DESTRUCTION EFFICIENCY
TEST REPORT
for
EU-PAINT

at

Grupo Antolin - Howell
3705 West Grand River Avenue
Howell, Michigan

Test Date: August 31, 2017

Report Date: October 26, 2017

Report Due Date: October 31, 2017

Prepared by:

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Report Certification:

Air emission compliance testing was performed under my observation and in conjunction with the production operations on August 31, 2017 at the Grupo Antolin facility located at 3705 W. Grand River Avenue, Howell, Michigan. This report presents the testing results and operational data collected during the testing. The data presented herein are believed to be a true and accurate representation of actual field conditions observed during the compliance testing exercise.

Bruce H. Connell
Principal
Environmental Partners, Inc.

October 26, 2017

EXECUTIVE SUMMARY

A compliance stack test program was performed at the Grupo Antolin manufacturing facility located at 3705 W. Grand River Avenue, Howell, Michigan on August 31, 2017. The purpose of the test program was to determine the Volatile Organic Compound (VOC) destruction efficiency for the paint line (EUPAINT). EUPAINT is a conveyorized interior automotive plastic parts coating operation, with a regenerative thermal oxidizer used to control emissions released from the paint booths, flash tunnel, and cure oven.

The test program was conducted in accordance with the test plan dated June 1, 2017, and confirmed by the Michigan Department of Environmental Quality (MDEQ) by letter dated July 5, 2017. A copy of the test plan and the MDEQ confirmation letter is included in Appendix A.

The paint process evaluated is regulated by the Michigan issued New Source Review Permit to Install No. 52-09B. The testing was conducted to satisfy EUPAINT special condition number V.2 and to confirm compliance with special condition numbers IV.3 and IV.5.

The overall compliance test program was coordinated by Mr. Bruce Connell, of Environmental Partners, Inc. The compliance test program was performed by The Stack Test Group. Plant operations were coordinated by Mr. Jim Ulrey, Grupo Antolin. The compliance test program was witnessed by Mr. Tom Gasloli of the Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD).

The results of testing, are presented in Table 1. A further breakdown of the summary may be found in Section 3.0. The results indicate that the process control equipment was in compliance with the above stated permit conditions.

Table 1 – NFE Capture Demonstration and Destruction Efficiency Test Summary

TEST	**Paint Booth 1 Entrance ΔP ("H_2O)**	**Cure Oven Exit ΔP ("H_2O)**	**RTO INLET VOC (lb/hr)**	**RTO OUTLET VOC (lb/hr)**	**DESTRUCTION EFFICIENCY (%)**
1	-0.0116	-0.0189	39.97	2.26	94.35%
2	-0.0111	-0.0190	44.03	1.65	96.24%
3	-0.0113	-0.0190	44.36	1.09	97.55%
AVG	-0.0113	-0.0190	42.79	1.67	96.05%
PERMIT	**Negative**	**Negative**			**95%**

1.0 PROCESS AND CONTROLS SYSTEMS DESCRIPTION

The Paint Line (EUPAINT) is a conveyorized automotive plastic parts coating line consisting of a surface prep station, two water wash paint spray booths, an enclosed flash zone, and a cure oven. The system is completely enclosed with the exception of the load / unload section where parts are added and coated parts removed. The regenerative thermal oxidizer (RTO) controls emissions from both paint application booths, the flash zone, and the cure oven.

The paint spray booths are equipped with water wash particulate controls. Air movement within the booth is a top – down flow with air being drawn through a trough of water at the back of the booth. Paint is supplied to each robot from a paint delivery area, located in the clean room area adjoining the paint booth. On the day of testing, the plastic parts were coated with solvent based basecoat in both booths (wet-on-wet application). The paint applicators were conventional air atomizing applicators, as required by the Original Equipment Manufacturer (OEM).

The regenerative thermal oxidizer is Turner Enviro-Logic Regenerative Thermal Oxidizer with a rated airflow rate of 7,500 scfm and a design destruction efficiency of 95%.

In accordance with Special Condition IV.3 of EUPAINT (PTI #52-09B) the oxidizer must maintain a minimum combustion chamber temperature above 1450°F when operating the coating line. Appendix B contains both periodic hand written recordings of the combustion chamber temperature and a table of values downloaded from the RTO's data-logging system for the combustion chamber.

During the day of testing, sampling was conducted in the RTO inlet and the RTO exhaust stack (outlet). In addition, differential pressure readings were recorded in the tunnel leading to the first paint booth entrance and cure oven exit to demonstrate that the paint envelope was under negative pressure to the surrounding area. These observations are located in Appendix B.

During each destruction efficiency emissions test, sampling was conducted simultaneously at the inlet and outlet of the control device, while the controlled equipment was operating under representative operating conditions.

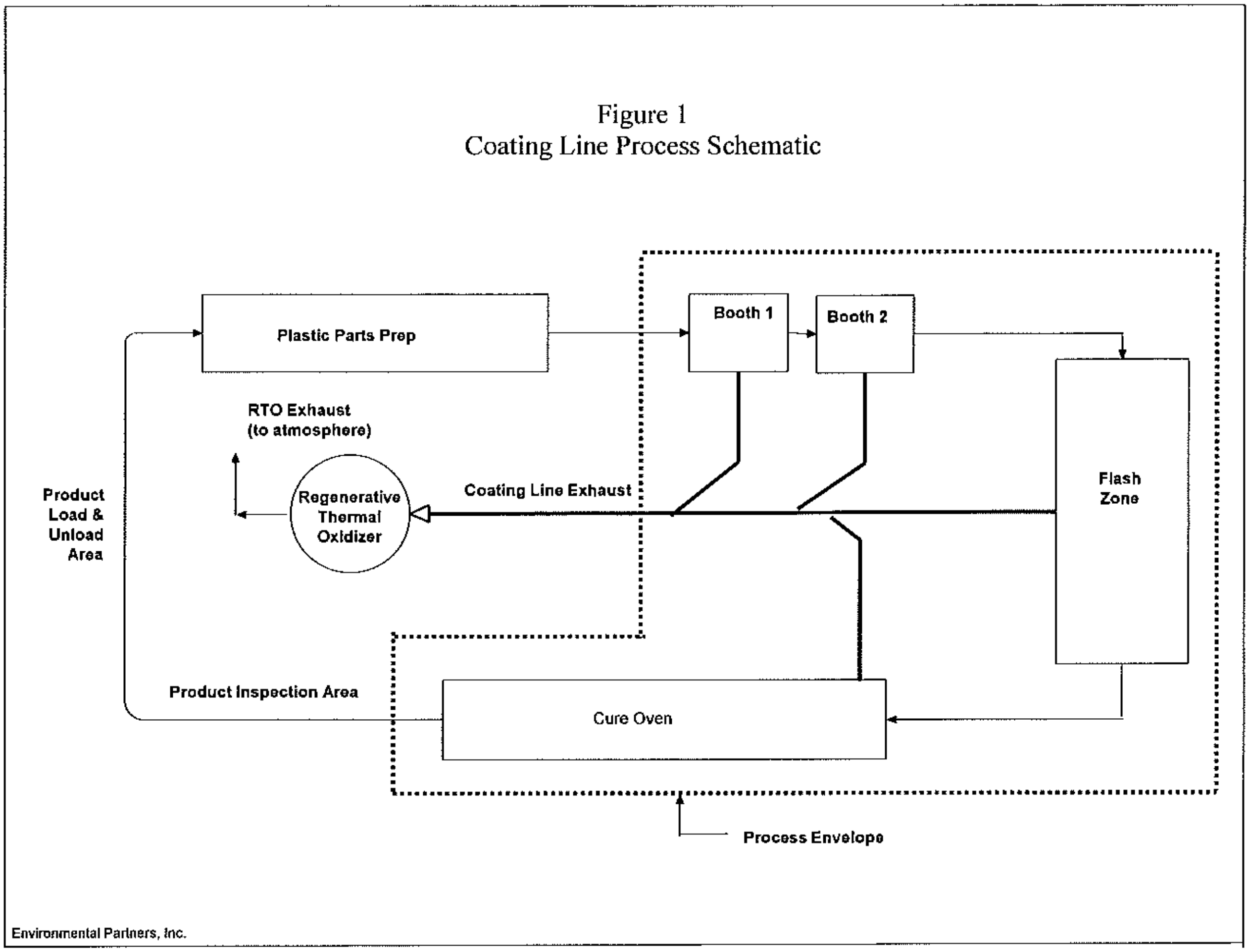

Figure 1
Process and Control Equipment Diagram
Grupo Antolin
Howell, Michigan

2.0 TEST METHODOLOGIES

Three one-hour test runs were performed at the inlet and outlet of the oxidizer unit. For each test run, the concentrations and mass emission rates of VOCs at the inlet and outlet test locations were compared in order to determine the VOC destruction efficiency. All tests were conducted in accordance with USEPA Methods 1-4, and 25A, as described in the *Code of Federal Regulations, Title 40, Part 60, Appendix A*. Descriptions of these methods are as follows:

USEPA Method	Description
1	Sample and Velocity Traverses for Stationary Sources
2	Determination of Stack Gas Velocity and Volumetric Flow Rate
3	Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight
4	Determination of Moisture Content in Stack Gases
25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

2.1 Volumetric Flow Rate Determination – USEPA Methods 1 - 4

The volumetric flow rate of the exhaust was determined following USEPA Methods 1 through 4. Velocity measurement points were selected in accordance with USEPA Method 1. Gas stream velocities were determined using a Type-S pitot tube and inclined manometer in accordance with USEPA Method 2.

Two velocity measurements were made at each test location for each one hour test run, one just before and one just after each test. The completion of the first and second test runs were reasonably temporally coincidental to the start of the subsequent test runs, therefore the ending velocity measurement for the previous test run was utilized as the beginning velocity measurement for the subsequent test run.

Concentrations of carbon dioxide were determined using the instrumental analyzer technique in accordance with USEPA Method 3A. Gas stream moisture contents were determined by passing the exhaust sample gas through a series of four chilled impingers containing pre-measured amounts of absorbing solution, followed by an impinger containing silica gel. Volumetric determinations were made of moisture gain, and equivalent water vapor volumes were determined in accordance with USEPA Method 4.

2.2 *Total Gaseous Organic Concentration Determination – USEPA Method 25A*

The procedures outlined in USEPA Method 25A were followed to determine the total gaseous organic concentration in the exhaust streams at the inlet and outlet of the oxidizer. For each test run, a gas sample was collected continuously for a minimum of 60 minutes from a single representative sampling point. The gas sample stream was passed through a heated filter and stainless steel probe, and drawn to a flame ionization analyzer via a Teflon sample line that was heated to at least 250°F. Both the inlet and outlet concentrations were measured with a JUM Model 3-300A Flame Ionization Analyzer.

The flame ionization analyzer was pre-calibrated in the applicable ranges. Appropriate mid-range and zero calibration gases were introduced, and the analyzer response was checked between each test run, as well as after the final test run. Calibration gases consisted of certified (Protocol 1) concentrations of propane in air. Sixty one-minute averages for each run were totaled and averaged to determine an average organic concentration for each of the three test runs. Organic concentrations are expressed on a parts per million by volume as propane (ppmv C_3H_8) basis.

3.0 PRESENTATION OF PRODUCTION DATA

The MDEQ-AQD stack test approval letter, dated July 5, 2017 requested that the process be operated at a normal process rate. On the day of testing, the paint line was operating at average paint application rate of 5.81 gallons per test (approx. 60 minutes).

Table 2 presents a summary of the paint usage data for each test. Table 3 presents a summary of the combustion chamber temperatures during each test. Table 4 provides a summary of the differential pressure measurements during each test. A copy of the process data for each test run and the RTO combustion chamber data is provided in Appendix B.

Table 2 – Coating Summary Data

Test Run	**Jet Black G56B1068 (liters)**	**Hardener V66VM156 (liters)**	**Paint Usage (gal/test)**
1	16.88	5.56	5.928
2	16.92	5.52	5.928
3	15.90	5.22	5.579
Total (gal)			17.435

Table 3 – RTO Combustion Chamber Temperature Summary

RTO Combustion Zone	**Test 1**	**Test 2**	**Test 3**
Combustion Chamber Min °F	1,527.2	1,528.5	1,523.0
Combustion Chamber Max °F	1,600.7	1,602.7	1,601.2
Combustion Chamber Avg °F	1,575.9	1,577.7	1,576.1

Table 4 – Paint Enclosure Differential Pressure Measurements/Observations

	Test 1	**Test 2**	**Test 3**
Paint Booth Entrance			
Differential Pressure Min – in. H_20	-0.0092	-0.0077	-0.0095
Differential Pressure Max – in H_2O	-0.0125	-0.0126	-0.0131
Differential Pressure Avg – in. H_20	-0.0116	-0.0111	-0.0113
Cure Oven Exit			
Differential Pressure Min – in. H_20	-0.0188	-0.0189	-0.0188
Differential Pressure Max – in. H_20	-0.0190	-0.0192	-0.0191
Differential Pressure Avg – in. H_20	-0.0189	-0.0190	-0.0190

PTI #52-09B, special condition III.4 specifies that the differential pressure across the PTE shall be maintained at a minimum of 0.007 inches of water pressure. Upon start-up of the operation, the company installed differential pressure meters across both Non-Ducted Openings (NDOs) to the paint line enclosure. The placement of the enclosure entrance was located just upstream of the first paint booth entrance. Due to the proximity of a fresh air supply duct, the differential pressure taps were located approximately halfway between the booth opening and the air fresh air supply vent, located 7-1/2 feet upstream in the tunnel.

The intent of the location was to demonstrate that air movement at the enclosure entrance was moving inwards to the booth, capturing all VOCs within the enclosure. The differential pressure readings from this location were well above the permit requirement of 0.007 inches and clearly demonstrated air movement heading inwards to the booth.

Sometime prior to the day of testing the MDEQ-AQD district staff was on site and directed the company to relocate the enclosure inlet differential pressure orifices further up the tunnel, beyond the air supply vent. This revised location, was located 7-1/2 feet beyond the air supply duct, which provides approximately 800 acfm to the tunnel. The introduction of air between the differential pressure orifice and the enclosure entrance reduces the air demand from up the tunnel by 800 cfm and thereby provides a false (artificially low) indication of the true differential pressure as parts enter the enclosure.

While the readings listed during each test run demonstrated continuous negative draw into the enclosure, the readings also show a fairly significant swing in differential pressure when compared to the stable readings at the oven exit. This can be attributed to the air supply duct located between the location of the differential pressure meter and the enclosure entrance.

The air supply duct provides air to the tunnel based on static pressure readings at various locations along the main trunk of the air supply line and therefore will swing in its air supply to the tunnel. With increases and decreases in air supply, demand for the balance of air from up the tunnel will also swing. As a result we believe that the location of the enclosure entrance differential pressure orifice is in error and therefore poorly reflects the actual differential pressure across the enclosure opening.

We would recommend that the MDEQ-AQD re-evaluate this situation and if in agreement re-direct the company to relocate the enclosure entrance differential pressure orifice back to its original location halfway between the booth entrance and the air supply duct within the tunnel.

4.0 PRESENTATION AND DISCUSSION OF TEST RESULTS

The results of the compliance test program are summarized in the following tables:

Table 5
Destruction Efficiency Test Summary

Parameter	**1**	**2**	**3**	**Avg.**[1]
Start Time	08:15	09:35	10:45	
Stop Time	09:15	10:35	11:45	
Inlet Volumetric Flow Rate (dscfm)	5,114	5,338	5,519	5,257
Inlet VOC Concentration (ppmv C_3H_8)	331.5	333.1	321.0	328.5
Inlet VOC Mass Emission Rate (lbs/hr C_3H_8)	11.82	12.41	11.91	12.05
Outlet Volumetric Flow Rate (dscfm)	5,786	5,981	6,258	6,008
Outlet VOC Concentration (ppmv C_3H_8) less methane	2.2	0.8	2.2	1.7
Outlet VOC Mass Emission Rate (lbs/hr C_3H_8)	0.09	0.03	0.10	0.07
VOC Destruction Efficiency (%)	**99.24**	**99.72**	**99.18**	**99.38**

The permit limit for the destruction efficiency is 95%. The average of the three test runs demonstrates that the destruction efficiency on the day of the test was above the permit limit and therefore in compliance with Special Condition IV.3 of EU-PAINT (PTI #52-09B).

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