1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

General Motors, LLC contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance emissions test program on the FG-TOPCOAT Operation at the General Motors, LLC-Lansing Delta Township facility located in Lansing, Michigan. The tests were conducted to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit No. MI-ROP-N6950-2020.

The specific objectives were to:

- Verify the total gaseous organic (TGO) removal efficiency (RE) of the concentrators (RCC1/RCC2) serving FG-TOPCOAT
- 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)
06/23/2020	RCC1/RCC2 INLET/OUTLET	Velocity/Volumetric Flow Rate	EPA 1 & 2	3	~10
06/23/2020	RCC1/RCC2 INLET/OUTLET	O_2, CO_2	EPA 3	3	~3
06/23/2020	RCC1/RCC2 OUTLET	Moisture	EPA 4	1	30
06/23/2020	RCC1/RCC2 INLET/OUTLET	TGO	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 testing was conducted by the Montrose personnel listed in Table 1-3 on June 23, 2020. The tests were conducted according to the test plan (protocol) dated March 17, 2020 that was submitted to EGLE.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
RCC1/RCC2
JUNE 23, 2020

Parameter/Units	Average Results	Allowable Limits
TGO RE		
%	97.5	--

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	General Motors-Lansing Delta Township Lansing Delta Township 8175 Millet Hwy Lansing, MI 48917	
Project Contact:	Brian Borzenski	Jessica Alderton
Role:	Sr. Environmental Engineer	Sr. Environmental Engineer
Company	General Motors, LLC	General Motors, LLC
Telephone:	517-388-0631	586-863-8490
Email:	Brian.borzenski@gm.com	Jessica.alderton@gm.com

Agency Information

Regulatory Agency:	EGLE	
Contact:	Bob Byrnes	Lindsey Wells
Telephone:	517-275-0439	517-282-2345
Email:	byrnesr@michigan.gov	wellsl8@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC	
Contact:	Matthew Young	Mason Sakshaug
Title:	District Manager	Field Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	myoung@montrose-env.com	msakshaug@montrose-env.com

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

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Matthew Young	Montrose	District Manager
David Trahan	Montrose	Senior Field Technician, QI
Ryan McWhinnie	Montrose	Field Technician
Brian Borzenski	General Motors, LLC	Observer/Client Liaison/Test Coordinator
Jessica Alderton	General Motors, LLC	Observer/Client Liaison/Test Coordinator
Bob Byrnes	EGLE	Observer
Lindsay Wells	EGLE	Observer

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The General Motors, LLC-Lansing Delta Township automobile assembly plant operates two topcoat spray booths followed by topcoat ovens (EU-TOPCOAT1 and EU-TOPCOAT2). There is a heated flash-off area located between the basecoat portion of each booth and the clearcoat portion of each booth. Basecoat is applied manually or robotically using air atomized guns on cut in areas. Basecoat is then applied to the body using robots equipped with electrostatic applicators. The first and second coats of exterior clearcoat are applied with electrostatic applicators. The clearcoat observation zone maybe used for backup/manual spraying if required using air atomized applicators. Each section of the topcoat booth is equipped with a waterwash system to control particulate emissions from paint overspray. The VOC emissions from the heated flash off area and the oven are each controlled by a Topcoat Thermal Oxidizer. This topcoat thermal oxidizer is in series with two parallel and identical carbon adsorption units that also control the VOC emissions from the automatic clearcoat sections of the topcoat booths.

The two parallel and identical carbon adsorption units (concentrators) accept high volume, low VOC concentration exhaust gases from the clearcoat spray booths. Low volume, high VOC concentration gases exhaust from the adsorption units and are directed to the topcoat regenerative thermal oxidizer (RTO). High volume, low VOC concentration gases also exit the adsorption units and are exhausted directly to the atmosphere via the RCC1/RCC2 outlet.

EU-TOPCOAT1 and EU-TOPCOAT2 were in operation during this test event.

2.2 FLUE GAS SAMPLING LOCATION(S)

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

TABLE 2-1
SAMPLING LOCATIONS

Sampling Location	Stack Inside Dimensions (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
RCC1/RCC2 INLET	66.0 x 66.0 Square	480 / 7.3	96.0 / 1.5	Flow: 16 (4/port); Moisture: 1 Gaseous: 1
RCC1/RCC2 OUTLET	62.0 x 62.0 Square	360.0 / 5.8	48 / 0.8	Flow: 25 (5/port) Moisture: 1 Gaseous: 1

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 Appendices A.1 and A.2 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while RCC1/RCC2 and the EU-TOPCOAT1 and 2 were 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:

- Average Desorption Air Supply Temperature, °F
- Paint Shop Actual Net While Running Line Speed (Jobs/hr)
- Average Number of Vehicles in Clearcoat Spray Zones

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.

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.

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

EPA Method 3 is used to calculate the dry molecular weight of the stack gas using one of three methods. The first choice is 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.

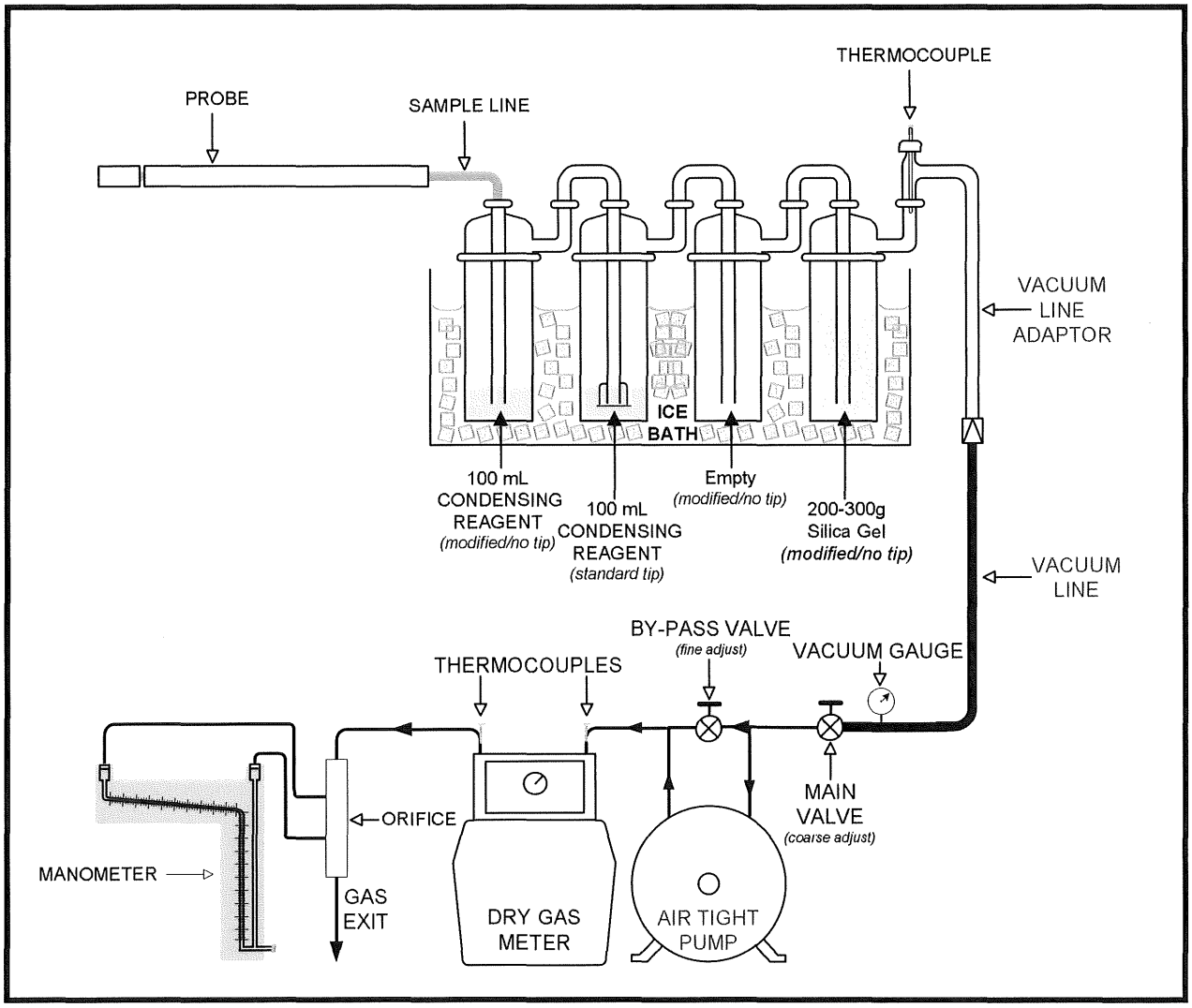
3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

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.

The wet bulb/dry bulb approximation method (EPA Method 4, Section 2.2.1) was also utilized during this test event.

The sampling system is detailed in Figure 3-1.

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

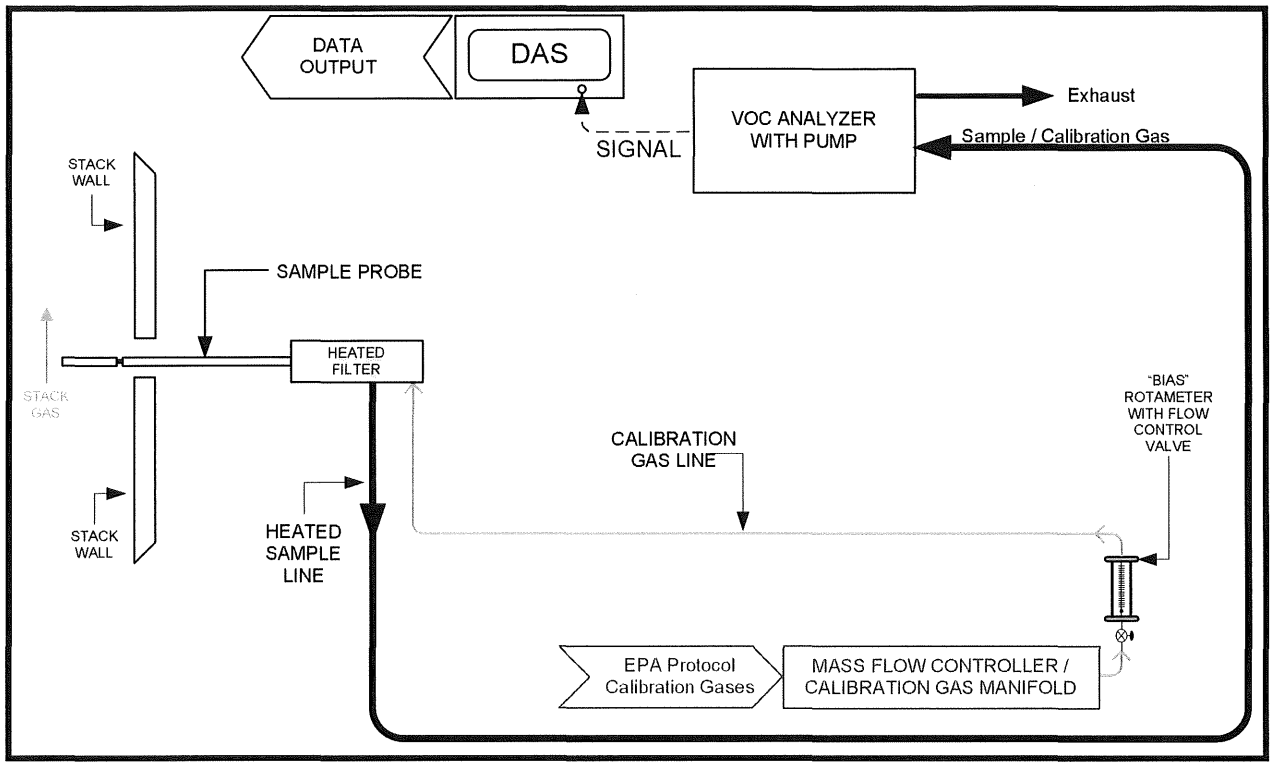


3.1.5 EPA Method 25A, Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

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.

Figure 3-2 details the sampling system.

FIGURE 3-2
EPA METHOD 25A 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 displayed in Table 1-2. The results of individual test runs performed are presented in Tables 4-1 and 4-2. 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.

Due to the low moisture content in the gas streams at the inlet and outlet sampling locations, the wet bulb/dry bulb (wb/db) approximation method (EPA Method 4 Section 2.2.1) was utilized to measure the moisture content of the duct gas for runs 1 through 3 at the RCC1/RCC2 Inlet Duct and runs 2 and 3 at the RCC1/RCC2 Outlet Duct.

TABLE 4-1
TGO EMISSIONS RESULTS -
RCC1/RCC2 INLET

Run Number	1	2	3	Average
Date	06/23/2020	06/23/2020	06/23/2020	--
Time	07:20-08:20	09:50-10:50	12:45-13:45	--
Flue Gas Parameters				
O_2, % volume dry	21.0	21.0	21.0	21.0
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	75	76	75	75
moisture content, % volume	1.80	1.80	1.74	1.78
volumetric flow rate, scfm	67,887	66,803	66,142	66,944
TGO as Propane				
ppmvd	167	157	166	164
lb/hr	78.1	72.0	75.4	75.2

TABLE4-2
TGO EMISSIONS AND RE RESULTS -
RCC1/RCC2 OUTLET

Run Number	1	2	3	Average
Date	06/23/2020	06/23/2020	06/23/2020	--
Time	07:20-08:20	09:50-10:50	12:45-13:45	--
Process Data				
Air Supply Temperature, °F*	271	271	271	
Average Number of Vehicles†	16	16	17	
Flue Gas Parameters				
O_2, % volume dry	21.0	21.0	21.0	21.0
CO_2, % volume dry	0.0	0.0	0.0	0.0
flue gas temperature, °F	97	97	97	97
moisture content, % volume	6.27	3.30	3.41	4.33
volumetric flow rate, dscfm	77,983	76,280	70,959	75,074
TGO as Propane				
ppmvd	3.86	3.62	3.66	3.71
lb/hr	2.07	1.90	1.79	1.92
TGO RE				
%	97.4	97.4	97.6	97.5

* Average Desorption Air Supply Temperature

† Average Number of Vehicles in Clearcoat Spray Zones

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling train utilized during Run 1 at the RCC1/RCC2 Outlet performed within the requirements of the respective methods. The post-test leak check and minimum metered volume 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.

An EPA Method 205 field evaluation of the calibration gas dilution system was conducted. The dilution accuracy and precision QA specifications were met.

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 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).