



EXECUTIVE SUMMARY

RWDI USA Inc. (RWDI) was retained by FCA US LLC (FCA) to complete air emission testing program at their Detroit Assembly Complex – Mack (DACM) located at 4000 Saint Jean Street, Detroit, Michigan. DACM operates an automobile assembly plant that produces the all-new Jeep Grand Cherokee L. Under Permit to Install (PTI) 14-19A the emissions testing covers the required testing outlined in the FGAUTOASSEMBLY Flexible group (V(1)) for the following:

- PM/PM₁₀/PM_{2.5} emissions from EUPRIMER and EUTOPCOAT observations zones. For Basecoat 1 and Clearcoat 1, since the two (2) coating lines are virtually identical, the observation stacks from one (1) line was tested and assumed to be representative of the 2nd line. For Tutone (or EU-PRIMER) there is only one (1) exhaust for the Primer/Tutone booth.
- PM/PM₁₀/PM_{2.5} emissions from EUSPOTREPAIR exhaust stack

Sections V(1) and V(2) of FGAUTOASSEMBLY require the verification of PM, PM₁₀, and PM_{2.5} emission rates from representative particulate units and NO_x emissions from representative natural gas combustion units, Concentrator and RTO. The testing of NO_x emissions from the Concentrator and PM and NO_x emissions from the RTO were completed under separate cover. Manufacturer's PM and NO_x emission factor guarantees were provided to EGLE for several natural gas emissions sources (including hot water generators and air supply houses) in review of the PTI. This program provides the PM, PM₁₀ and PM_{2.5} emission rate data for the remaining Emission Units at the site.

DACM recorded the production rate of vehicles processed during each particulate test from each of the sources. Testing was completed October 7-8, 2021 and October 13-14, 2021.



A summary of the results can be found in the "Tables" section of this report.

Table i: Average Emission Data – Particulate Testing (PM/PM₁₀/PM_{2.5})

Source	Parameter	Emission Rate (lb/hr)			
		Run 1	Run 2	Run 3	Average
SVPRMOBS (Tutone)	PM	0.07	0.12	0.18	0.12
	PM ₁₀	0.05	0.11	0.13	0.10
	PM _{2.5}	0.04	0.10	0.06	0.07
SVRPRCS (Repair Booth)	PM	0.15	0.18	0.12	0.15
	PM ₁₀	0.12	0.14	0.08	0.11
	PM _{2.5}	0.04	0.10	0.04	0.06
SVC1BCOBS (Basecoat 1)	PM	1.19	0.66	1.52	1.36[1]
	PM ₁₀	0.92	0.45	1.24	0.87
	PM _{2.5}	0.50	0.39	1.10	0.66
SVC1CCOBS (Clearcoat 1)	PM	0.24	0.20	0.04	0.16
	PM ₁₀	0.23	0.19	0.03	0.15
	PM _{2.5}	0.21	0.16	0.03	0.13

Note: [1] For Test 2 for Basecoat 1 Observation, the PM results are considered invalid due to the isokinetic sampling rate of 111% (1% outside of allowable range). Test 2 yielded the lowest results and its removal from the averaging for PM results in a higher average. PM₁₀ and PM_{2.5} were within the allowable range and are considered valid for Test 2.

Table ii: Average Concentration Data – Particulate Testing (PM/PM₁₀/PM_{2.5})

Source	Parameter	Emission Rate (gr/dscf)			
		Run 1	Run 2	Run 3	Average
SVPRMOBS (Tutone)	PM	0.00027	0.00049	0.00071	0.00049
	PM ₁₀	0.00020	0.00045	0.00051	0.00039
	PM _{2.5}	0.00014	0.00039	0.00024	0.00026
SVRPRCS (Repair Booth)	PM	0.00024	0.00027	0.00020	0.00024
	PM ₁₀	0.00019	0.00021	0.00014	0.00018
	PM _{2.5}	0.00006	0.00016	0.00007	0.00010
SVC1BCOBS (Basecoat 1)	PM	0.00790	0.00445	0.01010	0.00900[1]
	PM ₁₀	0.00610	0.00300	0.00820	0.00577
	PM _{2.5}	0.00328	0.00260	0.00729	0.00439
SVC1CCOBS (Clearcoat 1)	PM	0.00111	0.00096	0.00020	0.00076
	PM ₁₀	0.00105	0.00090	0.00017	0.00071
	PM _{2.5}	0.00097	0.00078	0.00014	0.00063

Note: [1] For Test 2 for Basecoat 1 Observation, the PM results are considered invalid due to the isokinetic sampling rate of 111% (1% outside of allowable range). Test 2 yielded the lowest results and its removal from the averaging for PM results in a higher average. PM₁₀ and PM_{2.5} were within the allowable range and are considered valid for Test 2.



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CITY Lansing	POSTAL CODE 48909-7760
SIGNATURE (PLEASE PRINT) X See below	

DATE 21-12-13	# PIECES 1
SPECIAL INSTRUCTIONS Deliver ASAP!	
ROUND TRIP No	TOTAL WEIGHT 4 Lbs
READY TIME 12-13-21 12:00 PM	
SERVICE TYPE Direct Drive	PACKAGE TYPE Printed Matter
DRIVER # PICK / DEL RGC YQG Leo	REFERENCE DACM Reports

Shipper's Signature: _____

Print Name: Brad Bergeron / Juan Vargas / Alec Smith / Benjamin Durham / Mason Sakshaug

Date / Time: 13th Dec, 2021 @ _____ hrs

Receiver's Signature: _____

Print Name: Karen Kajiya-Mills

Date / Time: 13th Dec, 2021 @ _____ hrs



Name of ACR / inspector: _____

*Secured cargo inspected and reviewed by RGC Inc.
** Transportation security checklist completed





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1 INTRODUCTION

RWDI USA Inc. (RWDI) was retained by FCA US LLC (FCA) to complete air emission testing program at their Detroit Assembly Complex – Mack (DACM) located at 4000 Saint Jean Street, Detroit, Michigan. DACM operates an automobile assembly plant that produces the all-new Jeep Grand Cherokee L. Under Permit to Install (PTI) 14-19A the emissions testing covers the required testing outlined in the FGAUTOASSEMBLY Flexible group (V(1)) for the following:

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- PM/PM₁₀/PM_{2.5} emissions from EUSPOTREPAIR exhaust stack

Sections V(1) and V(2) of FGAUTOASSEMBLY require the verification of PM, PM₁₀, and PM_{2.5} emission rates from representative particulate units and NO_x emissions from representative natural gas combustion units, Concentrator and RTO. The testing of NO_x emissions from the Concentrator and PM and NO_x emissions from the RTO were completed under separate cover. Manufacturer's PM and NO_x emission factor guarantees were provided to EGLE for several natural gas emissions sources (including hot water generators and air supply houses) in review of the PTI. This program provides the PM, PM₁₀ and PM_{2.5} emission rate data for the remaining Emission Units at the site.

Testing was successfully completed while all process equipment was operating under normal operating conditions.

Testing was completed October 7-8, 2021 and October 13-14, 2021. Testing of emissions was conducted by Mr. Mason Sakshaug, Mr. Juan Vargas, Mr. Ben Durham, Mr. Brad Bergeron, and Mr. Steve Smith of RWDI. Mr. Thomas Caltrider and Mr. Paul Diven were on-site to monitor the process operation and witness the testing on behalf of FCA US LLC. Ms. Regina Angellotti from the State of Michigan Department of Environment, Great Lakes and Energy (EGLE) was on-site on October 13-14, 2021 to witness the testing at DACM.

2 PROCESS DESCRIPTION

DACM operates an automobile assembly plant that produces the all-new Jeep Grand Cherokee L models for FCA US LLC under Emission Units and Flexible Group: EUPRIMER, EUTOPCOAT, EUSPOTREPAIR and FG-AUTOASSEMBLY. Additional information for process emissions can be found in **Appendix A**.

3 SAMPLING LOCATIONS AND METHODS

3.1 Sampling Location

This following table summarizes the sampling locations.

Table 3.1.1: Summary of the Stack Characteristics

Source	Parameter	Diameter	Approximate Duct Diameters from Flow Disturbance	Number of Ports	Points per Traverse	Total Points per Test	Anticipated Stack Temperature
SVPRMOBS (Tutone)	PM/PM ₁₀ /PM _{2.5}	44"	~7 downstream and >8 upstream	2	6	12 PM/Flow	82°F
SVC1BCOBS (Basecoat 1)	PM/PM ₁₀ /PM _{2.5}	36"	~9 downstream and >8 upstream	2	6	12 PM/Flow	87°F
SVC1CCOBS (Clearcoat 1)	PM/PM ₁₀ /PM _{2.5}	40"	~8 downstream and >8 upstream	2	6	12 PM/Flow	82°F
SVRPRCS (Rapid Repair)	PM/PM ₁₀ /PM _{2.5}	77.5"	-8 downstream and >2 upstream	2	6	12 PM/Flow	75°F

Example photos of sources are provided below:



Figure 3.1.1.1 – Tutone Observation Zone Exhaust



Figure 3.1.1.2 – Basecoat Observation Zone Exhaust



Figure 3.1.1.3 – Clearcoat Observation Zone Exhaust



Figure 3.1.1.4 – Rapid Repair Booth Exhaust

3.2 Test Methodology

3.2.1 Velocity, Temperature and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following U.S. EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer. Volumetric flow rates were determined following the equal area method as outlined in U.S. EPA Method 2. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a calibrated digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in U.S. EPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight". The stack was assumed to be at ambient conditions for the determination of the dry molecular weight. Stack moisture content was determined through direct condensation and according to U.S. EPA Method 4, "Determination of Moisture Content of Stack Gases".



3.2.2 Sampling for Particulate Matter (PM, PM10 and PM2.5)

Particulate matter (PM/PM₁₀/PM_{2.5}) was sampled following procedures outlined in U.S. EPA Method 201A. Method 202 was only used if the filter temperature exceeds 85°F.

As stated in Method 202, *"If the gas filtration temperature exceeds 30°C (85°F) and you must measure both the filterable and condensable (material that condenses after passing through a filter) components of total primary (direct) PM emissions to the atmosphere, then you must combine the procedures in this method with the procedures in Method 201A of appendix M to this part for measuring filterable PM. However, if the gas filtration temperature never exceeds 30°C (85°F), then use of this method is not required to measure total primary PM"*.

For Basecoat 1 Observation (SVC1BCOBS), the filtration temperature did exceed 85°F and therefore PM measurements included the results from Method 201A and Method 202. For Tutone (SVPRMOBS), Clearcoat 1 Observation (SVC1CCOBS) and Rapid Repair Booth (SVRPRCS), the filtration temperature did not exceed 85°F, therefore, the results for PM/PM₁₀/PM_{2.5} only include the Method 201A portion. Nitrogen purges were not completed post sample to remove sulphates for any of the sampling as sulfur dioxide exposure was not expected to be an issue at this source location. This was approved in the Source Testing Plan. Blank corrections were made in accordance with EPA Method 201A and EPA Method 202, where applicable.

For the observation zone exhausts (Primer, Basecoat and Clearcoat), the tests were 120 minutes in duration. For the Spot Repair Exhaust, the tests were 240 minutes.

3.3 Quality Assurance/Quality Control Measures

Applicable quality assurance measures were implemented during the sampling program to ensure the integrity of the results. These measures included detailed documentation of field data, equipment calibrations for all measured parameters, completion of Chain of Custody forms when submitting laboratory samples, and submission of field blank samples to the laboratories. **Table 2** presents a sample log and summarizes the sampling times, sample ID's, and filter ID's.

All samplers were bench tested and calibrated in RWDI's office prior to field deployment. For each sample collected with a Method 5 sampling train, both pre- and post- leak checks were conducted by plugging the inlet and drawing a vacuum of equal to or greater than the vacuum recorded during the test. Dry gas meter reading leakage rates greater than 4 percent of the average sampling rate or 0.00057 m³/min (0.02 cfm), whichever is less, were considered unacceptable. Similar leak check procedures for pitot tube and pressure lines were also conducted. Daily temperature sensor audits were completed by noting the ambient temperature, as measured by a reference thermometer, and comparing these values to those obtained from the stack sensor. Leak checks for each test were documented on the field data sheets presented in the applicable appendices for each sample parameter.



4 RESULTS

The average emission results are presented in the 'Tables' section of this report. **Table 1** presents a summary of the parameters and methodology used in this sampling program. **Table 2** presents a summary of sample times and sample logs and **Tables 3 and 4** provide details on the stack gas characteristics and PM/PM₁₀/PM_{2.5} results, respectively. Detailed information regarding each particulate test can be found in **Appendices B through C**.

All calibration information for the equipment used for this study is included in **Appendix D**. Laboratory results are included in **Appendix E**. Production data is summarized in **Appendix F**.

4.1 Discussion of Results

Sampling was completed between October 6th and October 14th, 2021. A summary of the results can be found in the Tables section of this report and the more detailed calculations can be found in **Appendices B, C, D and E**. PM/PM₁₀/PM_{2.5} was measured (U.S. EPA Method 201A and 202 for sources when the filtration temperature was greater than 85°F). The results have been summarized below in **Table 4.1.1 and 4.1.2**.

Concentrations were corrected to reference conditions of 68 °F, and 29.92 in.Hg. Operating conditions during the sampling were monitored by FCA personnel. All equipment was operated under normal representative operating conditions.

Contact was maintained between the operator and the sampling team. A member of the RWDI sampling team contacted the operator before each test, to ensure that the process was at normal maximum operating conditions.



Table 4.1.1: Average Emission Data – Particulate Testing (PM/PM₁₀/PM_{2.5})

Source	Parameter	Emission Rate (lb/hr)			
		Run 1	Run 2	Run 3	Average
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Note: [1] For Test 2 for Basecoat 1 Observation, the PM results are considered invalid due to the isokinetic sampling rate of 111% (1% outside of allowable range). Test 2 yielded the lowest results and its removal from the averaging for PM results in a higher average. PM₁₀ and PM_{2.5} were within the allowable range and are considered valid for Test 2.

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5 OPERATING CONDITIONS

Operating conditions during sampling were monitored by DACM personnel. Contact was maintained between the operator and the sampling team. A member of the RWDI sampling team contacted the operator before each test, to ensure that the process was at normal maximum operating conditions.

6 MODIFICATIONS

For Basecoat 1 Observation, the sampling rate resulted in an isokinetic run of 111% which is 1% above the allowable variable for PM. Method 201A allows a variation of 20% (80% to 120%) and therefore the data from all three tests is considered valid for PM₁₀ and PM_{2.5}.

7 CONCLUSIONS

Testing was successfully completed on October 6th to 14th, 2021. All parameters were tested in accordance with referenced methodologies.