FINAL REPORT

FCA US LLC

STERLING HEIGHTS, MICHIGAN

STERLING HEIGHTS ASSEMBLY PLANT – SOUTH PAINT SHOP TRANSFER EFFICIENCY AND CAPTURE EFFICIENCY TESTING

RWDI #1803870

December 4, 2018

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI AIR Inc. (RWDI) and JLB Industries, LLC were retained by Fiat Chrysler Automobiles (FCA) US LLC to complete compliance testing of the Topcoat operations at their Sterling Heights Assembly Plant (SHAP) South Paint Shop located at 38111 Van Dyke, Sterling Heights, Michigan. The scope of the test program was to complete paint solids transfer efficiency (TE) and Capture Efficiency (CE) testing of the Topcoat operations (FG-TOPCOAT BOX), for one (1) representative Topcoat Booth (EU-TOPCOAT 1 BOX or EU-TOPCOAT 2 BOX), on the following coatings:

- Metallic Basecoat (Granite);
- Solid Basecoat (White); and
- Clearcoat.

SHAP South Paint Shop currently operates under Permit to Install (PTI) Permit # 27-17B dated April 6, 2018. The results will be used to support on-going VOC monthly emission calculations. The testing program consisted of Transfer Efficiency (TE) testing and Capture Efficiency (CE) testing. Determination of TE and CE were conducted in accordance with all applicable procedures contained in USEPA document "Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Topcoat Operations". The testing was completed during the week of October 15, 2018. The testing consisted of the following:

- Paint solids transfer efficiency (TE) – the percent of paint solids sprayed that deposit on the painted part. was measured when applying White solid basecoat, Granite metallic basecoat and standard clearcoat in the "EU-TOPCOAT 2 BOX" line and are considered to be representative for all Topcoat Operations.
- Volatile Organic Compound (VOC) capture efficiency (CE) was completed on the booth, flash zone and bake oven for the "EU-TOPCOAT 2 BOX" line since all aspects of the booth are controlled. This includes the percent of VOC captured from the curing of the coating in the flash zone and bake oven. The flash and bake oven VOC CE is used to calculate the mass of VOC captured per gallon of applied coating solids (lb VOC/gacs) and is also referred to as oven solvent loading. Flash and Oven VOC CE was measured at "EU-TOPCOAT 2 BOX" Spraybooth when applying solid White basecoat, Granite metallic basecoat and standard clearcoat and are considered to be representative for all Topcoat Operations.

RWDI/JLB Industries used highly accurate weighing systems to determine the vehicle and panel 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 spray out. Determination of percent solids by weight and density was performed by Advanced Technologies of Materials laboratories, located in Waverly, Ohio.

Transfer Efficiency (TE) Results Summary

Tested Coating	Solids Transfer Efficiency (%)
Basecoat (White Solid Basecoat)	77.8%
Basecoat (Granite Metallic)	71.6%
Clearcoat	69.1%

Capture Efficiency (CE) Results Summary

		Loading (Lb/GACS)	Capture Efficiency
		EU-TOPCOAT 2 BOX	EU-TOPCOAT 2 BOX
Solid Basecoat (White)	**Booth/Flash**	3.96	--
	Oven	1.95	
	Total	**5.91**	**83.4%**
Metallic Basecoat (Granite)	**Booth/Flash**	6.40	--
	Oven	1.74	
	Total	**8.15**	**84.2%**
Clearcoat	**Booth**	4.87	47.3%
	Oven	3.34	32.4%
	Total	**8.21**	**79.6%**

1 INTRODUCTION

RWDI AIR Inc. (RWDI) and JLB Industries, LLC were retained by Fiat Chrysler Automobiles (FCA) US LLC to complete compliance testing of the Topcoat operations at their Sterling Heights Assembly Plant (SHAP) South Paint Shop located at 38111 Van Dyke, Sterling Heights, Michigan. The scope of the test program was to complete paint solids transfer efficiency (TE) and Capture Efficiency (CE) testing of the Topcoat operations (FG-TOPCOAT BOX), for one (1) representative Topcoat Booth (EU-TOPCOAT 1 BOX or EU-TOPCOAT 2 BOX), on the following coatings:

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- Volatile Organic Compound (VOC) capture efficiency (CE) was completed on the booths, flash zone and bake oven for the "EU-TOPCOAT 2 BOX" line. This includes the percent of VOC captured from the curing of the coating in the flash zone and bake oven. The flash and bake oven VOC CE is used to calculate the mass of VOC captured per gallon of applied coating solids (lb VOC/gacs) and is also referred to as oven solvent loading. Flash and Oven VOC CE was measured at "EU-TOPCOAT 2 BOX" Spraybooth when applying solid White basecoat, Granite metallic basecoat and standard clearcoat and are considered to be representative for all Topcoat Operations.

A Source Testing Plan, for the testing, was submitted to the Michigan Department of Environmental Quality (MDEQ) on August 22, 2018. Testing was successfully completed while all process equipment was operating under normal maximum operating conditions during the week of October 15th, 2018. A copy of the Source Testing Plan is provided in **Appendix A**.

Testing of emissions was conducted by Mr. Jim Belanger and Mr. Jeff Monache of JLB, and Mr. Brad Bergeron and Mr. Alec Smith of RWDI. Mr. Adekunle Sanni and Mr. Rohit Patel were on-site to monitor the process operation and witness the testing on behalf of FCA US LLC.

2 SOURCE AND SAMPLING LOCATIONS

2.1 Process Description

SHAP is located at 38111 Van Dyke in Sterling Heights, Michigan. The facility completes assembly and paint operations for FCA US LLC. Vehicle body panels are stamped and assembled on site from sheet metal components. The bodies are cleaned, treated, and prepared for painting in the phosphate system. Drawing compounds, mill oils, and dirt are removed from the vehicle bodies utilizing both high pressure spray and immersion cleaning/rinsing techniques. Vehicle bodies then are dip coated in electro deposition corrosion primer paint for protection. The electro primer (E-coat) is heat-cured to the vehicle body in a high-temperature bake oven. After completing the E-coat operation, vehicle bodies are conveyed to the sealer area for application of various sealants to body seams and joints. Vehicle bodies are then conveyed to an oven to cure the sealers.

After the sealer oven, the vehicles are routed to the powder prime system and then topcoat operations. In the topcoat system, the bodies receive a combination of waterborne and solvent borne coatings: basecoat and clearcoat coatings. After topcoat is applied, the vehicle is baked in the topcoat oven. After exiting the topcoat oven, the vehicles are routed to inspection.

An overview of the process to be sampled and associated sampling sites is provided below.

Figure 1: Process and Sampling Location Overview

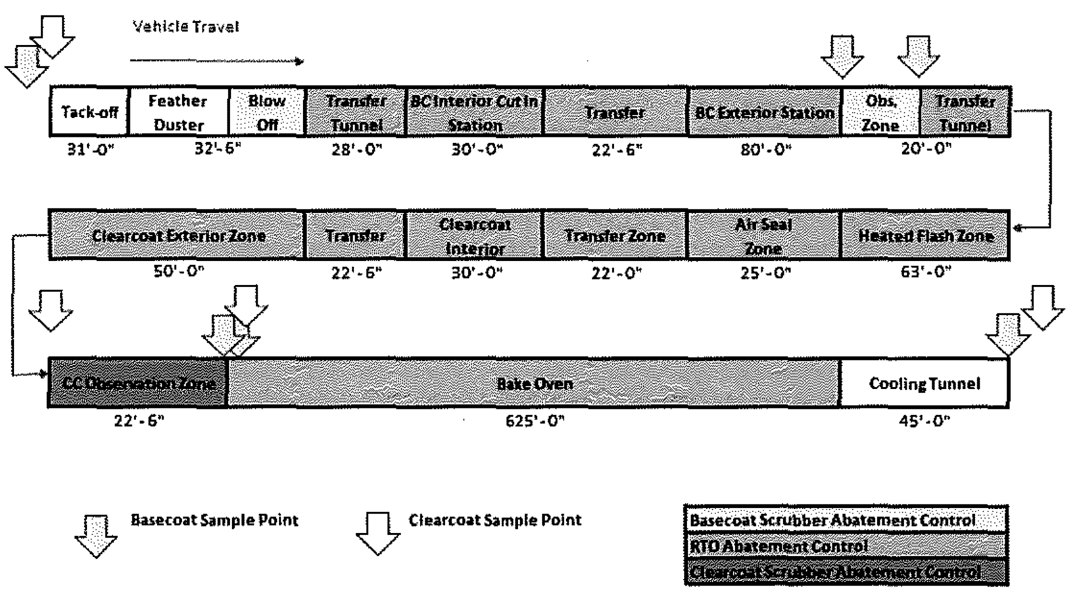


Table 2.1-1: Summary of "EU-TOPCOAT 2 BOX" Applicator Parameters

Operation	Manufacturer	Applicator	Fluid Tip/ Bell Size	Air Cap	Gun Voltage (kV)	RPM	Gun-to-Target Distance (inch)	Remarks
Basecoat	Fanuc	Cartridge Fanuc Versa Bell II+	0.9mm 65 mm	N/A	40-80 kV	40 - 50,000	10 inch	Waterborne
Clearcoat	Fanuc	Gear Pump Fanuc Versa Bell II+	1.2mm 65mm	N/A	40-80 kV	35-75,000	10 inch	Solvent

Notes: mm – millimetres
kV – kilovolts
RPM – revolutions per minute
13.1 ft/min line speed

2.2 Control Equipment

Topcoat Spray Booths are controlled using a downdraft ventilation system and water wash system below the booth grate to control paint overspray. Captured basecoat and clearcoat booth, flash zone and bake oven VOC emission are directed to regenerative thermal oxidizer for VOC abatement. All controls were functioning during the testing period.

2.3 Operating Parameters

The following process control measures were recorded during the testing:

- Coating usage;
- Application information;
- Bake Oven Temperature;
- Spray booth relative humidity; and
- Spray booth temperature.

The following summarizes the Spray booth and Bake Oven process conditions.

Table 2.3-1: Summary of Operating Conditions

Source	Spray Booth Temperature			Spray Booth Relative Humidity			Bake Oven Temperature		
	Unit	10/16/18	10/17/18	Unit	10/16/18	10/17/18	Unit	10/16/18	10/17/18
EU-TOPCOAT 2 BOX Spray Booth	ARU 1	80°F	80°F	ARU 1	57%	63%	Sill Heater	265°F	271°F
	ARU 2	75°F	72°F	ARU 2	60%	65%	Zone 1	378°F	380°F
	ASU 1	75°F	71°F	ASU 1	61%	65%	Zone 2	390°F	388°F
	ARU 3	82°F	80°F	ARU 3	65%	55%	Zone 3	264°F	258°F
	ARU 4	81°F	82°F	ARU 4	63%	62%	Zone 4	265°F	264°F
	ASU 2	85°F	74°F	ASU 2	54%	77%	Zone 5	275°F	265°F
	--						Zone 6	259°F	265°F
	--						Cooling	65°F	78°F

2.4 Process Sampling Locations

A process sample of each coating applied during the testing was collected for analysis. The coatings were collected following procedures in USEPA's "Standard Procedure for Collection of Coating and Ink Samples for Analysis by Method 24 and 24A".

Coating samples were collected at the application point into four (4) ounce glass sampling jars with minimal headspace. The coating-as-applied samples were analyzed using USEPA Method 24 to measure percent VOC, percent water and density. The results are summarized below in **Table 2.4-1** and in **Appendix C**.

Table 2.4-1: Summary of Method 24 Coating Analysis

Sample	Parameter									
	Date	% Non-Volatile	% Volatile	Density		% Water	VOC		VOC-Water	
				g/ml	lb/gal		g/L	lb/gal	g/L	lb/gal
Granite Metallic Basecoat	10/16/18	32.67	67.33	1.049	8.753	43.85	246.26	2.055	457.12	3.815
White Basecoat	10/16/18	47.47	52.53	1.255	10.476	34.29	228.99	1.911	402.93	3.362
Clearcoat Part A	10/16/18	57.43	42.57	1.055	8.804	0	449.14	3.748	N/A	N/A
Clearcoat Part B	10/16/18	56.76	43.24	1.009	8.421	0	436.38	3.642	N/A	N/A

In addition, thirteen (13) samples were collected by RWDI/JLB (12 samples + 1 blank) of waterborne coatings to analyze for percent moisture. The samples were collected at the point of application on foil panels attached to the test vehicles. The coated foils were then transferred into a four (4) ounce glass sampling jar and anhydrous methanol was added to the sampling jar to allow the coating to disperse. The sample was then allowed to separate and analyzed for percent water using ASTM E203-08 "Standard Test Method for Water Using Volumetric Karl Fischer Titration". The ASTM E203 -08 coating analysis is summarized in **Table 2.4-2** and **Appendix C.**

Table 2.4-2: Summary of Volumetric Karl Fischer Titration Coating Analytical

Sample	Date	Parameter Percent Water
Blank	10/17/2018	0.14
Sample B1 White Solid	10/17/2018	0.47
Sample B2 White Solid	10/17/2018	0.34
Sample B3 White Solid	10/17/2018	0.44
Sample B4 White Solid	10/17/2018	0.17
Sample B5 White Solid	10/17/2018	0.18
Sample B6 White Solid	10/17/2018	0.16
Sample M1 Granite Metallic	10/17/2018	0.37
Sample M2 Granite Metallic	10/17/2018	0.34
Sample M3 Granite Metallic	10/17/2018	0.40
Sample M4 Granite Metallic	10/17/2018	0.15
Sample M5 Granite Metallic	10/17/2018	0.13
Sample M6 Granite Metallic	10/17/2018	0.12

3 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Summary of Test Program

The topcoat process at SHAP South is comprised of two (2) topcoat paint lines consisting of the "EU-TOPCOAT 1 BOX" and "EU-TOPCOAT 2 BOX". The topcoat system consists of several spray sections followed by an associated curing oven. The spray booth operations are defined as follows:

- Basecoat Robots – Basecoat was applied to the exterior and interior surfaces; and
- Clearcoat Robots - Clearcoat was applied to the exterior and interior surfaces.

Skidded vehicles are conveyed through the booth and coated with topcoat materials (basecoat and clearcoat). The vehicles are processed through a bake oven where the coating is cured.

Currently, coatings are applied to the new RAM 1500 Box production models. Production units on which an electrocoat corrosion inhibiting primer had been applied were used in the test program for the transfer efficiency testing. For the CE testing, scrap vehicles were used for the testing program. The test program is summarized below.

3.2 Transfer Efficiency Test

Transfer Efficiency testing was conducted in the Topcoat Spray Booth where White solid basecoat, Granite metallic basecoat and clearcoat were applied. Applicator and environmental conditions were monitored to ensure that the testing accurately reflected production conditions. Measured parameters included: Vehicle weight gain, material usage, material analysis (percent solids by weight and density), applicator settings, film build and oven heat settings.

A total of four (4) vehicle bodies were used in calculating test results. Three (3) vehicles were processed as normal production vehicles, and one vehicle were dedicated as no-paint, control vehicles in conjunction with the testing. All units were production vehicles with sealer.

An off-line vehicle weigh station (VWS) was constructed to measure the weight of the test units before and after each painting process. Test vehicles were routed to a dedicated conveyor spur. A fixed stop was secured to assure repeatable positioning of the vehicles. 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 on vehicles and 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 or two-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 a representative test vehicle to verify paint film-build was within the production specification. The data was taken with a handheld Elcometer gauge.

Coating material usage was monitored via volumetric flow measurement devices located on each applicator. A verification of each applicator was performed by FCA personnel to ensure accurate usage measurement. Material samples of applied coatings were collected from the respective systems directly after testing. Samples were sent to Advanced Technologies of Materials for analysis to determine density by ASTM D1475 and weight solids content by ASTM D2369 (referenced in EPA Method 24). The laboratory results were used in calculating the Transfer Efficiency and Capture Efficiency values.

Production vehicles with paint shop sealer were prepared with prime and processed through the Topcoat Spray Booth. The test sequence for the Transfer Efficiency test was:

White Solid Basecoat:

1. Test Unit ID TE1 – Carrier 455
2. Test Unit ID TE2 – Carrier 490
3. Test Unit ID TE3 – Carrier 401
4. Test Unit ID TE4 – Carrier 262 (no-paint control)
5. Test Unit ID TE5 – Carrier 124 (no-paint control)

Granite Metallic Basecoat:

1. Test Unit ID TE1 – Carrier 455
2. Test Unit ID TE2 – Carrier 490
3. Test Unit ID TE3 – Carrier 401
4. Test Unit ID TE5 – Carrier 124
5. Test Unit ID TE4 – Carrier 262 (no-paint control)
6. Test Unit ID TE5 – Carrier 124 (no-paint control) *sent back through prior to coating for blank

Clearcoat:

1. Test Unit ID TE1 – Carrier 455
2. Test Unit ID TE2 – Carrier 490
3. Test Unit ID TE3 – Carrier 401
4. Test Unit ID TE4 – Carrier 262
5. Test Unit ID TE5 – Carrier 124 (no-paint control)
6. Test Unit ID TE4 – Carrier 262(no-paint control) *sent back through prior to coating for blank

Test Vehicles were routed through the bake oven and back to the vehicle weigh station. After cooling, the test vehicles were weighed and released to production.

3.3 Capture Efficiency Tests

A panel weigh station (PWS) was assembled at the Topcoat Spray Booth. A precision balance with measurement capability to 0.001 gram was placed on an isolation platform inside an enclosure to minimize vibration and air movement.

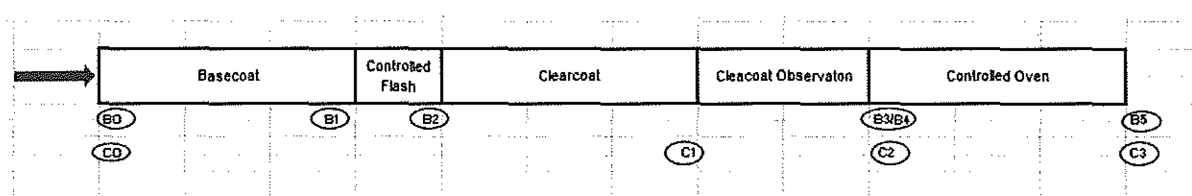
The testing conformed to the methods described in ASTM 5087-02 for solvent borne coatings and ASTM 6266-00a (Reapproved 2005) for waterborne coatings.

Test panels were placed on a test vehicle and processed with normal production spray programming.

Four (4) electrocoated panels were used for each test. Each group of test panels was weighed in four locations (see panel test diagram) to determine the relative distribution of VOC that is released in the controlled booth zone and bake oven. The panels were attached to test vehicles by magnet, which allowed for removal of the wet panels with minimal disturbance to the coating during handling. Panel mounting locations were chosen to achieve a representative coating film based on the observation of normal vehicle production.

Before the panels were coated, they were marked (1, 2, 3, 4, blank) and weighed to establish the initial unpainted panel weights (P0). The panels were then attached to a test vehicle and routed through the Spray Booth. After coating, the panels were carefully removed from the test vehicle and brought to the balance for weighing immediately upon exit from the controlled booth zone (P1). Panels were weighed again before entering the controlled bake oven (P2). The panels were then placed on the test vehicle for travel through the curing oven. Upon exiting the oven, the panels were allowed to cool and then weighed a final time (P3).

Figure 2: Panel Testing Diagram



4 TEST EQUIPMENT AND QA/QC PROCEDURES

Equipment used in this program passed the Quality Assurance /Quality Control (QA/QC) procedures. **Appendix D** contains the calibration records of the equipment and inspection sheets.

4.1 Pretest QA/QC Activities and Audits

Before testing, the equipment was inspected and calibrated according to the procedures outlined in the applicable procedures outlined in the USEPA document "Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobiles and Light Duty Truck Topcoat Operations", as referenced in 40 CFR 63, Subpart IIII. Refer to **Appendix D** for inspection and calibration sheets.

The results of select sampling and equipment QA/QC audits are presented in the following sections. Refer to **Appendix D** for inspection and calibration sheets. Test Equipment and QA/QC Procedures

4.1.1 Vehicle Weigh Station (VWS)

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 500 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.

4.1.2 Material Usage

Coating material usage was monitored via volumetric flow measurement devices located on each applicator. A verification of the applicators was performed by FCA personnel before testing to ensure accurate usage data. Paint usage was measured at each applicator in a graduated cylinder and compared to the expected volume.

A sample of each material was taken after each test and analyzed by Advanced Technologies of Materials, located in Waverly, Ohio. These values were used in calculating the paint solids sprayed and the transfer efficiency. ASTM Method D-2369 was used to determine paint solids. ASTM Method D-1475 was used to determine paint density.

4.1.3 Panel Weigh Station

A panel weigh station (PWS) with measurement capability to 0.001 gram was used to measure panel weights. The balance was warmed up and then calibrated with a 300 gram test weight. The balance was tested with 100, 50, 10 and 1 gram weights before commencing weighing operations. A blank panel weight was measured at the beginning of the testing program and again at the time of each subsequent panel weight measurement. The balance was placed on an isolation platform and inside an enclosure to minimize vibration and airflow at the measurement point.

5 RESULTS

The testing program consisted of Transfer Efficiency (TE) testing and Capture Efficiency (CE) testing. Determination of TE and CE were conducted in accordance with all applicable procedures contained in USEPA document "Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Topcoat Operations".

The test results will be used to demonstrate compliance with Auto MACT requirements and for use in monthly emissions compliance calculations for the CAAP Permit and 40CFR 63 Subpart IIII – National Emissions Standards or Hazardous Pollutants: Surface Coating of Automobiles and Light Duty Trucks, emission limits.

5.1 Results

Results are summarized in Tables 5.2-1 and 5.2-2 for TE and CE. Detailed VOC CE and paint solids TE results are presented in Table Section. All sampling field notes are provided in **Appendix F.** Sample Calculations are provided in **Appendix G.** All laboratory results are included in **Appendix C.** Process Data is provided in **Appendix B.**

Table 5.1-1: Transfer Efficiency Results Summary

Tested Coating	*Transfer Efficiency (%)*
Basecoat (White Solid Basecoat)	77.8%
Basecoat (Granite Metallic)	71.6%
Clearcoat	69.1%

Table 5.1-2 Capture Efficiency (CE) Results Summary

		Loading (Lb/GACS)	Capture Efficiency
		EU-TOPCOAT 2 BOX	EU-TOPCOAT 2 BOX
Solid Basecoat (White)	**Booth/Flash**	3.96	--
	Oven	1.95	
	Total	**5.91**	**83.4%**
Metallic Basecoat (Granite)	**Booth/Flash**	6.40	--
	Oven	1.74	
	Total	**8.15**	**84.2%**
Clearcoat	**Booth**	4.87	47.3%
	Oven	3.34	32.4%
	Total	**8.21**	**79.6%**

5.2 Discussion of Results

There were no significant disruptions to the testing program.

6 PROCESS CONDITIONS

Operating conditions during the sampling were monitored by FCA personnel. All equipment was operated under normal maximum operating conditions. Process Data is provided in **Appendix B**.

Contact was maintained between the operator and the sampling team. A member of the RWDI/JLB sampling team was in contact with FCA staff during the entire sampling program.

7 CONCLUSIONS

Testing was successfully completed during the week of October 15, 2018. All parameters were tested in accordance with referenced methodologies.

FCA SHAP South
October 2018
Summary

Table 1a: VOC Loading and Capture Efficiency

Process	Loading (Lb VOC/GACS)	Capture Efficiency (%)
Clearcoat Booth	4.87	47.3%
Clearcoat Oven	3.34	32.4%
Total Clearcoat	**8.21**	**79.6%**
Metallic Basecoat Booth	2.33	24.1%
Metallic Basecoat Flash	4.07	
Metallic Basecoat Oven	1.74	
Total Metallic Basecoat Flash and Oven	5.81	60.1%
Total Metallic Basecoat	**8.14**	**84.2%**
Solid Basecoat Booth	0.71	10.0%
Solid Basecoat Flash	3.25	
Solid Basecoat Oven	1.95	
Total Solid Basecoat Flash and Oven	5.20	73.4%
Total Solid Basecoat	**5.91**	**83.4%**

Table 1b: VOC Loading and Capture Efficiency

Process	Loading (Lb VOC/GACS)	Capture Efficiency (%)
Clearcoat Booth	4.87	47.3%
Clearcoat Oven	3.34	32.4%
Total Clearcoat	**8.21**	**79.6%**
Metallic Basecoat Booth/Flash	6.40	
Metallic Basecoat Oven	1.74	
Total Metallic Basecoat	**8.14**	**84.2%**
Solid Basecoat Booth/Flash	3.96	
Solid Basecoat Oven	1.95	
Total Solid Basecoat	**5.91**	**83.4%**

Table 2: Transfer Efficiency

Process	Transfer Efficiency (%)
Metallic Basecoat	71.7%
Solid Basecoat	77.8%
Clearcoat	69.1%

Table 3 -- Granite Metallic Basecoat Transfer Efficiency Summary
SHAP South, October 2018

Vehicle ID	Vehicle Weight Gain (lb.)	Average Vehicle Weight Gain (lb.)	Average Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Average Solids Sprayed	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(sumVWG-SWL)	(PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
TE 3	0.59	0.59	0.287	8.753	0.3267	0.82	**71.6%**
TE 5	0.58						

*Vehicle TE 1 and TE 2 weight gains not withing 10% of average. Not included in test calculations per Protocol.

Table 4 -- White Solid Basecoat Transfer Efficiency Summary
SHAP South, October 2018

Vehicle ID	Vehicle Weight Gain (lb.)	Average Vehicle Weight Gain (lb.)	Average Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Average Solids Sprayed	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(sumVWG-SWL)	(PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
TE 1	1.16	1.27	0.328	10.476	0.4747	1.63	**77.8%**
TE 2	1.27						
TE 3	1.37						

Table 5 -- Clearcoat Transfer Efficiency Summary
SHAP South, October 2018

Vehicle ID	Vehicle Weight Gain (lb.)	Average Vehicle Weight Gain (lb.)	Average Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Average Solids Sprayed	Transfer Efficiency (%)
Variable:	VWG	AVWG	APS	CD	WSF	SS	TE
Calculation:	(W2-W1)	(sumVWG-SWL)	(PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
TE 1	1.27	1.34	0.394	8.613	0.5710	1.94	**69.1%**
TE 3	1.31						
TE 4	1.43						

Note: Clearcoat is applied at a 1A:1B Ratio. Coating solids and density reflect an average of Clearcoat Part A and Part B.

*Vehicle TE 2 weight gain not withing 10% of average. Not included in test calculations per Protocol.

Table 6 -- Clearcoat Booth VOC Capture Efficiency
SHAP South, October 2018

Sample	Blank Panel Weights (g)	Wet Panel Weights - Control Zone Exit (g)	Panel Weights - after bake (g)	Weight of Coating Solids Deposited (g)	Weight of VOC remaining after zone (g)	Weight of VOC remaining per Weight Solids Deposited (g)	Mass Fraction Solids	Mass Fraction VOC in Coating	VOC fraction remaining on Panel after Zone	Section Capture Efficiency (%)
Variable	P0	P1	P2	W_{sdep}	W_{rem}	P_m	W_s	W_{VOC}	P_{VOC}	CE
Formula				P2-P0	P1-P2	W_{rem}/W_{sdep}			$(P_m)(W_s)/(W_{VOC})$	$1-P_{VOC}$
C1	187.979	190.305	189.637	1.658	0.668	0.403				
C2	187.987	190.824	190.000	2.013	0.824	0.409				
C3	187.416	190.032	189.304	1.888	0.728	0.386				
C4	188.819	191.467	190.728	1.909	0.739	0.387				
Average						0.396	0.5710	0.4291	0.527	47.3%

Booth Loading Calculation

	VOC Content (lb VOC/gal)	Volume Solids Fraction	Transfer Efficiency	Weight of VOC generated per volume of solids deposited (lb/GACS)	Capture Efficiency	Weight of VOC captured per volume of applied solids deposited (lb/GACS)
Variable	VOC	V_S	TE	VOC_G	CE	VOC_A
Formula				$VOC/(V_S*TE)$		$CE*VOC_G$
	3.695	0.519	0.691	10.31	0.473	4.87

Table 7 -- Clearcoat Oven Capture Efficiency
SHAP South, October 2018
Solvent Loading

Sample	Blank Panel Weights (g)	Wet Panel Weights - Before Bake (g)	Panel Weights - After Bake (g)	Weight of Coating Solids Deposited (g)	Weight of VOC available for abatement (g)	Weight of VOC available per volume of coating solids (lb/GACS)
Variable	P0	P2	P3	Wcos	Wa	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
C1	187.979	190.221	189.637	1.658	0.584	3.34
C2	187.987	190.740	190.000	2.013	0.740	3.48
C3	187.416	189.953	189.304	1.888	0.649	3.26
C4	188.819	191.388	190.728	1.909	0.660	3.27
Average	188.050	190.576	189.917	1.867	0.658	**3.34**

Material Properties

Sample	Coating Density (lb/gal)	Mass Fraction Solids	Volume Fraction Solids	Film Build Thickness (mil)	VOC mass fraction	Solids Density (lb/gal)
Variable	W_c	W_s	V_s	mil	W_{voc}	D_{cos}
Formula						(Ws*Wc)/Vs
Clearcoat	8.61	0.5710	0.5193	2.18	0.4291	9.47

Capture Efficiency

Mass Fraction VOC in Coating	Coating Density (lb/gal)	Mass VOC per Volume Coating (lb/gal)	Transfer Efficiency (%)	Volume Fraction Solids	Volume Solids Deposited per Volume Coating Sprayed	Panel Test Result (lb VOC/ gal Solids)	Oven VOC Capture Efficiency (%)
W_{voc}	D_c	VOC	TE	V_s	V_{sdep}	P	CE
		(Dc)(Wvoc)			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.4291	8.61	3.695	69.1%	0.5193	0.359	3.34	**32.4%**

Table 8 -- Granite Metallic Basecoat Oven Capture Efficiency
SHAP South, October 2018

	Unit	Variable	Formula	Panel 1	Panel 2	Panel 3	Panel 4	
Blank Panel Weight	g	P0		185.089	185.014	185.243	185.568	
Panel at Flash Entrance	g	P2		186.108	186.366	186.198	186.442	
Panel at Flash Exit/Oven Entrance	g	P3		185.747	185.832	185.841	186.152	
Baked Panel Weight	g	P5		185.644	185.696	185.754	186.071	
At Entrance to Flash								
% Nonvolatile	%	%NV	(P5-P0)/(P2-P0)	54.5%	50.4%	53.5%	57.6%	
% Volatile	%	%V	100-%NV	45.5%	49.6%	46.5%	42.4%	
% Water	%	$\%H_2O$	Average KF	14.08%	14.08%	14.08%	14.08%	
% VOC	%	%VOC	%V-%H2O	31.5%	35.5%	32.4%	28.4%	Average W_{VOC1}
Weight of VOC Available for Control	g	W_{VOC}	(P2-P0)*%VOC	0.321	0.480	0.310	0.248	0.339
At Flash Exit/Oven Entrance	*Note: Flash exit and oven entrance weight are the same to allow for panel to cool before weight.*							
% Nonvolatile	%	%NV	(P3-P0)/(P2-P0)	84.3%	83.4%	85.5%	86.1%	
% Volatile	%	%V	100-%NV	15.7%	16.6%	14.5%	13.9%	
% Water	%	$\%H_2O$	Average KF	0.00%	0.00%	0.00%	0.00%	
% VOC	%	%VOC	%V-%H2O	15.7%	16.6%	14.5%	13.9%	Average W_{VOC2}
Weight of VOC Available for Control	g	W_{VOC}	(P3-P0)*%VOC	0.103	0.136	0.087	0.081	0.102
At Oven Exit								
% Nonvolatile	%	%NV	(P3-P0)/(P3-P0)	100.0%	100.0%	100.0%	100.0%	
% Volatile	%	%V	100-%NV	0.0%	0.0%	0.0%	0.0%	
% Water	%	$\%H_2O$	Average KF	0.0%	0.0%	0.0%	0.0%	
% VOC	%	%VOC	%V-%H2O	0.0%	0.0%	0.0%	0.0%	Average W_{VOC3}
Weight of VOC Available for Control	g	W_{VOC}	(P5-P0)*%VOC	0.000	0.000	0.000	0.000	0.000
Solids Coating Density								
Coating Density	lb/gal	W_C	Material Property					8.75
Mass Fraction Solids		W_S	Material Property					0.3267
Volume Fraction Solids		V_S	Material Property					0.2967
Solids Density	lb/gal	D_{COS}	$(W_S*W_C)/V_S$					9.64
Coating Solids Deposited								Average W_{COS}
Weight of Coating Solids Deposited	g	W_{COS}	(P3-P0)	0.555	0.682	0.511	0.503	0.563
Loading in Flash								
Weight VOC Available in Flash	g	$W_{VOC\ Flash}$	W_{VOC1}-W_{VOC2}					0.238
Weight of VOC available per GACS	lb/gal	C_{Lflash}	$(W_{VOC\ Flash}/W_{COS})*D_{COS}$					4.07
Loading in Oven								
Weight VOC Available in Oven	g	$W_{VOC\ Oven}$	W_{VOC2}-W_{VOC3}					0.102
Weight of VOC available per GACS	lb/gal	C_{Loven}	$(W_{VOC\ Oven}/W_{COS})*D_{COS}$					1.74
Weight VOC Available Total	lb/gal	C_L	$C_{Lflash}+C_{Loven}$					**5.81**
Capture Efficiency Calculation								
Mass Fraction VOC		W_{VOC}	Material Property					0.2348
Mass VOC per Volume Coating	lb/gal	VOC	W_C*W_{VOC}					2.055
Transfer Efficiency	%	TE						71.6%
Volume Solids Deposited per Volume Coating Sprayed		V_{sdep}	(V_S*TE)					0.212
VOC Capture Efficiency	%	CE	$C_L*V_{sdep}*100/VOC$					**60.1%**

Table 9 -- Granite Metallic Basecoat Karl Fisher
SHAP South, October 2018

Foil Data Flash Entrance

Sample	Foil Weights (g)	Jar & Lid Weights (g)	Jar, Lid & Coated Foil Weights (g)	Jar, Lid, Coated Foil, & Methanol Weights (g)	KF % Water in Sample (% wt)	Weight of Paint Sample on Foil (g)	Weight of Methanol Used (g)	Water in Paint Sample (wt/wt)
Variable	F	J	K	L	KF	P	M	H2O Fract
Formula						K-(F+J)	L-K	(KF*(M+P)-KFb*M)/P
M1	3.967	126.139	131.088	183.444	0.370%	0.982	52.356	12.63%
M2	3.755	125.982	130.724	186.258	0.340%	0.987	55.534	11.59%
M3	4.215	126.305	131.584	203.665	0.400%	1.064	72.081	18.01%
Average								**14.08%**

KFb 0.140% = % H2O in field blank

Foil Data Oven Entrance

Sample	Foil Weights (g)	Jar & Lid Weights (g)	Jar, Lid & Coated Foil Weights (g)	Jar, Lid, Coated Foil, & Methanol Weights (g)	KF % Water in Sample (% wt)	Weight of Paint Sample on Foil (g)	Weight of Methanol Used (g)	Water in Paint Sample (wt/wt)
Variable	F	J	K	L	KF	P	M	H2O Fract
Formula						K-(F+J)	L-K	(KF*(M+P)-KFb*M)/P
M4	3.911	124.869	129.568	185.522	0.150%	0.788	55.954	0.86%
M5	4.024	124.973	129.802	183.964	0.130%	0.805	54.162	-0.54%
M6	3.850	124.762	129.310	194.377	0.120%	0.698	65.067	-1.74%
Average								***0.00%***

KFb 0.140% = % H2O in field blank

*Water in paint shown as 0%

Table 10 -- Granite Metallic Basecoat Booth Capture Efficiency
SHAP South, October 2018

	Unit	Variable	Formula	Panel 1	Panel 2	Panel 3	Panel 4	
Blank Panel Weight	g	P0		185.089	185.014	185.243	185.568	
Panel at Booth Ctl Exit	g	P2		186.226	186.485	186.291	186.528	
Panel at Flash Exit/Oven Entrance	g	P3		185.747	185.832	185.841	186.152	
Baked Panel Weight	g	P5		185.644	185.696	185.754	186.071	
At Entrance to Flash								
% Nonvolatile	%	%NV	(P5-P0)/(P2-P0)	48.8%	46.4%	48.8%	52.4%	
% Volatile	%	%V	100-%NV	51.2%	53.6%	51.2%	47.6%	
% Water	%	$\%H_2O$	Average KF	14.08%	14.08%	14.08%	14.08%	
% VOC	%	%VOC	%V-%H2O	37.1%	39.6%	37.2%	33.5%	Average W_{VOC1}
Weight of VOC Available for Control	g	W_{VOC}	(P2-P0)*%VOC	0.422	0.582	0.389	0.322	0.429
At Flash Exit/Oven Entrance	*Note: Flash exit and oven entrance weight are the same to allow for panel to cool before weight.*							
% Nonvolatile	%	%NV	(P3-P0)/(P2-P0)	84.3%	83.4%	85.5%	86.1%	
% Volatile	%	%V	100-%NV	15.7%	16.6%	14.5%	13.9%	
% Water	%	$\%H_2O$	Average KF	0.00%	0.00%	0.00%	0.00%	
% VOC	%	%VOC	%V-%H2O	15.7%	16.6%	14.5%	13.9%	Average W_{VOC2}
Weight of VOC Available for Control	g	W_{VOC}	(P3-P0)*%VOC	0.103	0.136	0.087	0.081	0.102
At Oven Exit								
% Nonvolatile	%	%NV	(P3-P0)/(P3-P0)	100.0%	100.0%	100.0%	100.0%	
% Volatile	%	%V	100-%NV	0.0%	0.0%	0.0%	0.0%	
% Water	%	$\%H_2O$	Average KF	0.0%	0.0%	0.0%	0.0%	
% VOC	%	%VOC	%V-%H2O	0.0%	0.0%	0.0%	0.0%	Average W_{VOC3}
Weight of VOC Available for Control	g	W_{VOC}	(P5-P0)*%VOC	0.000	0.000	0.000	0.000	0.000
Solids Coating Density								
Coating Density	lb/gal	W_C	Material Property					8.75
Mass Fraction Solids		W_S	Material Property					0.3267
Volume Fraction Solids		V_S	Material Property					0.2967
Solids Density	lb/gal	D_{COS}	$(W_S*W_C)/V_S$					9.64
Coating Solids Deposited								Average W_{COS}
Weight of Coating Solids Deposited	g	W_{COS}	(P3-P0)	0.555	0.682	0.511	0.503	0.563
Loading in Flash								
Weight VOC Available in Flash	g	$W_{VOC\ Flash}$	$W_{VOC1}-W_{VOC2}$					0.327
Weight of VOC available per GACS	lb/gal	C_{Lflash}	$(W_{VOC\ Flash}/W_{COS})*D_{COS}$					5.60
Loading in Oven								
Weight VOC Available in Oven	g	$W_{VOC\ Oven}$	$W_{VOC2}-W_{VOC3}$					0.102
Weight of VOC available per GACS	lb/gal	C_{Loven}	$(W_{VOC\ Oven}/W_{COS})*D_{COS}$					1.74
Weight VOC Available Total	lb/gal	C_L	$C_{Lflash}+C_{Loven}$					**7.34**
Capture Efficiency Calculation								
Mass Fraction VOC		W_{VOC}	Material Property					0.2348
Mass VOC per Volume Coating	lb/gal	VOC	W_C*W_{VOC}					2.055
Transfer Efficiency	%	TE						71.6%
Volume Solids Deposited per Volume Coating Sprayed		V_{sdep}	(V_S*TE)					0.212
VOC Not Captured in Booth	%	VOC_{NOT}	$C_L*V_{sdep}*100/VOC$					75.9%
Booth VOC Capture Efficiency	%	CE	$1-VOC_{NOT}$					**24.1%**
Loading in Booth								
VOC Content (lb VOC/gal)								2.055
Volume Solids Fraction								0.2967
Transfer Efficiency								71.6%
Weight of VOC generated per volume of solids deposited (VOC_G),(lb/GACS), VOC/(VS*TE)								9.68
Capture Efficiency								24.1%
Weight of VOC captured per volume of applied solids deposited (lb/GACS), $CE*VOC_G$								**2.33**

Table 11 -- White Solid Basecoat Oven Capture Efficiency
SHAP South, October 2018

	Unit	Variable	Formula	Panel 1	Panel 2	Panel 3	Panel 4	
Blank Panel Weight	g	P0		185.030	184.576	184.672	184.777	
Panel at Flash Entrance	g	P2		186.801	186.165	186.514	186.474	
Panel at Flash Exit/Oven Entrance	g	P3		186.323	185.756	186.020	186.036	
Baked Panel Weight	g	P5		186.147	185.609	185.825	185.878	
At Entrance to Flash								
% Nonvolatile	%	%NV	(P5-P0)/(P2-P0)	63.1%	65.0%	62.6%	64.9%	
% Volatile	%	%V	100-%NV	36.9%	35.0%	37.4%	35.1%	
% Water	%	%H_2O	Average KF	13.03%	13.03%	13.03%	13.03%	
% VOC	%	%VOC	%V-%H_2O	23.9%	22.0%	24.4%	22.1%	Average W_{VOC1}
Weight of VOC Available for Control	g	W_{VOC}	(P2-P0)*%VOC	0.423	0.349	0.449	0.375	0.399
At Flash Exit/Oven Entrance	*Note: Flash exit and oven entrance weight are the same to allow for panel to cool before weight.*							
% Nonvolatile	%	%NV	(P3-P0)/(P2-P0)	86.4%	87.5%	85.5%	87.5%	
% Volatile	%	%V	100-%NV	13.6%	12.5%	14.5%	12.5%	
% Water	%	%H_2O	Average KF	1.53%	1.53%	1.53%	1.53%	
% VOC	%	%VOC	%V-%H_2O	12.1%	10.9%	12.9%	11.0%	Average W_{VOC2}
Weight of VOC Available for Control	g	W_{VOC}	(P3-P0)*%VOC	0.156	0.129	0.174	0.139	0.150
At Oven Exit								
% Nonvolatile	%	%NV	(P3-P0)/(P3-P0)	100.0%	100.0%	100.0%	100.0%	
% Volatile	%	%V	100-%NV	0.0%	0.0%	0.0%	0.0%	
% Water	%	%H_2O	Average KF	0.0%	0.0%	0.0%	0.0%	
% VOC	%	%VOC	%V-%H_2O	0.0%	0.0%	0.0%	0.0%	Average W_{VOC3}
Weight of VOC Available for Control	g	W_{VOC}	(P5-P0)*%VOC	0.000	0.000	0.000	0.000	0.000
Solids Coating Density								
Coating Density	lb/gal	W_C	Material Property					10.48
Mass Fraction Solids		W_S	Material Property					0.4747
Volume Fraction Solids		V_S	Material Property					0.3467
Solids Density	lb/gal	D_{COS}	$(W_S*W_C)/V_S$					14.34
Coating Solids Deposited								Average W_{COS}
Weight of Coating Solids Deposited	g	W_{COS}	(P3-P0)	1.117	1.033	1.153	1.101	1.101
Loading in Flash								
Weight VOC Available in Flash	g	$W_{VOC\ Flash}$	W_{VOC1}-W_{VOC2}					0.249
Weight of VOC available per GACS	lb/gal	C_{Lflash}	$(W_{VOC\ Flash}/W_{COS})*D_{COS}$					3.25
Loading in Oven								
Weight VOC Available in Oven	g	$W_{VOC\ Oven}$	W_{VOC2}-W_{VOC3}					0.150
Weight of VOC available per GACS	lb/gal	C_{Loven}	$(W_{VOC\ Oven}/W_{COS})*D_{COS}$					1.95
Weight VOC Available Total	lb/gal	C_L	$C_{Lflash}+C_{Loven}$					**5.20**
Capture Efficiency Calculation								
Mass Fraction VOC		W_{VOC}	Material Property					0.1824
Mass VOC per Volume Coating	lb/gal	VOC	W_C*W_{VOC}					1.911
Transfer Efficiency	%	TE						77.8%
Volume Solids Deposited per Volume Coating Sprayed		V_{sdep}	(V_S*TE)					0.270
VOC Capture Efficiency	%	CE	$C_L*V_{sdep}*100/VOC$					**73.4%**

Table 12 -- White Solid Basecoat Karl Fisher
SHAP South, October 2018

Foil Data Flash Entrance

Sample	Foil Weights (g)	Jar & Lid Weights (g)	Jar, Lid & Coated Foil Weights (g)	Jar, Lid, Coated Foil, & Methanol Weights (g)	KF % Water in Sample (% wt)	Weight of Paint Sample on Foil (g)	Weight of Methanol Used (g)	Water in Paint Sample (wt/wt)
Variable	F	J	K	L	KF	P	M	H2O Fract
Formula						K-(F+J)	L-K	(KF*(M+P)-KFb*M)/P
B1	3.678	124.749	129.895	189.784	0.470%	1.468	59.889	13.93%
B2	3.406	124.586	129.254	198.713	0.340%	1.262	69.459	11.35%
B3	3.408	124.803	129.693	195.737	0.440%	1.482	66.044	13.81%
Average								**13.03%**

KFb | 0.140% | = | % H2O in field blank

Foil Data Oven Entrance

Sample	Foil Weights (g)	Jar & Lid Weights (g)	Jar, Lid & Coated Foil Weights (g)	Jar, Lid, Coated Foil, & Methanol Weights (g)	KF % Water in Sample (% wt)	Weight of Paint Sample on Foil (g)	Weight of Methanol Used (g)	Water in Paint Sample (wt/wt)
Variable	F	J	K	L	KF	P	M	H2O Fract
Formula						K-(F+J)	L-K	(KF*(M+P)-KFb*M)/P
B4	3.378	124.652	129.281	195.766	0.170%	1.251	66.485	1.76%
B5	3.753	124.801	129.872	185.124	0.180%	1.318	55.252	1.86%
B6	3.614	124.918	129.985	188.605	0.160%	1.453	58.620	0.97%
Average								**1.53%**

KFb | 0.140% | = | % H2O in field blank

Table 13 -- White Solid Basecoat Booth Capture Efficiency
SHAP South, October 2018

	Unit	Variable	Formula	Panel 1	Panel 2	Panel 3	Panel 4	
Blank Panel Weight	g	P0		185.030	184.576	184.672	184.777	
Panel at Booth Ctl Exit	g	P2		186.900	186.261	186.619	186.588	
Panel at Flash Exit/Oven Entrance	g	P3		186.323	185.756	186.020	186.036	
Baked Panel Weight	g	P5		186.147	185.609	185.825	185.878	
At Entrance to Flash								
% Nonvolatile	%	%NV	(P5-P0)/(P2-P0)	59.7%	61.3%	59.2%	60.8%	
% Volatile	%	%V	100-%NV	40.3%	38.7%	40.8%	39.2%	
% Water	%	$\%H_2O$	Average KF	13.03%	13.03%	13.03%	13.03%	
% VOC	%	%VOC	$\%V-\%H_2O$	27.2%	25.7%	27.8%	26.2%	Average W_{VOC1}
Weight of VOC Available for Control	g	W_{VOC}	(P2-P0)*%VOC	0.509	0.432	0.540	0.474	0.489
At Flash Exit/Oven Entrance	*Note: Flash exit and oven entrance weight are the same to allow for panel to cool before weight.*							
% Nonvolatile	%	%NV	(P3-P0)/(P2-P0)	86.4%	87.5%	85.5%	87.5%	
% Volatile	%	%V	100-%NV	13.6%	12.5%	14.5%	12.5%	
% Water	%	$\%H_2O$	Average KF	1.53%	1.53%	1.53%	1.53%	
% VOC	%	%VOC	$\%V-\%H_2O$	12.1%	10.9%	12.9%	11.0%	Average W_{VOC2}
Weight of VOC Available for Control	g	W_{VOC}	(P3-P0)*%VOC	0.156	0.129	0.174	0.139	0.150
At Oven Exit								
% Nonvolatile	%	%NV	(P3-P0)/(P3-P0)	100.0%	100.0%	100.0%	100.0%	
% Volatile	%	%V	100-%NV	0.0%	0.0%	0.0%	0.0%	
% Water	%	$\%H_2O$	Average KF	0.0%	0.0%	0.0%	0.0%	
% VOC	%	%VOC	$\%V-\%H_2O$	0.0%	0.0%	0.0%	0.0%	Average W_{VOC3}
Weight of VOC Available for Control	g	W_{VOC}	(P5-P0)*%VOC	0.000	0.000	0.000	0.000	0.000
Solids Coating Density								
Coating Density	lb/gal	W_C	Material Property					10.48
Mass Fraction Solids		W_S	Material Property					0.4747
Volume Fraction Solids		V_S	Material Property					0.3467
Solids Density	lb/gal	D_{COS}	$(W_S*W_C)/V_S$					14.34
Coating Solids Deposited								Average W_{COS}
Weight of Coating Solids Deposited	g	W_{COS}	(P3-P0)	1.117	1.033	1.153	1.101	1.101
Loading in Flash								
Weight VOC Available in Flash	g	$W_{VOC\ Flash}$	$W_{VOC1}-W_{VOC2}$					0.339
Weight of VOC available per GACS	lb/gal	C_{LFlash}	$(W_{VOC\ Flash}/W_{COS})*D_{COS}$					4.42
Loading in Oven								
Weight VOC Available in Oven	g	$W_{VOC\ Oven}$	$W_{VOC2}-W_{VOC3}$					0.150
Weight of VOC available per GACS	lb/gal	C_{LOven}	$(W_{VOC\ Oven}/W_{COS})*D_{COS}$					1.95
Weight VOC Available Total	lb/gal	C_L	$C_{LFlash}+C_{LOven}$					**6.37**
Capture Efficiency Calculation								
Mass Fraction VOC		W_{VOC}	Material Property					0.1824
Mass VOC per Volume Coating	lb/gal	VOC	W_C*W_{VOC}					1.911
Transfer Efficiency	%	TE						77.8%
Volume Solids Deposited per Volume Coating Sprayed		V_{sdep}	(V_S*TE)					0.270
VOC Not Captured in Booth	%	VOC_{NOT}	$C_L*V_{sdep}*100/VOC$					90.0%
Booth VOC Capture Efficiency	%	CE	$1-VOC_{NOT}$					**10.0%**
Loading in Booth								
VOC Content (lb VOC/gal)								1.911
Volume Solids Fraction								0.3467
Transfer Efficiency								77.8%
Weight of VOC generated per volume of solids deposited (VOC_G),(lb/GACS), VOC/(VS*TE)								7.08
Capture Efficiency								10.0%
Weight of VOC captured per volume of applied solids deposited (lb/GACS), $CE*VOC_G$								**0.71**