sampling and analysis is performed for Method 18
- Method Exceptions:
 - For CH₄/C₂H₆ corrected emissions samples resulting in a negative value, an assigned detection limit (DL) of 1.00 is utilized.
- Target and/or Minimum Required Sample Duration: 240 minutes
- Analytical Laboratory: Montrose-Wauconda, Wauconda, Illinois

The typical sampling system is detailed in Figure 3-1.

Figure 3-1
EPA Method 3A, 7E, 18 (Bag), and 25A Sampling Train



3.1.7 EPA Method 201A, Determination of PM₁₀ and PM_{2.5} Emissions from Stationary Sources (Constant Sampling Rate Procedure)

To measure PM₁₀ and PM_{2.5}, extract a sample of gas at a predetermined constant flow rate through an in-stack sizing device. The particle-sizing device separates particles with nominal aerodynamic diameters of 10 micrometers and 2.5 micrometers. To minimize variations in the isokinetic sampling conditions, you must establish well-defined limits. After a sample is obtained, remove uncombined water from the particulate, then use gravimetric analysis to determine the particulate mass for each size fraction. The original method, as promulgated in 1990, has been changed by adding a PM_{2.5} cyclone downstream of the PM₁₀ cyclone. Both cyclones were developed and evaluated as part of a conventional five-stage cascade cyclone train. The addition of a PM_{2.5} cyclone between the PM₁₀ cyclone and the stack temperature filter in the sampling train supplements the measurement of PM₁₀ with the measurement of PM_{2.5}.

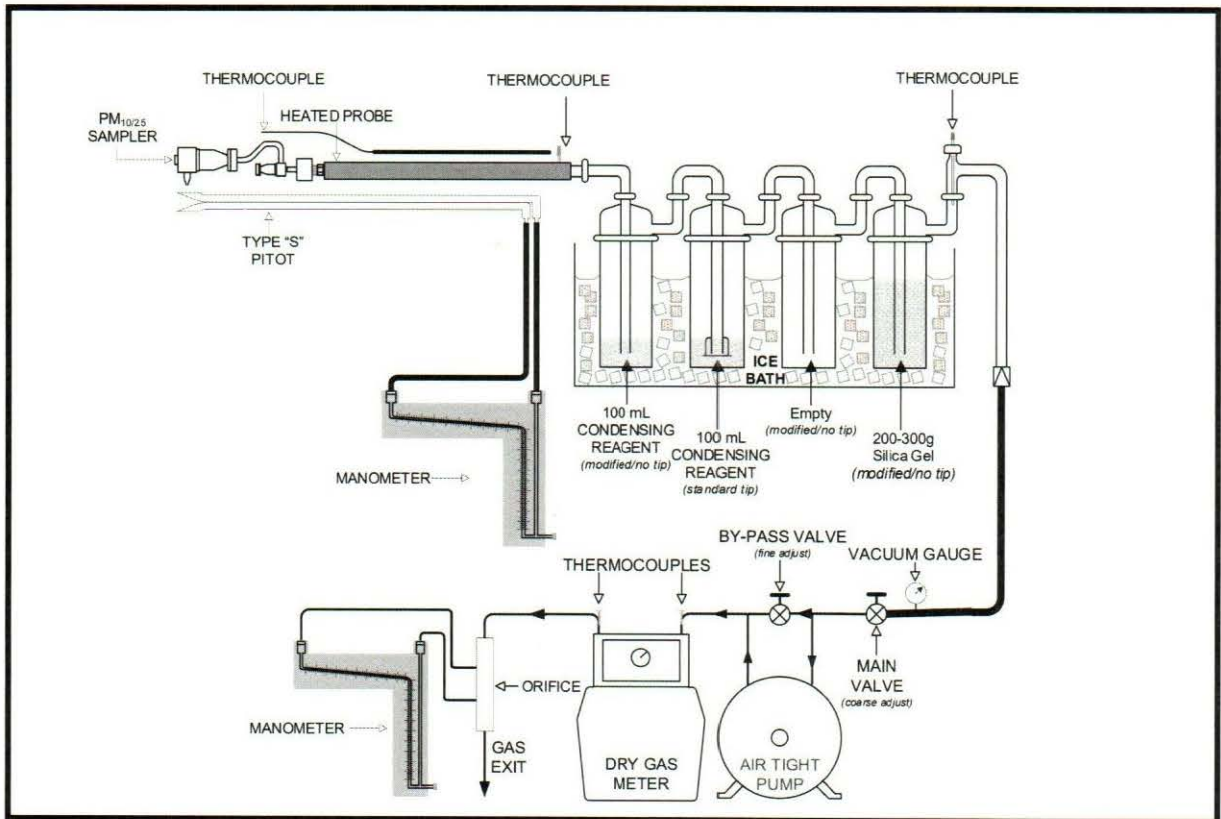
Without the addition of the PM_{2.5} cyclone, the filterable particulate portion of the sampling train may be used to measure total and PM₁₀ emissions. Likewise, with the exclusion of the PM₁₀ cyclone, the filterable particulate portion of the sampling train may be used to measure total and PM_{2.5} emissions.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
 - In-stack filtration was conducted using a glass fiber filter in a stainless-steel filter holder
 - Since the gas filtration temperature never exceeds 30 °C (85 °F), the probe was constructed of stainless steel without a probe liner and the extension was not recovered as part of the PM sample
- Method Exceptions:
 - None
- Target and/or Minimum Required Sample Duration: 240 minutes
- Target and/or Minimum Required Sample Volume: 60 dscf
- Analytical Laboratory: Montrose-Royal Oak, Royal Oak, Michigan

The typical sampling system is detailed in Figure 3-2.

Figure 3-2
EPA Method 201A Sampling Train



3.2 Process Test Methods

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 Test Discussion and Results

4.1 Field Test Deviations and Exceptions

No field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 Presentation of Results

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Tables 4-1 through 4-5. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

For EPA Method 18, the methane spike recovery value was 82.63. While still within the acceptable recovery range for EPA Method 18, the lower recovery resulted in corrected methane concentrations that were likely higher than the actual concentrations found in the vent gas. This resulted in some methane-corrected THC concentrations being negative. Utilizing a conservative approach, an assigned Detection Limit (DL) of 1.00 was applied to all negative methane- and ethane-corrected THC values.

The moisture scale was not zeroed during run 2 and had a negative weight of -9.3 grams as a zero. The moisture results from the second run were corrected to include the 9.3 grams offset by the scale.

**Table 4-1
NO_x, VOC, PM₁₀, and PM_{2.5} Emissions Results -
EU-POURING Combined Stack Vents**

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	1/17/2024	1/18/2024	1/18/2024	--
Time	11:20-15:20	8:15-12:15	14:00-18:00	--
Process Data *				
Production rate, ton of metal/hr	19.72	20.68	20.68	20.36
Total Particulate Matter Under 10-µm (PM₁₀)				
lb/hr	0.89	2.03	2.06	1.66
lb/ton of metal	0.045	0.098	0.100	0.081
Total Particulate Matter Under 2.5-µm (PM_{2.5})				
lb/hr	0.75	1.57	1.56	1.29
lb/ton of metal	0.038	0.076	0.075	0.063
Nitrogen Oxides (NO_x)				
lb/hr, as NO ₂	1.41	1.64	1.77	1.61
lb/ton of metal, as NO ₂	0.072	0.079	0.086	0.079
Volatile Organic Compounds (VOC), as propane				
lb/hr	2.40	1.60	4.30	2.77
lb/ton of metal	0.12	0.077	0.21	0.14

* Process data was provided by CWC Textron personnel.

**Table 4-2
NO_x, VOC, PM₁₀, and PM_{2.5} Emissions Results -
EU-POURING Stack Vent 1**

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	1/17/2024	1/18/2024	1/18/2024	--
Time	11:20-15:20	8:15-12:16	14:00-18:02	--
Sampling & Flue Gas Parameters				
sample duration, minutes	240	240	240	--
O ₂ , % volume dry	20.88	20.92	20.92	20.90
CO ₂ , % volume dry	0.08	0.08	0.07	0.08
flue gas temperature, °F	56.6	54.2	55.2	55.3
moisture content, % volume	0.63	0.73	0.85	0.73
volumetric flow rate, scfm	87,507	93,562	92,927	91,332
volumetric flow rate, dscfm	86,955	92,880	92,141	90,659
Particulate Matter Under 10-µm (PM₁₀)				
gr/dscf	0.00042	0.00091	0.00122	0.00085
lb/hr	0.32	0.72	0.96	0.67
Particulate Matter Under 2.5-µm (PM_{2.5})				
gr/dscf	0.00034	0.00086	0.00098	0.00073
lb/hr	0.25	0.68	0.77	0.57
Nitrogen Oxides (NO_x)				
ppmvd	1.36	1.35	1.40	1.37
lb/hr, as NO ₂	0.85	0.90	0.93	0.89
Volatile Organic Compounds (VOC), as propane *				
ppmvw	<1.00	0.19	<1.00	<0.73
lb/hr	<0.60	0.12	<0.63	<0.45

* The NMNEHC (VOC) concentration was below the detection limit. See Section 4.2 for details.

**Table 4-3
NO_x, VOC, PM₁₀, and PM_{2.5} Emissions Results -
EU-POURING Stack Vent 2**

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	1/17/2024	1/18/2024	1/18/2024	--
Time	11:20-15:22	8:15-12:18	14:00-18:04	--
Sampling & Flue Gas Parameters				
sample duration, minutes	240	240	240	--
O ₂ , % volume dry	20.89	20.96	20.94	20.93
CO ₂ , % volume dry	0.15	0.15	0.15	0.15
flue gas temperature, °F	58.6	63.0	64.7	62.1
moisture content, % volume	0.65	0.16	0.93	0.58
volumetric flow rate, scfm	33,342	31,527	30,757	31,875
volumetric flow rate, dscfm	33,125	31,475	30,472	31,691
Particulate Matter Under 10-µm (PM₁₀)				
gr/dscf	0.00094	0.00090	0.00087	0.00090
lb/hr	0.27	0.24	0.23	0.25
Particulate Matter Under 2.5-µm (PM_{2.5})				
gr/dscf	0.00086	0.00081	0.00075	0.00081
lb/hr	0.24	0.22	0.20	0.22
Nitrogen Oxides (NO_x)				
ppmvd	0.63	0.84	0.91	0.79
lb/hr, as NO ₂	0.15	0.19	0.20	0.18
Volatile Organic Compounds (VOC), as propane *				
ppmvw	3.61	<1.00	3.29	<2.64
lb/hr	0.83	<0.22	0.70	<0.58

* The NMNEHC (VOC) concentration was below the detection limit. See Section 4.2 for details.

Table 4-4
NO_x, VOC, PM₁₀, and PM_{2.5} Emissions Results -
EU-POURING Stack Vent 3

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	1/17/2024	1/18/2024	1/18/2024	--
Time	11:20-15:22	8:15-12:16	14:00-18:08	--
Sampling & Flue Gas Parameters				
sample duration, minutes	240	240	240	--
O ₂ , % volume dry	20.88	20.79	20.70	20.79
CO ₂ , % volume dry	0.13	0.12	0.13	0.13
flue gas temperature, °F	58.4	70.6	72.5	67.2
moisture content, % volume	0.65	0.60	0.80	0.69
volumetric flow rate, scfm	66,809	70,176	67,527	68,171
volumetric flow rate, dscfm	66,372	69,753	66,987	67,704
Particulate Matter Under 10-µm (PM₁₀)				
gr/dscf	0.00033	0.00073	0.00115	0.00074
lb/hr	0.19	0.44	0.66	0.43
Particulate Matter Under 2.5-µm (PM_{2.5})				
gr/dscf	0.00027	0.00062	0.00068	0.00053
lb/hr	0.16	0.37	0.39	0.31
Nitrogen Oxides (NO_x)				
ppmvd	0.64	0.58	0.84	0.69
lb/hr, as NO ₂	0.30	0.29	0.40	0.33
Volatile Organic Compounds (VOC), as propane *				
ppmvd	0.048	<1.00	2.90	<1.32
lb/hr	0.022	<0.48	1.34	<0.62

* The NMNEHC (VOC) concentration was below the detection limit. See Section 4.2 for details.

**Table 4-5
NO_x, VOC, PM₁₀, and PM_{2.5} Emissions Results -
EU-POURING Stack Vent 4**

Parameter/Units	Run 1	Run 2	Run 3	Average
Date	1/17/2024	1/18/2024	1/18/2024	--
Time	11:20-15:22	8:15-12:16	14:00-18:01	--
Sampling & Flue Gas Parameters				
sample duration, minutes	240	240	240	--
O ₂ , % volume dry	20.73	20.72	20.67	20.71
CO ₂ , % volume dry	0.04	0.09	0.08	0.07
flue gas temperature, °F	55.3	61.9	65.0	60.8
moisture content, % volume	0.81	0.71	0.57	0.69
volumetric flow rate, scfm	43,886	44,109	44,460	44,152
volumetric flow rate, dscfm	43,533	43,796	44,207	43,845
Particulate Matter Under 10-µm (PM₁₀)				
gr/dscf	0.00029	0.00168	0.00056	0.00084
lb/hr	0.11	0.63	0.21	0.32
Particulate Matter Under 2.5-µm (PM_{2.5})				
gr/dscf	0.00028	0.00080	0.00052	0.00053
lb/hr	0.10	0.30	0.20	0.20
Nitrogen Oxides (NO_x)				
ppmvd	0.36	0.82	0.75	0.64
lb/hr, as NO ₂	0.11	0.26	0.24	0.20
Volatile Organic Compounds (VOC), as propane				
ppmvd	3.15	2.58	5.31	3.68
lb/hr	0.95	0.78	1.62	1.12

5.0 Internal QA/QC Activities

5.1 QA/QC Audits

The meter boxes and sampling trains used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations, and percent isokinetics met the applicable QA/QC criteria.

EPA Method 3A and 7E calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

EPA Method 25A FIA calibration audits were within the measurement system performance specifications for the calibration drift checks and calibration error checks.

EPA Method 201A QA/QC for Δ Ps and aerodynamic cut sizes (D_{50}) met the criteria specified in Section 8.5 of the method, except where noted in Section 5.2.

5.2 QA/QC Discussion

For EPA Method 201A, the PM_{2.5} cyclone (Cyclone IV) did not meet the required cyclone cut diameters (D_{50-IV}) criteria of $2.25 \mu\text{m} \leq D_{50-IV} \leq 2.75 \mu\text{m}$.

5.3 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. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).