Ford Michigan Assembly Plant

3-Wet Transfer Efficiency and Capture Efficiency Test Report
March 2019

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1.0 Executive Summary

JLB Industries, LLC completed a compliance environmental testing program during the week of March 11, 2019 in the paint shop at the Ford Michigan Assembly Plant (MAP) facility located in Wayne, Michigan. The testing program included Transfer Efficiency (TE) and Capture Efficiency (CE) testing of the 3-Wet spraybooths and ovens. 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* and with 40 CFR Chapter 1, Appendix A to Subpart IIII of Part 63. The test results will be used to demonstrate compliance with Auto MACT requirements and in monthly emissions compliance calculations.

Transfer Efficiency values were derived for the Ford Ranger model, which currently accounts for the majority of production volume at the facility. Personnel from the paint shop, Ford 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 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.

Table 1 – Testing Results Summary

Tested Coating	Solids Transfer Efficiency (%)
3-Wet System (Prime, Basecoat and Clearcoat)	71.9%

Tested Coating	Booth Capture Efficiency	Oven Capture Efficiency	Total Capture Efficiency
Enamel 2 Prime	N/A	9.7%	9.7%
Enamel 2 Basecoat	76.1%	10.8%	87.0%
Enamel 2 Clearcoat	68.8%	16.6%	85.4%
Enamel 1 Prime	78.2%	10.4%	88.6%
Enamel 1 Basecoat	77.5%	11.5%	89.0%
Enamel 1 Clearcoat	68.2%	17.8%	86.0%

2.0 Introduction

JLB Industries, LLC (JLBI) was contracted by Ford Michigan Assembly Plant (MAP) to perform Transfer Efficiency (TE) and Capture Efficiency (CE) testing program on the 3-Wet Systems in the paint shop at the Michigan Assembly Plant located in Wayne, Michigan. This testing was conducted on the Ford Ranger model during the week of March 11, 2019.

3.0 Sampling and Analytical Procedures

Transfer Efficiency Test

Transfer Efficiency testing was conducted in the Enamel 2 3-Wet Spraybooth where Light Gray Prime, Shadow Black 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 five vehicle bodies were used in testing. Three vehicles were processed as normal production vehicles for the test, while two vehicles were dedicated as no-paint, control vehicles. All units were production vehicles with sealer.

An on-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 four 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 MAP 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, located in Waverly, Ohio, 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 e-coat and processed through the Enamel 2 3-Wet Spraybooth. The test sequence for the Transfer Efficiency test was:

1. Test Unit ID TE 1
2. Test Unit ID TE 2
3. Test Unit ID TE 3
4. Test Unit ID TE 4 (No-paint)
5. Test Unit ID TE 5 (No-paint)

Test vehicles were baked and routed back to the VWS for post-weights.

Capture Efficiency Tests

Capture Efficiency testing was performed on both Enamel 1 and Enamel 2 systems. A panel weigh station (PWS) was assembled at a location near the 3-Wet Spraybooth. 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.

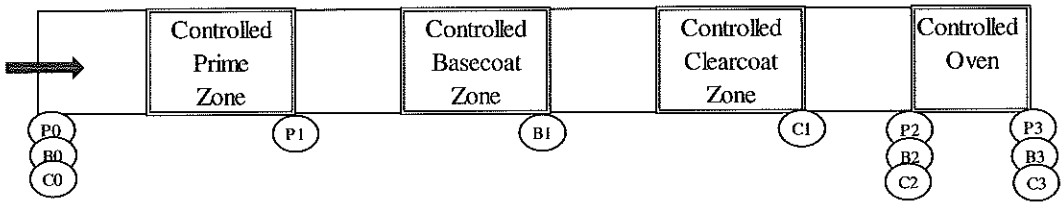
The testing conformed to the methods described in ASTM 5087-02 for solvent borne coatings. Capture Efficiency values for the controlled oven and spraybooth zones were calculated using the procedures outlined in the 40 CFR, Part 63.

All test panels were placed on Ford Ranger bodies and processed with normal production spray programming.

Four electrocoated panels were used for each of the tests. Each group of test panels was weighed in several locations (see panel test diagram) to determine the relative distribution of VOC that is released in the controlled spray zones 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 Spraybooth. After coating, upon exiting the controlled spraybooth zone, the panels were carefully removed from the test vehicle and brought to the balance for weighing (P1). The panels were weighed again immediately before entering the 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).

Diagram 1 – Panel Testing Diagram



4.0 Test Equipment and Calibration

Vehicle Weigh Station (VWS)

A dedicated vehicle weigh station (VWS) equipped with four 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 300 pounds of Class F calibration weights on each scale platform. Then, the VWS was calibrated with 800 pounds of Class F calibration weights. VWS linearity was checked using a one or two-pound, Class F stainless steel calibration weight. The two-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 via volumetric flow measurement devices located on each applicator. A verification of each applicator was performed by MAP 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. Verification data is included in section 7 of this report.

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

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 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.

5.0 Discussion of Test Results

There were no significant disruptions to the testing process. Representative coatings were chosen for testing based on the production volume and the application process.

6.0 Summary of Results

Table 2 - 3-Wet Transfer Efficiency Calculation Summary
Ford MAP, March 2019

Vehicle ID	Vehicle Weight Gain (lb.)	Prime Sprayed (gal)	Basecoat Sprayed (gal)	Clearcoat Sprayed (gal)
Variable:	VWG	PPS	BCPS	CCPS
Calculation:	(W2-W1)			
11532	4.98	0.425	0.700	0.635
18254	4.98	0.429	0.700	0.635
26240	4.74	0.426	0.700	0.635
Average:	4.90	0.427	0.700	0.635
AVWG:	**5.68**	AVWG=(avg VWG-SWL)		

Material	Avg. Paint Sprayed (gal)	Coating Density (lb/gal)	Weight Solids Fraction	Avg. Solids Sprayed (lb.)	Transfer Efficiency (%)
Variable:	APS	CD	WSF	SS	TE
Calculation:	(Avg PS)	(Method 24)	(Method 24)	(APS*CD*WSF)	(AVWG/SS)
Prime	0.427	9.67	0.5618	2.32	
Basecoat	0.700	8.53	0.4638	2.77	
Clearcoat	0.635	8.32	0.5339	2.82	
				7.91	**71.9%**

Control Vehicle Sealer Weight Loss

Vehicle ID	Vehicle Weight Gain (lb.)
Variable:	SWL
Calculation:	(W2-W1)
Control 1	-0.85
Control 2	-0.71
Average	-0.78

Table 3 -- Enamel 1 Prime Booth VOC Capture Efficiency
Ford MAP, March 2019

Sample	Blank Panel Weights (g)	Wet Panel Weights - Control Zone Exit	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	P3	W_{sdep}	W_{rem}	P_m	W_s	W_{VOC}	P_{VOC}	CE
Formula				P3-P0	P1-P3	W_{rem}/W_{sdep}			$(P_m)(W_s)/(W_{VOC})$	$1-P_{VOC}$
P1	186.483	187.737	187.559	1.076	0.178	0.165				
P2	186.087	187.449	187.250	1.163	0.199	0.171				
P3	186.204	187.563	187.358	1.154	0.205	0.178				
P4	186.871	188.299	188.095	1.224	0.204	0.167				
Average						0.170	0.5613	0.4387	0.218	**78.2%**

Table 4 -- Enamel 2 Basecoat Booth VOC Capture Efficiency
Ford MAP, March 2019

Sample	Blank Panel Weights (g)	Wet Panel Weights - Control Zone Exit	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	P3	Wsdep	Wrem	P_m	W_s	W_{VOC}	P_{VOC}	CE
Formula				P3-P0	P1-P3	W_{rem}/W_{sdep}			$(P_m)(W_s)/(W_{VOC})$	$1-P_{VOC}$
B1	185.038	186.511	186.175	1.137	0.336	0.296				
B2	185.636	186.914	186.654	1.018	0.260	0.255				
B3	185.478	186.862	186.548	1.070	0.314	0.293				
B4	185.516	186.810	186.537	1.021	0.273	0.267				
Average						0.278	0.4622	0.5378	0.239	**76.1%**

Table 5 -- Enamel 2 Clearcoat Booth VOC Capture Efficiency
Ford MAP, March 2019

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	P3	Wsdep	Wrem	P_m	W_s	W_{VOC}	P_{VOC}	CE
Formula				P3-P0	P1-P3	W_{rem}/W_{sdep}			$(P_m)(W_s)/(W_{VOC})$	$1-P_{VOC}$
C1	186.107	188.101	187.690	1.583	0.411	0.260				
C2	187.547	189.782	189.287	1.740	0.495	0.284				
C3	187.017	188.866	188.477	1.460	0.389	0.266				
C4	187.068	189.017	188.586	1.518	0.431	0.284				
Average						0.274	0.5326	0.4674	0.312	68.8%

Table 6 -- Enamel 2 Prime Oven VOC Capture Efficiency
Ford MAP, March 2019

Oven 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/gal)
Variable	P0	P2	P3	W_{cos}	W_a	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
P1	184.665	186.144	186.005	1.340	0.139	1.14
P2	186.011	187.542	187.393	1.382	0.149	1.19
P3	186.504	188.106	187.949	1.445	0.157	1.20
P4	185.265	186.947	186.793	1.528	0.154	1.11
Average				1.424	0.150	**1.16**

Material Properties

Sample	Coating Density (lb/gal)	Mass Fraction Solids	Volume Fraction Solids	Average 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
Prime	9.65	0.5614	0.4910	1.06	0.4386	11.03

Capture Efficiency

Mass Fraction VOC in Coating	Coating Density (lb/gal)	Mass VOC per Volume Coating (lb/gal)	Transfer Efficiency (%)	Volume Fraction Solids	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)			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.4386	9.65	4.231	71.9%	0.4910	0.353	1.16	**9.7%**

Table 7 -- Enamel 2 Basecoat Oven VOC Capture Efficiency
Ford MAP, March 2019

Oven 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/gal)
Variable	P0	P2	P3	Wcos	Wa	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
B1	185.038	186.368	186.175	1.137	0.193	1.50
B2	185.636	186.810	186.654	1.018	0.156	1.36
B3	185.478	186.749	186.548	1.070	0.201	1.66
B4	185.516	186.732	186.537	1.021	0.195	1.69
Average				1.062	0.186	**1.55**

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						$(W_s*W_c)/V_s$
Basecoat	8.55	0.4622	0.4460	0.93	0.5378	8.86

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
		$(D_c)(W_{voc})$			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.5378	8.55	4.596	71.9%	0.4460	0.321	1.55	**10.8%**

Table 8 -- Enamel 2 Clearcoat Oven VOC Capture Efficiency
Ford MAP, March 2019

Oven 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/gal)
Variable	P0	P2	P3	Wcos	Wa	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
C1	186.107	188.007	187.690	1.583	0.317	1.80
C2	187.547	189.645	189.287	1.740	0.358	1.85
C3	187.017	188.771	188.477	1.460	0.294	1.81
C4	187.068	188.890	188.586	1.518	0.304	1.80
Average				1.575	0.318	**1.82**

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	8.32	0.5326	0.4930	1.59	0.4674	8.99

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)			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.4674	8.32	3.890	71.9%	0.4930	0.354	1.82	**16.6%**

Table 9 -- Enamel 1 Basecoat Booth VOC Capture Efficiency
Ford MAP, March 2019

Sample	Blank Panel Weights (g)	Wet Panel Weights - Control Zone Exit	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	P3	Wsdep	Wrem	P_m	W_s	W_{VOC}	P_{VOC}	CE
Formula				P3-P0	P1-P3	W_{rem}/W_{sdep}			$(P_m)(W_s)/(W_{VOC})$	$1-P_{VOC}$
B1	186.418	188.073	187.731	1.313	0.342	0.260				
B2	187.501	189.082	188.755	1.254	0.327	0.261				
B3	186.390	188.111	187.737	1.347	0.374	0.278				
B4	186.501	188.091	187.784	1.283	0.307	0.239				
Average						0.260	0.4641	0.5359	0.225	**77.5%**

Table 10 -- Enamel 1 Clearcoat Booth VOC Capture Efficiency
Ford MAP, March 2019

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	P3	Wsdep	Wrem	P_m	W_s	W_{VOC}	P_{VOC}	CE
Formula				P3-P0	P1-P3	W_{rem}/W_{sdep}			$(P_m)(W_s)/(W_{VOC})$	$1-P_{VOC}$
C1	186.021	188.307	187.810	1.789	0.497	0.278				
C2	185.153	187.645	187.103	1.950	0.542	0.278				
C3	185.996	188.159	187.684	1.688	0.475	0.281				
C4	185.665	187.751	187.288	1.623	0.463	0.285				
Average						0.281	0.5316	0.4684	0.318	68.2%

Table 11 -- Enamel 1 Prime Oven VOC Capture Efficiency
Ford MAP, March 2019

Oven 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/gal)
Variable	P0	P2	P3	Wcos	Wa	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
P1	186.483	187.674	187.559	1.076	0.115	1.18
P2	186.087	187.383	187.250	1.163	0.133	1.26
P3	186.204	187.503	187.358	1.154	0.145	1.39
P4	186.871	188.224	188.095	1.224	0.129	1.16
Average				1.154	0.130	**1.25**

Material Properties

Sample	Coating Density (lb/gal)	Mass Fraction Solids	Volume Fraction Solids	Average 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
Prime	9.65	0.5613	0.4910	0.83	0.4387	11.04

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)			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.4387	9.65	4.235	71.9%	0.4910	0.353	1.25	**10.4%**

Table 12 -- Enamel 1 Basecoat Oven VOC Capture Efficiency
Ford MAP, March 2019

Oven 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/gal)
Variable	P0	P2	P3	Wcos	Wa	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
B1	186.418	187.967	187.731	1.313	0.236	1.60
B2	187.501	188.987	188.755	1.254	0.232	1.65
B3	186.390	188.006	187.737	1.347	0.269	1.78
B4	186.501	188.009	187.784	1.283	0.225	1.56
Average				1.299	0.241	**1.65**

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						$(W_s*W_c)/V_s$
Basecoat	8.55	0.4641	0.4460	1.04	0.5359	8.90

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
		$(D_c)(W_{voc})$			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.5359	8.55	4.582	71.9%	0.4460	0.321	1.65	**11.5%**

Table 13 -- Enamel 1 Clearcoat Oven VOC Capture Efficiency
Ford MAP, March 2019

Oven 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/gal)
Variable	P0	P2	P3	Wcos	Wa	CL
Formula				P3-P0	P2-P3	$(W_a/W_{cos})*D_{cos}$
C1	186.021	188.203	187.810	1.789	0.393	1.97
C2	185.153	187.533	187.103	1.950	0.430	1.98
C3	185.996	188.050	187.684	1.688	0.366	1.95
C4	185.665	187.639	187.288	1.623	0.351	1.94
Average				1.763	0.385	**1.96**

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	8.32	0.5316	0.4930	1.77	0.4684	8.97

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)			$(V_s)(TE)$		$(P)(V_{sdep})(100)/(VOC)$
0.4684	8.32	3.898	71.9%	0.4930	0.354	1.96	**17.8%**

7.0 Data Sheets