General Motors Detroit-Hamtramck Assembly Center

Environmental Testing Program

October 2016

Transfer Efficiency

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AIR QUALITY DIV.

Prepared By:

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AIR QUALITY DIV.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT
REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: General Motors, LLC - Detroit-Hamtramck Assembly County: Wayne

Source Address: 2500 EAST GENERAL MOTORS BLVD City: Detroit, MI 48211-2002

AQD Source ID (SRN): M4199 ROP No.: MI-ROP-M4199-2010 ROP Section No.: 1

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From Dec. 5, 2016 To Dec. 5, 2016

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

GM Detroit-Hamtramck Assembly is submitting the test report for the transfer efficiency testing of the Primer Surfacer (EUPRIMERSURFACER V.1.a.) and Topcoat (EUTOPCOATSYSTEM V.1.a.) operations pursuant to approved test methods.

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Julio Garica	Plant Manager	313-972-6020
Name of Responsible Official (print or type)	Title	Phone Number

Signature of Responsible Official — 12-5-2016 — Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

1.0 Executive Summary

JLB Industries, LLC completed a compliance environmental testing program during the week of October 3, 2016 at the General Motors LLC Detroit-Hamtramck Assembly Center, located in Detroit, Michigan. The testing served as a compliance demonstration for the existing primer surfacer and topcoat coating operations. Solids transfer efficiency (TE) values were determined for the Medium Gray Primer Surfacer, Black Solid Basecoat, Black Meet Kettle Metallic Basecoat and Clearcoat processes. These processes are currently operating under Air Quality Permit #MI-ROP-M4199-2010.

The testing program was conducted in accordance with all applicable procedures contained in the U.S. Environmental Protection Agency document *Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Topcoat Operations* as referenced in 40 CFR, Part 63. The resultant test values will be used to calculate emissions.

Transfer Efficiency values were derived for the Chevrolet Impala, which is representative of current production at the facility. Personnel from the paint shop, GM environmental staff and JLB Industries, LLC conducted the testing. These groups worked together at each stage of testing to ensure that the results were representative of production conditions.

JLB Industries used highly accurate weighing systems to determine the vehicle weights before and after coating application. Calibrated volumetric flow meters, located on each applicator, were used to measure paint usage.

Material samples were collected from the paint circulation tanks directly after vehicle processing. Determination of percent solids by weight and density was performed by Axalta at their laboratory facilities in Mount Clemens, Michigan.

Table 1 – Testing Results Summary

Tested Coating	Solids Transfer Efficiency (%)
Medium Gray Prime	82%
Black Solid Basecoat	77%
Black Meet Kettle Metallic Basecoat	64%
Clearcoat	79%

2.0 Introduction

JLB Industries, LLC (JLBI) was contracted by the General Motors, LLC Detroit-Hamtramck Assembly Center (GM) to perform an environmental testing program on the existing primer surfacer and topcoat coating operations. Solids transfer efficiency (TE) values were determined for the Medium Gray Primer Surfacer, Black Solid Basecoat, Black Meet Kettle Metallic Basecoat and Clearcoat processes. This testing was conducted using the Chevrolet Impala model during the week of October 3, 2016.

3.0 Sampling and Analytical Procedures

Transfer Efficiency testing was conducted in the Primer Surfacer Booth, where medium gray primer surfacer was applied, and in the Number 4 Modular Topcoat Spraybooth, where Black Meet Kettle Metallic Basecoat, Black Solid Basecoat and Clearcoat coatings were applied by robotic applicators. Applicator and environmental conditions were monitored to ensure that the testing accurately reflected production conditions. Measured parameters included: vehicle weight gain, coating material usage, coating material analysis (percent solids by weight and density), applicator settings, film build and oven heat settings.

A total of five vehicle bodies were used for each tested process. Three vehicles were processed as normal production vehicles, while two vehicles were dedicated as no-paint test controls in conjunction with each test. Testing was performed with scrap vehicles; all with no paint shop sealer.

An off-line vehicle weigh station (VWS) was constructed to measure the weight of the test vehicles before and after each coating process. Test vehicles were pulled off-line and pushed into the VWS. Test vehicles were lifted free from their carriers by two lift-table mounted scale bases. Ultra-high molecular weight (UHMW) plastic blocks were strategically placed on the scale bases to lift the vehicle at the center of gravity locations. The UHMW blocks minimized friction loading from the vehicles on scale bases.

Vehicle weights were measured several times and recorded. All test vehicles were weighed with production fixtures (door hooks and hood props) installed. The vehicle weigh station scales were calibrated using Class F calibration weights conforming to the National Bureau of Standards handbook 105-1. A one-pound avoirdupois, Class F stainless steel weight was added periodically during pre- and post-process weighing to verify scale linearity.

Coating thickness was measured on representative vehicles to verify paint film-build was within the production specification. The data was taken with a handheld Elcometer gauge.

Robotic coating material usage was monitored via volumetric flow measurement devices located on each applicator. A verification of each applicator was performed before testing to ensure accurate usage measurement.

Medium Gray Primer Surfacer

Electrocoated test vehicles were weighed and processed through the Primer Surfacer Spraybooth and coated with Medium Gray Prime. The test sequence was:

1. Test Vehicle ID 6570
2. Test Vehicle ID 6401
3. Test Vehicle ID 6425
4. Test Vehicle ID 6980 (No-paint)
5. Test Vehicle ID 6093 (No-paint)

Black Meet Kettle Metallic Basecoat

Test vehicles were routed through the Prime Oven and allowed to cool. The vehicles were weighed and processed through the Number 4 Modular Topcoat Spraybooth and coated with Black Meet Kettle Metallic Basecoat. The test sequence was:

1. Test Vehicle ID 6570
2. Test Vehicle ID 6401
3. Test Vehicle ID 6425
4. Test Vehicle ID 6980 (No-paint)
5. Test Vehicle ID 6093 (No-paint)

Black Solid Basecoat

Test vehicles were routed through the Modular Oven and allowed to cool. The vehicles were weighed and processed through the Number 4 Modular Topcoat Spraybooth and coated with Black Solid Basecoat. The test sequence was:

1. Test Vehicle ID 6570
2. Test Vehicle ID 6401
3. Test Vehicle ID 6425
4. Test Vehicle ID 6980 (No-paint)
5. Test Vehicle ID 6093 (No-paint)

Clearcoat

Test vehicles were routed through the Modular Oven and allowed to cool. The vehicles were weighed and processed through the Number 4 Modular Topcoat Spraybooth and coated with Clearcoat. The test sequence was:

1. Test Vehicle ID 6570
2. Test Vehicle ID 6401
3. Test Vehicle ID 6425
4. Test Vehicle ID 6980 (No-paint)
5. Test Vehicle ID 6093 (No-paint)

The test vehicles were routed through the Modular Oven and allowed to cool before a final weight measurement was taken at the VWS.

4.0 Test Equipment and Calibration

Vehicle Weigh Station

A dedicated vehicle weigh station (VWS) equipped with two 1,000 lb. capacity scale bases was used to obtain pre- and post-process vehicle weights. The VWS is accurate to better than 0.05 pounds.

The scales were calibrated as directed by the operating instruction manual. Scales were powered up and exercised by placing 250 pounds of Class F calibration weights on each scale platform. Then, the VWS was calibrated with 600 pounds of Class F calibration weights. VWS linearity was checked using a one-pound, Class F stainless steel calibration weight. The one-pound weight was also added to each test vehicle during pre- and post-process weighing to verify scale linearity.

Material Usage

Coating material usage was monitored by volumetric flow measurement devices located on each applicator. A verification of each applicator was performed by GM personnel prior to testing to ensure accurate usage data. Paint usage was measured at each applicator in a graduated cylinder and compared to the expected volume. The Paint Metering Verification Record is included in Section 7 of this report.

Prime and basecoat samples were taken after each test and analyzed by Axalta at their laboratory facilities in Mount Clemens, Michigan. Clearcoat samples were analyzed upon packaging and are representative as no solvent is added to the coatings. As referenced in EPA Method 24, ASTM Method D-2369 was used to determine paint solids and ASTM Method D-1475 was used to determine paint density. These values were used in calculating the paint solids sprayed and the transfer efficiency for each process.

5.0 Discussion of Test Results

During the metallic basecoat test, vehicle ID 6401 was not mounted on the carrier properly. This caused the paint robots to fault and the vehicle was not able to be processed completely. This vehicle was excluded from the metallic basecoat test results.

During the gray primer surfacer test, vehicle ID 6570 was processed with the spray program for the Buick model. As the vehicle weight gain and the material usage were both within ten percent of the average for the test group, this vehicle was included in the medium gray primer surfacer test results.

6.0 Calculation of Results

Table 2 - Medium Gray Prime Transfer Efficiency Summary
GM DHAM Transfer Efficiency Test
October 2016

Vehicle ID	Vehicle Weight Gain (lb.)	Avg. Vehicle Weight Gain (lb.)	Avg. Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Avg. Solids Sprayed	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(avg VWG)-SWL	(avg PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
6570	1.33	1.36	0.280	9.74	0.6063	1.65	**82%**
6401	1.28						
6425	1.26						

Control Vehicle	SWL
6980	-0.08
6093	-0.05

Table 3 - Black Meet Kettle Metallic Basecoat Transfer Efficiency Summary
GM DHAM Transfer Efficiency Test
October 2016

Vehicle ID	Vehicle Weight Gain (lb.)	Avg. Vehicle Weight Gain (lb.)	Avg. Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Avg. Solids Sprayed	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(avg VWG)-SWL	(avg PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
6570	0.80	0.86	0.683	8.50	0.2325	1.35	**64%**
6401	**						
6425	0.79						

Control Vehicle	SWL
6980	-0.07
6093	-0.06

Table 4 - Black Solid Basecoat Transfer Efficiency Summary
GM DHAM Transfer Efficiency Test
October 2016

Vehicle ID	Vehicle Weight Gain (lb.)	Avg. Vehicle Weight Gain (lb.)	Avg. Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Avg. Solids Sprayed	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(avg VWG)-SWL	(avg PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
6570	1.04	1.01	0.700	8.47	0.2200	1.30	**77%**
6401	1.05						
6425	0.94						

Control Vehicle	SWL
6093	0.01
6980	-0.01

Table 5 - Clearcoat Transfer Efficiency Summary
GM DHAM Transfer Efficiency Test
October 2016

Vehicle ID	Vehicle Weight Gain (lb.)	Avg. Vehicle Weight Gain (lb.)	Avg. Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Avg. Solids Sprayed (lb.)	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(avg VWG)-SWL	(avg PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
6570	2.41	2.38	0.476	8.27	0.5077	2.00	**79%**
6401	2.43		0.159	8.93	0.7170	1.02	
6425	2.51						
Control Vehicle	SWL					3.01	
6093	0.09						
6980	0.06						

Note: Total solids sprayed (3.01) is equal to the sum of the part A (2.00) and part B (1.02) solids sprayed.