SOURCE TEST REPORT
2022 COMPLIANCE TESTING
GENERAL MOTORS LLC - SAGINAW METAL CASTING OPERATIONS (SMCO)
SV-Z02-BH-6 BAGHOUSE
SAGINAW, MICHIGAN

Prepared For:

General Motors LLC - Saginaw Metal Casting Operations (SMCO)
1629 N Washington Ave.
Saginaw, MI 48601

For Submittal To:

Michigan Department of Environment, Great Lakes, and Energy
525 West Allegan Street, Constitution Hall 2S
Lansing, MI 48933

Prepared By:

Montrose Air Quality Services, LLC
1371 Brummel Ave
Elk Grove Village, Illinois 60007

Document Number:	**MW023AS-015369-RT-1359**
Test Dates:	**April 12, 2022**
Submittal Date:	**May 9, 2022**

ACCREDITED
TO ASTM D7036 ONLY
CERT #1923.01

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: 05 / 05 / 2022

Name: Sean Wheeler, QI Title: Field 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: Henry M. Taylor Date: 05 / 05 / 2022

Name: Henry M. Taylor, QSTO Title: Senior Reporting Specialist

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

General Motors LLC (GM) - Saginaw Metal Casting Operations (SMCO) (State Registration No.: B1991) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the SV-Z02-BH-6 Baghouse serving EU-PSAND Sand Handling (EU-PSANDSH) at their facility located in Saginaw, Michigan. Testing was conducted to meet the requirements of GM and the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

The specific objectives were to:

- Determine the concentration and emission rate of THC
- 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 Dates	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
4/12/22	SV-Z02-BH-6 Baghouse	Velocity/Volumetric Flow	EPA 1 & 2	3	60
		O_2, CO_2	EPA 3	3	60
		Moisture	EPA 4	3	60
		THC	EPA 25A	3	60

To simplify this report, a list of Units and Abbreviations is included in Appendix C.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 tests were conducted according to Test Plan No. MW023AS-015369-PP-407 dated February 28, 2022.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
SV-Z02-BH-6 BAGHOUSE
APRIL 12, 2022

Parameter/Units	Average Results	Emission Limits
Total Hydrocarbons (THC) as Propane		
lb/hr	13.48	14.88*

*Emission limit is from PTI 36-12M, which was issued on February 9, 2022. A Rule 216 modification application was submitted to EGLE on February 15, 2022 to incorporate the terms and conditions of PTI 36-12M into the renewable operating permit MI-ROP-B1991-2021a.

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	General Motors SMCO 1629 N. Washington Ave. Saginaw, Michigan 48601	
Project Contact:	Alex Thibeault	Jeffrey Hummel
Role:	SMCO Sr. Environmental Eng.	Senior Environmental Project Eng.
Company:	General Motors	General Motors
Telephone:	810-577-9003	517-719-9053
Email:	alexandra.thibeault@gm.com	jeffrey.hummel@gm.com

Agency Information

Regulatory Agency:	Michigan Department of Environment, Great Lakes and Energy
Agency Contact:	Tammy Bell
Telephone:	313-456-4692
Email:	BELLT4@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC
Contact:	Sean Wheeler
Title:	Field Project Manager
Telephone:	630-860-4740
Email:	stwheeler@montrose-env.com

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

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Brian Romani	Montrose	Field Project Manager/Field Team Leader/QI/Trailer Operator/Sample Recovery
Jack Hutchison	Montrose	Report Preparation
Alex Thibeault	GM	Client Liaison/Test Coordinator

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

EU-PSANDSH (PSAND Sand Handling) consists of the scrap core sand handling equipment downstream of EU-PSANDCASTLINE, EU-PSANDCOREROOM and EU-FINISH. It includes the Pre-Crusher, Didion Drum, Sand Transport Hoppers, and Pre-Reclaim Sand Silo. Most of the scrap core sand process in EU-PSANDSH comes from the shakeout system at the end of EU-PSANDCASTLINE. The rest of the scrap core sand processed in EU-PSANDSH, coming from EU-PSANDCOREROOM and EU-FINISH, are introduced through the Pre-Crusher. Scrap core sand is then broken down in the Didion Drum, before being conveyed to sand hoppers and pneumatically transferred to the Pre-Reclaim Sand Silo of EU-PSANDPROCESS. Emissions are vented to a 35,000 scfm fabric filter collector to stack SV-Z02-BH-6.

2.2 FLUE GAS SAMPLING LOCATION

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

TABLE 2-1
SAMPLING LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
SV-Z02-BH-6 Baghouse	30	480 / 16.0	1080 / 36.0	Isokinetic: 16 (8/port)

The sample location was verified in the field to conform to EPA Method 1. Absence of cyclonic flow conditions were confirmed following 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 EU-PSANDSH and the air pollution control devices were operating at the conditions required by the permit.

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:

- Sand throughput, lb/hr
- Mold Production Rate

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously 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 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

3.1.2 EPA Method 2, Determination of Stack 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 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.

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

- Method Options:
  - S-type pitot tube coefficient is 0.84
- Method Exceptions:
  - None

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

3.1.3 EPA Method 3, Gas Analysis for the Determination of Dry Molecular Weight

EPA Method 3 is used to measure the percent O_2 and CO_2 in the gas stream. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2 and percent O_2 using either an Orsat or a Fyrite analyzer.

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

- Method Options:
  - An Fyrite analyzer was used to measure the analyte concentrations
  - The sample is collected into a Tedlar bag from the back of the sample train for the duration of the test run
- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration: 60 minutes

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

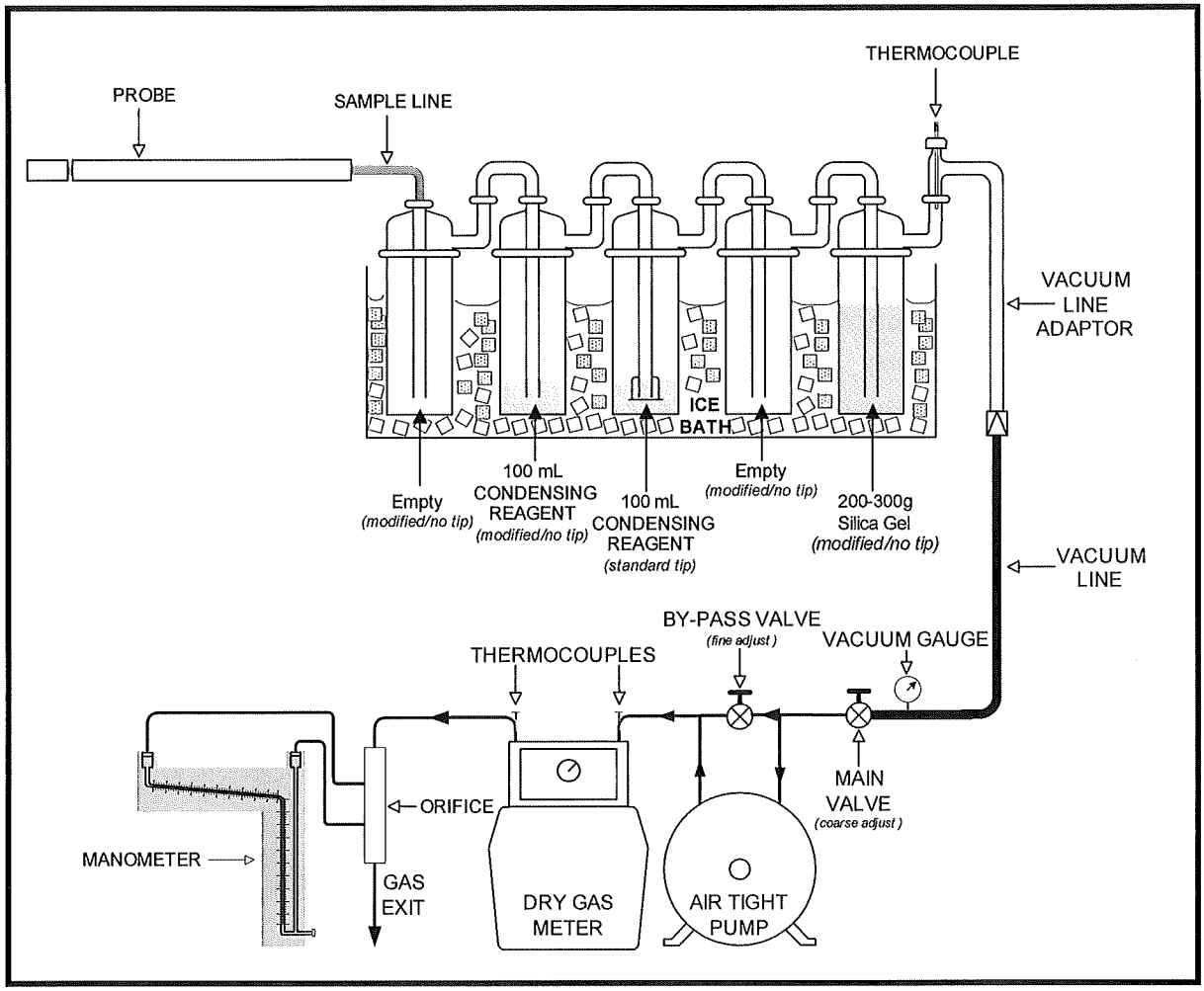
EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed 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:
  - Montrose used knockout jars with flexible gum tubing in place of the Greenburg-Smith impinger train per 40 CFR Part 60, Appendix A, Method 5 §6.1.1.8.
  - 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:
  - Moisture sampling is performed as a stand-alone method at a single point in the centroid of the stack.
- Target and/or Minimum Required Sample Duration: 60 minutes

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

FIGURE 3-1
EPA METHOD 4 (DETACHED) (KO) SAMPLING TRAIN



3.1.5 EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

EPA Method 25A is an instrumental test method used to measure the concentration of THC in stack gas. A gas sample is extracted from the source through a heated sample line and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

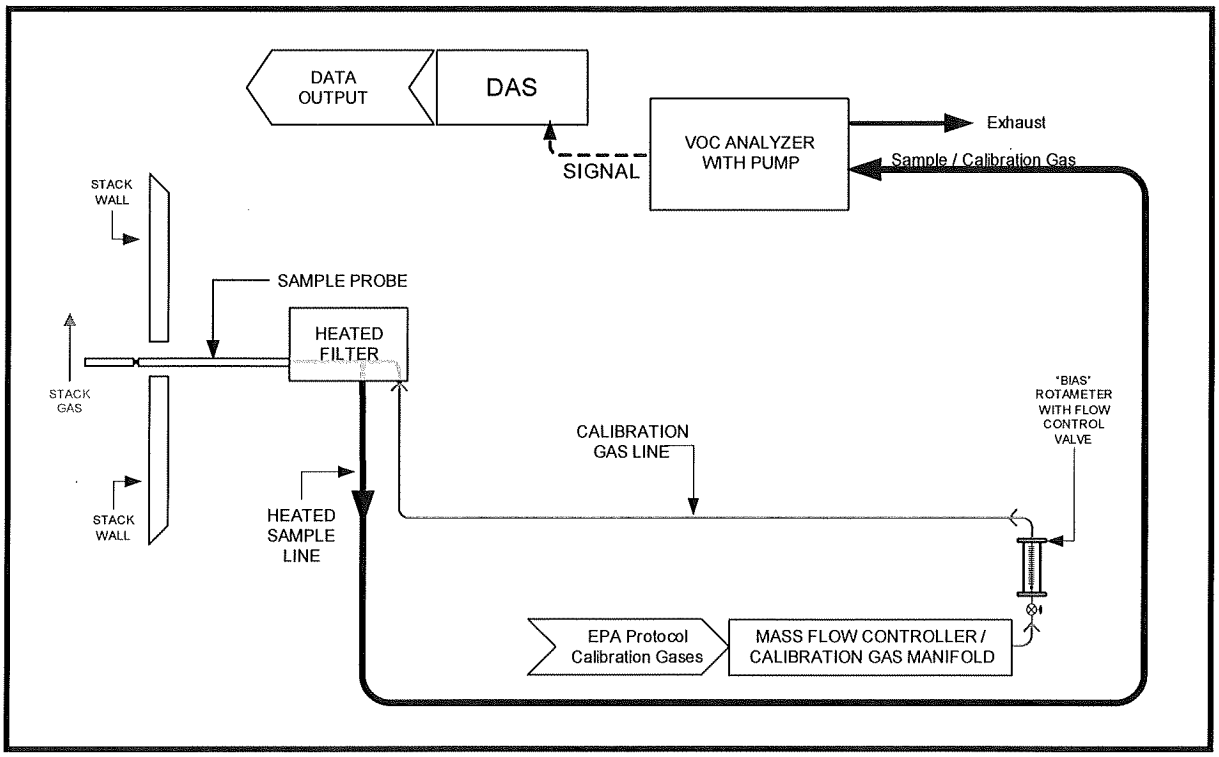
Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Results are reported in terms of propane

- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration: 60 minutes

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

FIGURE 3-2
EPA METHOD M25A 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

With the exception of EPA Method 3 being used in place of EPA Method 3A for O_2 and CO_2 analysis, no field deviations or exceptions from the test plan 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 Table 4-1. 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.

TABLE 4-1
THC EMISSIONS RESULTS -
SV-Z02-BH-6 BAGHOUSE

Run Number	1	2	3	Average
Date	4/12/2022	4/12/2022	4/12/2022	--
Time	08:30-09:30	09:50-10:50	11:06-12:06	--
Flue Gas Parameters				
flue gas temperature, °F	102.9	101.0	102.0	102.0
volumetric flow rate, acfm	24,639	24,112	23,988	24,246
volumetric flow rate, scfm	22,815	22,405	22,249	22,490
volumetric flow rate, dscfm	22,582	22,156	22,010	22,249
carbon dioxide, %	0.2	0.2	0.2	0.2
oxygen, %	20.5	20.5	20.5	20.5
moisture content, % volume	1.06	1.15	1.12	1.11
Total Hydrocarbon (THC) as Propane Emissions				
ppmvw	82.2	87.2	92.5	87.3
lb/hr	12.88	13.42	14.14	13.48

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling train 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.

Fyrite analyzer audits were performed during this test in accordance with EPA Method 3, Section 10.1 requirements. The results were within ± 0.5% of the respective audit gas concentrations.

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

5.2 QA/QC DISCUSSION

All QA/QC criteria were met during this test program.

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 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).