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TRANSMITTAL

DATE: 2022-02-14

Project Reference No: 2102367

TO: Karen Kajiya-Mills
Technical Programs Unit - AQD
State of Michigan - Environment, Great Lakes and Energy (EGLE)

ADDRESS/EMAIL: kajiya-millsk@michigan.gov

FROM: Thomas Caltrider

EMAIL: thomas.caltrider@stellantis.com

RE: **FCA US LLC**
Source Testing Report for Detroit Assembly Complex – Mack (DACM)
Re-Test of Particulate Matter - SVRTO
Permit to Install (PTI) 14-19A
Detroit, Michigan

Dear Ms. Kajiya-Mills,

Please find enclosed one (1) copy of the Source Testing Report for FCA US LLC Detroit Assembly Complex – Mack (DACM). The Source Testing Report covers the re-test of particulate matter fort SVRTO as per the Permit to Install (PTI) 14-19A The regenerative thermal oxidizer (SVRTO) serves the E-Coat Tank and curing oven (EUECOAT), Primer Curing Oven (EUPRIMER), and basecoat/clearcoat curing ovens (EUTOPCOAT).

Should you have any questions, please feel free to contact me directly.

Kind regards,

FCA US LLC (Stellantis)

Thomas Caltrider, P.E.
Corporate Environmental Programs
Environmental Health & Safety

cc: April Wendling (Michigan EGLE – Detroit District Office, AQD)
Paul Diven (FCA US LLC – DACM, Environmental Specialist)
Brad Bergeron (RWDI AIR Inc.)

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FINAL REPORT

FCA US LLC

DETROIT, MICHIGAN

DETROIT ASSEMBLY COMPLEX MACK (DACM): RTO PARTICULATE MATTER EMISSIONS REPORT

RWDI #2104809.03

February 14, 2022

SUBMITTED TO

Karen Kajiya-Mills
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SUBMITTED BY

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by FCA US LLC (FCA) to complete the emission sampling 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. Permit to Install (PTI) 14-19A, requires testing for particulate matter (including $PM/PM_{10}/PM_{2.5}$ ("PM")) from the regenerative thermal oxidizer ("RTO"). The RTO treats emissions from the E-Coat Tank and Curing Oven (EUECOAT), Primer Curing Oven (EUPRIMER), Basecoat/Clearcoat Curing Ovens (EUTOPCOAT), and the desorb portion from the two (2) concentrators.

This test report is specific to the retest of PM emissions from the RTO (original test performed the week of September 8, 2021). The RTO PM retest took place December 16-17, 2021 , as agreed upon by FCA and EGLE's Air Quality Division.

The test plan for the initial September 2021RTO and Concentrator test program is provided in **Appendix A**. Only the RTO PM segments are pertinent to this retest and report.

Executive Table i: RTO - Average Emission Data - Particulate Testing, December 16-17, 2021

Source	Units	Concentration & Emission Rate			
		Test 1	Test 2	Test 3	Average
RTO Outlet	grains/dscf	0.00075	0.00072	0.00062	0.00069
	lb/hr	0.46	0.44	0.39	0.43

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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by FCA US LLC (FCA) to complete the emission sampling 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. Pursuant to Permit to Install (PTI) 14-19A, this source testing program covers the required testing for the particulate measurements on the regenerative thermal oxidizer (RTO) exhaust (outlet) for PM/PM10/PM2.5. Triplicate 240-minute tests were completed. The RTO serves the E-Coat Tank and Curing Oven (EUECOAT), Primer Curing Oven (EUPRIMER), Basecoat/Clearcoat Curing Ovens (EUTOPCOAT), and the desorb portion from the two (2) Concentrators.

DACM recorded the production rate of vehicles processed during each PM test of the RTO.

The results of the sampling program are outlined in the results tables below. Results of individual tests are presented in the **Appendix C**. This testing program was a retest of the RTO PM portion of the original test program completed the week of September 8, 2021. The attached test plan in **Appendix A** is for complete testing of the RTO and two (2) concentrators, however only PM was retested for the RTO for this additional program. The retest program was completed December 16-17, 2021.

1.1 Testing Personnel

The following table presents personnel that were involved with the testing program.

Table 1.1.1: Summary of Testing Personnel

Name	Title & Affiliation	Address	Contact Number
Mr. Paul Diven	Environmental Specialist FCA US LLC Detroit Assembly Complex - Mack	4000 Saint Jean Street Detroit, MI 48214	313-212-2588
Mr. Tom Caltrider	Corporate Environmental Programs EHS FCA US LLC	38111 Van Dyke Avenue Sterling Heights, MI 48312	248-882-7169
Mr. Bob Byrnes	Environmental Engineer Specialist EGLE Air Quality Division	525 West Allegan Street Lansing, MI 48909	517-275-0439
Mr. Mark Dziadosz	Environmental Quality Analyst EGLE Air Quality Division	27700 Donald Court Warren, MI 48092	586-854-1611
Mr. Brad Bergeron	Senior Project Manager RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	519- 817-9888
Mr. Mason Sakshaug	Senior Scientist – Supervisor RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	989-323-0355

Name	Title & Affiliation	Address	Contact Number
Mr. Ben Durham	Senior Field Technician RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	734-474-1731
Mr. Juan Vargas	Scientist RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	513-293-3180

2 SUMMARY OF RESULTS

2.1 Operating Data

RWDI was in contact with FCA personnel to communicate start and stop time for each test of the RTO. FCA personnel was responsible for collecting the number of cars in production and the RTO temperature in degrees Fahrenheit during each test.

2.2 Permit Number and Source Designation

Testing was performed pursuant to Permit to Install (PTI) 14-19A. The RTO is designated as SVRTO and serves the E-Coat Tank and Curing Oven (EUECOAT), Primer Curing Oven (EUPRIMER), Basecoat/Clearcoat Curing Ovens (EUTOPCOAT) and the desorb portion from the two (2) Concentrators.

2.3 Results

The following table gives a summary of the results. Full details of PM data is provided in **Appendix C**. Field notes, calibration records, laboratory data and example calculations are provided in **Appendices D, E, F,** and **H**, respectively.

Table 2.3: RTO - Average Emission Data - Particulate Testing

Source	Units	Concentration & Emission Rate			
		Test 1	**Test 2**	**Test 3**	**Average**
RTO Outlet	grains/dscf	0.00075	0.00072	0.00062	0.00069
	lb/hr	0.46	0.44	0.39	0.43

3 SOURCE DESCRIPTION

3.1 Process Description

The following gives a detailed description of the RTO and each process that is controlled by the RTO.

3.1.1 SVRTO

Emissions from EUECOAT, EUPRIMER, EUTOPCOAT are controlled via a Regenerative Thermal Oxidizer (RTO). The inlet to the oxidizer consists of two (2) streams. The 1st stream is the desorbed section from the concentrators and the 2nd stream is from the combined E-Coat Dip Tank, E-Coat Oven, EUPRIMER Oven and EUTOPCOAT Oven. The two (2) streams are combined prior to entering into the RTO. The RTO operates at a minimum temperature of 1450°F and has a minimum residence time of 0.5 seconds. The following table gives a summary of the stack characteristics.

Table 3.1.1.1: Summary of the Stack Characteristics– SVRTO

Source	Parameter	Diameter	Approximate Duct Diameters from Flow Disturbance	Number of Ports	Points per Traverse	Total Points per Test	Stack Temperature
SVRTO Outlet	PM/PM10/PM2.5	68"	~8 downstream and ~2 Upstream	2	8	16 PM/Flow	~320°F

Further notes and photos of the system are provided in **Appendix A**.

3.1.2 EUECOAT

An electrodeposition (E-Coat) coating process consists of a series of steps that include a dip tank, rinses, and a curing oven. Emissions from the E-coat dip tank and the curing oven are controlled by the RTO.

3.1.3 EUPRIMER

The EUPRIMER process consists of booths where liquid primer is applied; observation and ambient flash zones where no application occurs; and a curing oven. The single line includes the application of primer to the vehicle's full body and the application of roof coating for those vehicles with a different colored roof. The coating booths' overspray is controlled by a water wash particulate control system. The primer spray booths are exhausted through a bank of particulate filters, the concentrator, and then to the RTO. The primer curing oven emissions are exhausted directly to the RTO. Emissions from the observation zones are filtered and exhausted to the ambient air. At the time of this test, the ambient flash-off zones were filtered and exhausted with the observation exhaust to the ambient air. Shortly after this testing was completed, the primer ambient flash-off zones were rerouted and now exhaust to the concentrator and RTO. Any subsequent retesting of the RTO will be confirmed with the AQD and scheduled accordingly.

3.1.4 EUTOPCOAT

The automatic topcoat spray application process includes two parallel lines, each consisting of a basecoat coating booth, a basecoat observation zone, a basecoat heated flash-off zone, a clearcoat coating booth, a clearcoat observation zone, a clearcoat ambient flash-off zone and a natural gas fired curing oven. Approximately 85 percent of the air from the spray zones is recirculated back into the process and 15 percent is exhausted to the concentrator and RTO. Coating booth overspray is controlled by a water wash particulate control system. The spray booths and heated flash zones are exhausted through a bank of particulate filters, the concentrator, and then to the RTO. Oven emissions are exhausted directly to the RTO.

3.2 Process Diagram

A process diagram is in the appendices section of **Appendix B**. The diagram shows the flow of air from the emitting sources to the RTO.

3.3 Raw and Finished Materials

The RTO uses a natural gas burner to destroy volatile organic compounds (VOC) coming from the emitting sources in the paint shop.

3.4 Monitored Process Instrumentation

The combustion chamber temperature is monitored and controlled via a PLC system.

4 TESTING METHODOLOGIES

4.1 Description of Testing Methodologies

The following section provides brief descriptions of the sampling methods and discusses any modifications to the reference test methods that were completed with the testing.

4.1.1 USEPA Method 1 - "Sample and Velocity Traverses for Stationary Sources"

USEPA Method 1 is used in the selection of sampling ports and traverse points at which sampling for air pollutants will be performed. Based on diameter, upstream, and downstream disturbances. The stack is divided into a determined number of equally size areas, and sampling points are located within each area.

4.1.2 USEPA Method 2 – *"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"*

USEPA Method 2 is used for the determination of the average velocity and the volumetric flow rate of a gas stream. Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a digital temperature indicator at each point as determined by USEPA Method 1.

A cyclonic verification check is done prior to testing to verify cyclicity is absent from the flow. The average absolute value of all points measure must be at or below 20 degrees for the flow measurements to be valid at the designated sampling point. The average absolute value of the angle of flow for all sampling points was at or below 20 degrees, so the sampling location is not considered cyclonic.

4.1.3 USEPA Method 3 – *"Gas Analysis for the Determination of Dry Molecular Weight"*

USEPA Method 3 is used for the determination of CO_2 and O_2 concentrations and dry molecular weight of a sample of effluent gas stream of a fossil-fuel combustion process or other process. A Fyrite analyzer was used in the analysis by introducing sample gas to each the CO_2 and O_2 during each test. Each Fyrite has a specific indicating chemical for either CO_2 or O_2 and introducing sample gas creates a reaction which indicates the percentage of the respected gas. Sample gas is introduced to the Fyrite using a one-way squeeze bulb, and then mixed multiple times with the specified chemical. The results are then used to calculate the dry molecular weight of the sample gas.

4.1.4 USEPA Method 4 – *"Determination of Moisture Content in Stack Gases"*

USEPA Method 4 is used to determine the moisture content of stack gas. Moisture is determined via direct condensation. In the case of determining moisture content during an isokinetic test, a gas sample is drawn through a probe and filter, then through a series of impingers (impinger type and contents vary depending on the isokinetic method) and dropped to a temperature below 68° Fahrenheit to ensure all moisture is removed from the sample. The impingers are analyzed gravimetrically pre and post test to determine total moisture gain. Moisture content is then calculated based on moisture gain and total sample volume passed through the impingers.

4.1.5 USEPA Method 5 – *"Determination of Particulate Matter Emissions from Stationary Sources"*

Particulate matter (PM/PM_{10}/$PM_{2.5}$) was sampled following procedures outlined in USEPA Method 5 and Method 202 (Condensable Particulate Matter) for the RTO outlet.

USEPA Method 5 is used to determine filterable particulate matter from the specified source. The sample gas is sampled isokinetically through a stainless-steel nozzle, then a glass/quartz (stainless-steel may also be used) probe-liner, and through a glass-fiber filter. The probe and filter are designed to keep the sampling temperature at 248 ± 25 °F per the method standards. USEPA Method 5 can be combined with other methods, but everything up to the filter is considered filterable particulate matter.

Prior to testing, a leak check is performed on the sampling train to ensure a leak-free system. The probe nozzle is then set to the first sampling point, and sampling begins once all temperatures and flow rates are established. Sampling occurs for a pre-determined amount of time and at all pre-determined sampling points. Sampling rate is determined based on in-stack conditions including flow rate and stack gas temperature. A valid test must sample at an average rate ±10% of 100% isokinetic sampling. Once testing is complete, a post-test leak check is done to show a leak-proof sampling system. The system is leak checked at a vacuum (Hg") at or just above the maximum vacuum seen during the test.

Once all sampling procedures are complete, recovery begins as soon as possible. The impingers in the train must be weighed prior to recovery for moisture content analysis. For USEPA Method 5, all used sampling equipment up to the filter is rinsed three times with acetone. The probe and nozzle must be rinsed and thoroughly brushed (three times for glass/quartz, six times for stainless-steel). The front half of the filter holder is then rinsed three time with acetone into the same glass sample jar as the probe and nozzle rinse. The filter is then collected and placed in a petri dish. All USEPA Method 5 recovered samples are analyzed gravimetrically by Enthalpy Labs in Durham, North Carolina.

4.1.6 USEPA Method 202 – "Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources"

USEPA Method 202 is an isokinetic method used to measure condensable particulate (CPM) emissions from a stationary source. CPM is collected after the filterable particulate matter is removed by the filterable particulate matter filter. The test follows all procedures laid out in USEPA Method 5 or 17. The impingers for the 202 train are as follows:

- After leaving the filter housing of the filterable particulate matter filter, the gas stream enters a vertical condenser to begin cooling the air sample and dropping out CPM;
- The sample is drawn through a large potbelly impinger that collects moisture;
- The sample is then drawn through a modified Greenburg-Smith impinger to drop out any remaining CPM;
- The CPM filter collects any remaining CPM in the air sample. The gas must be kept at a temperature between 65° and 85° Fahrenheit.

After the filter, the gas is then passed through a modified Greenberg-Smith impinger containing water, and an impinger containing silica gel to capture any remaining moisture.

Recovery of the USEPA Method 202 train begins immediately following sampling. Weights on all impingers are taken to determine moisture content. If necessary, a nitrogen purge is performed for one hour in compliance with section 8.5.3 of the test method (if sulfur dioxide is not suspected to be part of the process, then the nitrogen purge may be skipped). Following the nitrogen purge, everything following the filterable particulate filter and up to the CPM filter must be rinsed twice with water, once with acetone, and twice with hexane. Any condensed water in the first two impingers can be poured into the sample jar with the water rinses. The acetone and hexane rinses can be combined into the same jar. The CPM filter is put into either a sample jar on its own, or a petri dish. All samples are carried via courier to Enthalpy in Durham, North Carolina for analysis.

5 PROCESS DATA

During the emissions testing, plant process data was monitored and collected by DACM personnel to ensure representative operation of the facility. The following information was collected:

1. Production rate for each process (EUECOAT, EUPRIMER, and EUTOPCOAT); and
2. RTO combustion chamber operating temperature during each test.

Process data is provided in **Appendix G**.

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6 CONCLUSIONS

Testing was successfully completed on December 16th and 17th, 2021. All parameters were tested in accordance with USEPA referenced methodologies. This testing program was a retest of the RTO PM portion of the original test program completed the week of September 8, 2021. The updated PM data should be used in place of the original testing completed the week of September 8, 2021.