DESTRUCTION EFFICIENCY TEST REPORT

for

TWO REGENERATIVE THERMAL OXIDIZERS

at

Magna Mirrors Corporation
700 S. Industrial
Newaygo, Michigan

Test Dates: May 4, 2021

Report Date: June 22, 2021

Report Due Date: July 3, 2021

Prepared by:

Environmental Partners, Inc.
305 Hoover Boulevard, Suite 200
Holland, Michigan 49423

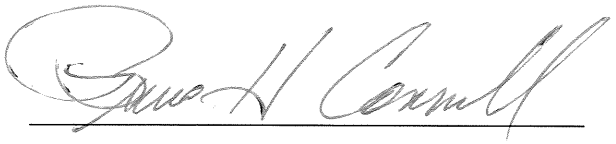
Report Certification:

Air emissions testing was performed under my observation and in conjunction with the production operations on May 4, 2021 at the Magna Mirrors facility in Newaygo, 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.



June 22, 2021

TABLE OF CONTENTS

1.0 INTRODUCTION AND PURPOSE OF THE TEST PROGRAM

A compliance test program was conducted at the Magna Mirrors manufacturing facility located in Newaygo, Michigan on May 4, 2021. The purpose of the test program was to determine the Volatile Organic Compound (VOC) destruction efficiency of two separate air pollution control systems used to control the VOC emissions from the wet coat paint system (EUWETCOAT).

The test program was conducted in accordance with the test plan dated January 22, 2021, and confirmed by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on April 7, 2021. A copy of the test plan and the EGLE confirmation is included in Appendix A.

The process evaluated is regulated by the Michigan issued Renewable Operating Permit No. MI-ROP-N5056-2016. The testing was conducted to satisfy special condition number V.3 of EUWETCOAT and to confirm compliance with special condition number III.2.

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. Brandon Doom, Magna Mirrors. The compliance test program was witnessed by Mr. Matt Karl, EGLE-AQD and Kaitlyn DeVries, EGLE-AQD.

2.0 PROCESS AND CONTROLS SYSTEMS DESCRIPTION

The Magna Mirrors conveyorized coating line consists of a wash line, dry-off oven, three (3) paint spray booths (prime, base, clear), a prime cure oven, and a final cure oven. The system is completely enclosed with the exception of the load / unload section where parts are added and coated parts removed. There are two regenerative thermal oxidizers (RTO) controlling emissions from the paint system (EUWETCOAT). Emissions from the prime booth are controlled by RTO-2 and the emissions from the combined base and clear booths are controlled by RTO-1.

All three paint spray booths are equipped with down draft, water wash particulate controls and each is equipped with six robotic paint applicators. Paint is supplied to each paint booth from a central paint mix (Kitchen) area. The mix kitchen staff measure each coating volume or mass (as mixed) prior to use and after it's use. For colors which are sprayed on multiple products, the final use volume is recorded after spraying the final product, so there are no intermediate measurements.

The prime booth RTO (RTO-2) is an Adwest Technologies Modular Retox® Regenerative Thermal Oxidizer with a rated airflow rate of 55,000 scfm and a design destruction efficiency of 95%. The basecoat and clearcoat booth RTO (RTO-1) is a Salem-Engelhard unit with a rated airflow rate of 12,000 scfm and a design destruction efficiency of 95%.

In accordance with Special Condition III.3 of EUWETCOAT, the oxidizers must maintain a minimum combustion chamber temperature above 1400°F when operating the coating line. Appendix B contains both periodic hand written recordings of the combustion chamber temperature and a continuous data-logger recording of the combustion chamber.

During each test run, smoke tube observations were documented at the entrance and exit of each paint enclosure to demonstrate compliance with special condition III.2 of EUWETCOAT. For the prime booth, the smoke tube observations included the entrance and exit to the booth. For the base coat - clear coat paint enclosure, the observations were conducted at the base coat booth entrance and the clear coat booth exit. The exhaust from both the base and clear paint booths are directed to the same RTO (RTO-1) and there are no exhaust points in the flash tunnel connecting the two booths. These observations were recorded to demonstrate that the coating booth operations are under negative pressure.

During each destruction efficiency emissions test, sampling was conducted simultaneously at the inlet and outlet of the respective control device, while the process was operating under maximum routine operating capacity.

3.0 TEST METHODOLOGIES

Three one-hour test runs were performed at the inlet and outlet of each 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

In addition, observations were made at each of the process enclosure openings to verify the inward flow of air into the enclosure which is indicative of the enclosure being negative relative to the room. Observations were made at each opening, using air current (smoke) tubes, and observed by EGLE-AQD staff. A copy of the observations is included in Appendix B.

3.1 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.

3.2 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.

For the Salem RTO (RTO-1), 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.

For the Adwest RTO (RTO-2), the inlet concentrations were measured with a JUM Model 3-300A Flame Ionization Analyzer, while the outlet was measured with a CAI 700 Series flame ionization analyzer. Both flame ionization analyzers were 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 methane (ppmv CH_4) basis. This was done to allow for the subtraction of methane and ethane from the exhaust stack of the RTO.

VOC emission results for each test are presented on a concentration basis (parts per million by volume as propane, ppmv C_3H_8 for RTO-1 only), and mass emission rate basis (pounds per hour as propane for RTO-1 only). For RTO-2, both inlet and outlet concentration and mass emission rates were based on methane. The VOC destruction efficiency of the oxidizer was calculated by comparing the mass of VOC measured at the oxidizer inlet to the mass of VOC measured in the oxidizer exhaust for each test run, and computing the arithmetic average of the three efficiency values. The destruction efficiency of each oxidizer is shown in Tables 2 and 3.

4.0 PRESENTATION OF PRODUCTION DATA

The EGLE-AQD stack test approval letter, dated April 7, 2021, requested the that the process be operated at maximum routine capacity. The process is set with a fixed conveyor line speed and the paint application rate is based on several factors including the complexity of the part being coated, the required coating thickness and the density of the parts on the rack. The conveyor line speed is 7.5 feet per minute and consisted of a mixture of racks and spindles. The fixed distance between racks is 4 feet on center. At the given line speed, theoretically 112.5 racks will pass in front of a given point during a 60 minute period.

Table 1 presents data on the number of racks observed passing through a booth per each hour of testing. This is only an estimate based on the paint schedule which indicates which product was being sprayed at the start and stop of each test run and how many racks of each particular part were to be loaded onto the line. Spindles require less space on the line and approximately 3.5 spindles equate to the size of one rack. Therefore, the estimated rack pass through is based on an equivalent rack throughput containing parts. Racks used as spacers between programs or to allow for color changes. A listing of the programs painted, paints used, volume of paint sprayed and both mix sheets and batch data sheets for each coating are provided in Appendix B.

Production paint usage data could not be collected to coordinate exactly with the start and stop times of each test run. Since some coatings were sprayed on multiple programs at multiple times during the day of testing, it is difficult to accurately correlate production data (paint usage and parts painted) with each test run.

Table 1 – Estimated Rack Pass-through Rate per 60 Minutes

Test Date	**Test 1**	**Test 2**	**Test 3**
RTO-1 (Salem-Engelhart)	91 (81%)	97.3 (86%)	87.4 (77%)
RTO-2 (Adwest Technologies)	132 (117%)	81 (72%)	97 (86%)

5.0 *PRESENTATION AND DISCUSSION OF TEST RESULTS*

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

Table	Description
2	Salem-Engelhard Oxidizer Destruction Efficiency Test Summary
3	Adwest Technologies Oxidizer Destruction Efficiency Test Summary

Table 2
Salem-Engelhard (RTO-1) Destruction Efficiency Test Summary
(Base – Clear Booth Oxidizer)
Magna Mirrors
Newaygo, Michigan
Test Date: May 4, 2021

Parameter	**1[1]**	**2**	**3[2]**	**Avg.**
Start Time	07:00	08:20	09:35	
Stop Time	08:02	09:20	10:45	
Test Data				
Inlet Volumetric Flow Rate (scfm)	10,050	10,043	9,994	10,029
Inlet VOC Concentration (ppmv C_3H_8)	781.8	670.1	662.5	704.8
Inlet VOC Mass Emission Rate (lbs/hr C_3H_8)	53.84	46.11	45.37	48.44
Outlet Volumetric Flow Rate (scfm)	10,609	10,373	10,311	10,431
Outlet VOC Concentration (ppmv C_3H_8)	14.0	14.9	13.5	14.1
Outlet VOC Mass Emission Rate (lbs/hr C_3H_8)	1.02	1.06	0.95	1.01
VOC Destruction Efficiency (%)	**98.11**	**97.70**	**97.90**	**97.90**
Operating Conditions				
Combustion Zone Temperature °F (avg)	1,540.6	1,540.1	1,529.7	1,536.8
Base Booth Inlet Air Current Direction	Inward	Inward	Inward	
Clear Booth Exit Air Current Direction	Inward	Inward	Inward	

[1]Two minutes was added to test run 1 to accommodate a stoppage of the line for a two minute period, while waiting on paint to be loaded for the parts in the based booth.
[2]Ten minutes was added to test run 3 to accommodate a gap of 7 racks that passed first through the base booth and then the clear booth, where no robots were spraying.

Table 3
Adwest Technologies (RTO-2) Destruction Efficiency Test Summary
(Prime Booth Oxidizer)
Magna Mirrors
Newaygo, Michigan
Test Date: May 4, 2021

Parameter	**1**	**2**	**3**	**Avg.[1]**
Start Time	12:05	13:20	14:35	
Stop Time	13:05	14:20	15:35	
Test Data				
Inlet Volumetric Flow Rate (scfm)	49,443	49,901	49,812	49,719
Inlet VOC Concentration (ppmv CH_4)	311.6	264.9	286.6	287.7
Inlet VOC Mass Emission Rate (lbs/hr CH_4)	105.56	90.57	97.82	97.98
Outlet Volumetric Flow Rate (scfm)	47,429	46,543	46,615	46,862
Outlet VOC Concentration (ppmv CH_4)	10.0	8.8	9.6	9.5
Outlet VOC Mass Emission Rate (lbs/hr CH_4)	3.25	2.81	3.07	3.04
VOC Destruction Efficiency (%)	**96.92**	**96.90**	**96.87**	**96.90**
Operating Conditions				
Combustion Zone Temperature °F (avg)	1,599.2	1,598.3	1,597.3	1,598.3
Prime Booth Inlet Air Current Direction	Inward	Inward	Inward	
Prime Booth Exit Air Current Direction	Inward	Inward	Inward	