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Air Emissions Test Report
Regenerative Catalytic Oxidizer (RCO) Compliance Test

DPI
DECORATIVE PANELS INTERNATIONAL
An American Standard Brands Company

PREPARED FOR:
Decorative Panels International, Inc.
416 Ford Avenue
Alpena, Michigan 49707

State Registration No. B1476

Apex Project No. 23008345

October 4, 2023

Apex Companies, LLC
46555 Humboldt Drive, Suite 103
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APEX

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Executive Summary

Decorative Panels International, Inc. (DPI) retained Apex Companies, LLC (Apex) to test air emissions from the Regenerative Catalytic Oxidizer (RCO) at the DPI facility in Alpena, Michigan. The RCO controls emissions from the Predryer and Bake Oven for the No. 3 press line.

The source is regulated by (1) Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) No. MI-ROP-B1476-2015a, effective April 6, 2016, and (2) National Emission Standards for Hazardous Air Pollutants: Plywood and Composite Wood Products, 40 CFR 63, Subpart DDDD.

Compliance with the FGMACTDDDD total hazardous air pollutant (HAP) permit limits based on the use of an add-on control device can be demonstrated by one of the following:

1. 90% reduction of total HAP mass emission rate, measured as total hydrocarbons
2. Total HAP concentration less than 20 ppmvd, measured as total hydrocarbons
3. Total HAP reduction so that methanol mass emission rate is reduced by 90%
4. Total HAP reduction such that methanol concentration is less than 1 ppmvd, if the uncontrolled methanol concentration entering the control device is greater than 10 ppmvd
5. Total HAP reduction so that formaldehyde mass emission rate is reduced by 90%
6. Total HAP reduction such that formaldehyde concentration is less than 1 ppmvd, if the uncontrolled formaldehyde concentration entering the control device is greater than 10 ppmvd

Apex measured formaldehyde, methanol, and nonmethane total hydrocarbons (NMTHC) at the inlet and outlet of the RCO control device. The testing followed United States Environmental Protection Agency Reference Methods 1 through 3, 18, 25A, 205, and 320.

Detailed results are presented in Table 1 after the Tables Tab of this report. The following table summarizes the results of testing conducted on August 8, 2023.

Summary of RCO Emissions Results

Parameter	Unit	Average Result	Permit Limit
Formaldehyde inlet emission rate	lb/hr	1.0	--
Formaldehyde outlet concentration	ppmv, dry	8.1	1†
Formaldehyde outlet emission rate	lb/hr	1.1	--
Formaldehyde removal efficiency	%	-10	≥90†
Methanol inlet emission rate	lb/hr	1.0	--
Methanol outlet concentration	ppmv, dry	2.3	1†
Methanol outlet emission rate	lb/hr	0.34	--
Methanol removal efficiency	%	66	≥90†
NMTHC inlet emission rate	lb/hr	5.1	--
NMTHC outlet concentration	ppmv, dry	24.2	20†
NMTHC outlet emission rate	lb/hr	1.3	--
NMTHC removal efficiency	%	74	≥90†

ppmv, dry: part per million by volume, dry basis
lb/hr: pound per hour
NMTHC: nonmethane total hydrocarbon
† Only one of the permit limits need to be met in order to demonstrate compliance.

The RCO did not meet any of the six options to meet compliance with the FGMACTDDDD.

1.0 Introduction

1.1 Summary of Test Program

Decorative Panels International, Inc. (DPI) retained Apex Companies, LLC (Apex) to test air emissions from the Regenerative Catalytic Oxidizer (RCO) at the DPI facility in Alpena, Michigan. The RCO controls emissions from the Predryer and Bake Oven for the No. 3 press line.

The purpose of the air emission testing was to evaluate compliance with certain emission limits in (1) Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B1476-2015a, effective April 6, 2016, and (2) National Emission Standards for Hazardous Air Pollutants (NESHAP): Plywood and Composite Wood Products, 40 CFR 63, Subpart DDDD.

Apex measured formaldehyde, methanol, and nonmethane total hydrocarbons (NMTHC) at the inlet and outlet of the RCO control device. The testing followed United States Environmental Protection Agency (USEPA) Reference Methods 1 through 3, 18, 25A, 205, and 320.

Table 1-1 lists the emission sources tested, parameters, and test date.

Table 1-1
Sources Tested, Parameters, and Test Date

Source	Test Parameter	Test Date
RCO Inlet and Outlet	Formaldehyde Methanol NMTHC	August 8, 2023

1.2 Key Personnel

The key personnel involved in this test program are listed in Table 1-2. Mr. David Kawasaki, Senior Engineer with Apex, led the emission testing program. Mr. Timothy Rombach, Senior Environmental Engineer with DPI, provided process coordination and recorded operating parameters. Ms. Rebecca Radulski, with EGLE, witnessed the testing and verified production parameters were recorded.

Table 1-2
Key Contact Information

Client	Apex
Timothy D. Rombach, P.E. Senior Environmental Engineer **Decorative Panels International, Inc.** 416 Ford Avenue Alpena, Michigan 49707 Phone: 989.356.8568 timothy.rombach@decpanels.com	Dr. Derek Wong, Ph.D., P.E. National Account Manager **Apex Companies, LLC** 46555 Humboldt Drive, Suite 103 Novi, Michigan 48377 Phone: 248.875.7581 derek.wong@apexcos.com
EGLE	
Jeremy Howe Technical Programs Unit Supervisor **EGLE Air Quality Division** **Technical Programs Unit** Constitution Hall, 2nd Floor South 525 West Allegan Street Lansing, Michigan 48933 Phone: 231.878.6687 howej1@michigan.gov	Shane Nixon District Supervisor **EGLE Air Quality Division** **Gaylord Field Office** 2100 West M-32 Gaylord, Michigan 49735 Phone: 231.492.5954 nixons@michigan.gov

2.0 **Source and Sampling Locations**

2.1 Process Description

Decorative Panels International, Inc. produces a variety of hardboard products including wall paneling, pegboard, and marker board. Hardwood chips, such as aspen, ash, maple, and beech chips, are purchased and stored in an outdoor raw material storage area and reclaimed into silos. The wood chips are cooked and softened in one of four digesters using steam injection and ground into wood pulp fibers.

The pulp fibers are conveyed to a forming machine, which forms a mat of un-pressed hardboard. The mats are processed through a Coe® dryer and cut using a trimmer and panel brush. The mats are conveyed to one of two hardboard lines, Line 1 or 3. Line 2 was historically operated but has since been decommissioned.

On the hardboard lines, the mats enter a predryer, a press, cooler, and tempering area. The predryer ensures the mat has the desired moisture content before the mat enters presses that heat and form hardboard. The hardboard is coated with linseed or Oxi-Cure® oil in the tempering area. The oil tempers the board thereby increasing its strength and "paintability." Once the board has been tempered, it is superheated to cure the binding resins in the bake ovens (No. 3 Press Line only). The hardboard is humidified to approximate atmospheric conditions to limit warping. The boards are inspected, graded, cut, and packed for shipping.

Operating parameters were measured and recorded by DPI personnel during testing. The board thickness produced during testing was three-sixteenths inch. In each press cycle, 20 boards with dimensions of 4 feet by 8 feet are produced. Table 2-1 summarizes the operating conditions during compliance testing of the RCO source. Additional operating parameter data are included in Appendix G.

Table 2-1
Summary of Production Data

Test Run	Number of Presses	Production Rate (ft^2/hr)
1	17	10,880
2	16	10,240
3	18	11,520
Average	**17**	**10,880**

2.2 Control Equipment Description

The RCO controls emissions from the EU3PREDRYER and EU3BAKEOVEN units. Emissions entering the RCO pass through a pre-filter that removes particulate matter. The flue gas is directed through an inlet damper to one of two chambers, heated by a burner, and directed through a catalyst bed. The burner increases the temperature of the flue gas to sustain the catalytic reaction. The catalyst is comprised of layers of treated ceramic saddles and rings, where pollutants are oxidized to carbon dioxide and water.

After passing through the catalyst in one chamber, the flue gas is directed through the second chamber, flowing in the opposite direction. This opposing flow allows transfer of heat to the catalyst bed in the second chamber. After exiting the second chamber, the flue gas is discharged through the RCO exhaust stack, SV#3LNRCO-STK93. In a repeated process, after a set cycle time (i.e., 90 seconds), chamber valves open and close, and direct the flue gas through the second chamber catalyst first, before directing it through the first chamber, and through the exhaust stack.

Table 2-2 summarizes the operating conditions during testing of the RCO. Detailed operating parameter data are included in Appendix G.

Table 2-2
Summary of RCO Operating Data

Test Run	RCO Temperature (°F)	RCO Prefilter Pressure (inch H_2O)
1	820	1.46
2	818	1.49
3	821	1.47
Average	**820**	**1.47**

2.3 Flue Gas Sampling Locations

2.3.1 RCO Inlet Sampling Location

One sampling port is located in a straight section of a 41.5 inch-internal-diameter duct. The sampling port is located:

- Approximately 15.5 inches (0.4 duct diameters) from the nearest downstream disturbance.
- Approximately 39 inches (0.9 duct diameters) from the nearest upstream disturbance.

The sampling port is accessible via platform. This sampling port was used only for gaseous concentration measurements. Volumetric gaseous flowrate was not measured at this location. A photograph of the RCO inlet sampling location is presented in Figure 2-1.

2.3.2 RCO Outlet Sampling Location

Two sampling ports oriented at 90° to one another are located in a straight section of a 47.5 inch-internal-diameter duct. The sampling ports are located:

- Approximately 25 feet (6.3 duct diameters) from the nearest downstream disturbance.
- Approximately 15 feet (3.8 duct diameters) from the nearest upstream disturbance.

The sampling ports are accessible via ladder and platform. A photograph of the RCO outlet sampling location is presented in Figure 2-1. Figure 1 in the Appendix depicts the RCO outlet sampling ports and traverse point locations.

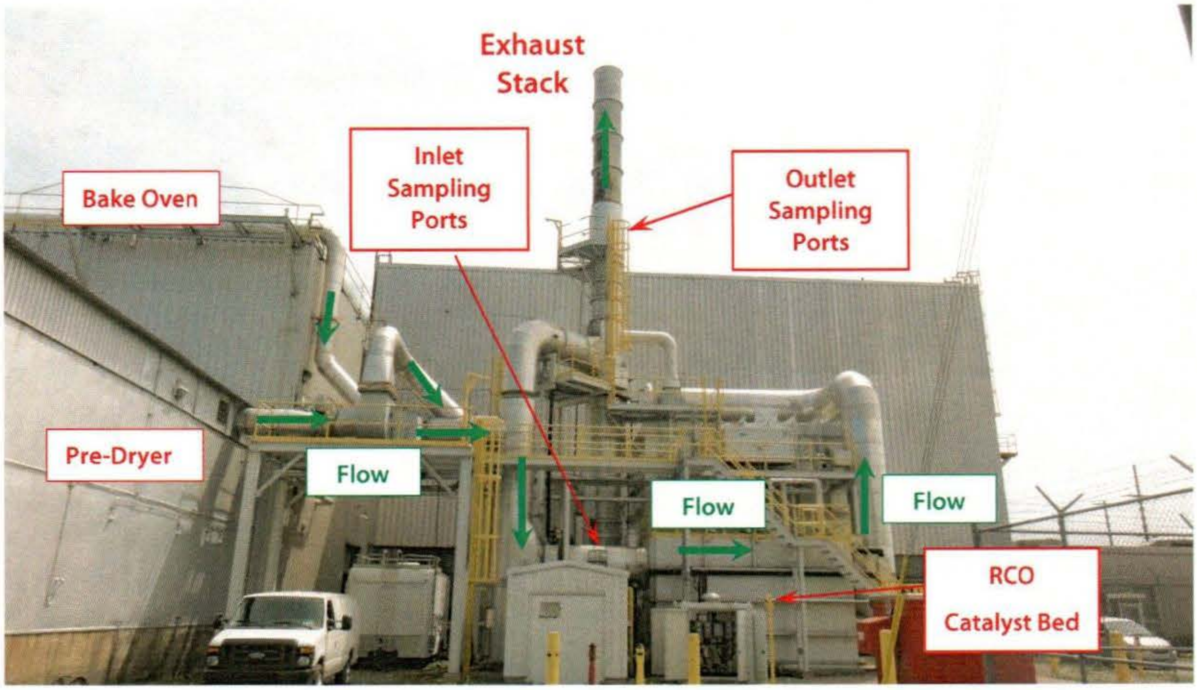


Figure 2-1. RCO Inlet and Outlet Sampling Locations

2.4 Process Sampling Locations

Process sampling was not required during this test program. A process sample is a sample that is analyzed for operational parameters, such as calorific value of a fuel (e.g., natural gas, coal), organic compound content (e.g., paint coatings), or composition (e.g., polymers).

3.0 **Summary and Discussion of Results**

3.1 Objectives and Test Matrix

The objective of the air emission testing was to evaluate compliance of the RCO with certain emission limits and requirements in (1) EGLE ROP MI-ROP-B1476-2015a, effective April 6, 2016, and (2) NESHAP: Plywood and Composite Wood Products, 40 CFR 63, Subpart DDDD.

Compliance with the FGMACTDDDD total HAP permit limits based on the use of an add-on control device can be demonstrated by one of the following:

1. 90% reduction of total HAP mass emission rate, measured as total hydrocarbons
2. Total HAP concentration less than 20 ppmvd, measured as total hydrocarbons
3. Total HAP reduction so that methanol mass emission rate is reduced by 90%
4. Total HAP reduction such that methanol concentration is less than 1 ppmvd, if the uncontrolled methanol concentration entering the control device is greater than 10 ppmvd
5. Total HAP reduction so that formaldehyde mass emission rate is reduced by 90%
6. Total HAP reduction such that formaldehyde concentration is less than 1 ppmvd, if the uncontrolled formaldehyde concentration entering the control device is greater than 10 ppmvd

Apex measured formaldehyde, methanol, and NMTHC at the inlet and outlet of the RCO control device. Table 3-1 summarizes the sampling and analytical matrix.

Table 3-1
Sampling and Analytical Matrix

Source	Sample/Type of Pollutant	Sampling Method	Date (2023)	Run	Start Time	End Time	Analytical Laboratory
RCO Inlet and Outlet	Flowrate, molecular weight, methane, total hydrocarbons, formaldehyde, methanol, moisture	USEPA 1, 2, 3, 18, 25A, 205, and 320	Aug. 8	1	1021	1121	Enthalpy Analytical
				2	1143	1243	
				3	1305	1405	

3.2 Field Test Changes and Issues

Communication between DPI, Apex, and EGLE allowed the testing to be completed, as proposed in the June 9, 2023 Intent-to-Test Plan, without any field test changes or issues.

3.3 Summary of Results

The results of testing are presented in Table 3-2. Detailed results are presented in Table 1 after the Tables Tab of this report. Graphs are presented after the Graphs Tab of this report. Sample calculations are presented in Appendix B.

Table 3-2
RCO Emissions Results

Parameter	Unit	Run 1	Run 2	Run 3	Average Result	Permit Limit
Formaldehyde inlet emission rate	lb/hr	1.0	1.0	1.0	1.0	--
Formaldehyde outlet concentration	ppmv, dry	**7.8**	**7.9**	**8.7**	**8.1**	**1†**
Formaldehyde outlet emission rate	lb/hr	1.1	1.1	1.2	1.1	--
Formaldehyde removal efficiency	%	**-8**	**-10**	**-13**	**-10**	**≥90†**
Methanol inlet emission rate	lb/hr	0.94	1.0	1.1	1.0	--
Methanol outlet concentration	ppmv, dry	**2.1**	**2.2**	**2.5**	**2.3**	**1†**
Methanol outlet emission rate	lb/hr	0.32	0.33	0.36	0.34	--
Methanol removal efficiency	%	**66**	**67**	**66**	**66**	**≥90†**
NMTHC inlet emission rate	lb/hr	5.4	4.6	5.2	5.1	--
NMTHC outlet concentration	ppmv, dry	**25.1**	**23.7**	**23.9**	**24.2**	**20†**
NMTHC outlet emission rate	lb/hr	1.4	1.3	1.3	1.3	--
NMTHC removal efficiency	%	**74**	**71**	**76**	**74**	**≥90†**

ppmv, dry: part per million by volume, dry basis
lb/hr: pound per hour
NMTHC: nonmethane total hydrocarbon
† Only one of the permit limits need to be met in order to demonstrate compliance.

The RCO did not meet any of the six options to meet compliance with the FGMACTDDDD.

4.0 Sampling and Analytical Procedures

Apex measured emissions in accordance with USEPA sampling methods. Table 4-1 presents the emissions test parameters and sampling methods.

Table 4-1
Emission Testing Methods

Parameter	RCO Inlet	RCO Outlet	USEPA Reference	
			Method	Title
Sampling ports and traverse points	†	•	1	Sample and Velocity Traverses for Stationary Sources
Velocity and flowrate	†	•	2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Molecular weight	†	•	3	Gas Analysis for the Determination of Dry Molecular Weight
Methane	•	•	18	Measurement of Gaseous Organic Compound Emissions by Gas Chromatography
Total hydrocarbons	•	•	25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
Gas dilution	•	•	205	Verification of Gas Dilution Systems for Field Instrument Calibrations
Formaldehyde, methanol, and moisture content	•	•	320	Measurements of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared

† Flowrates were not measured at the RCO inlet as it does not meet the minimum requirements of USEPA Method 1. RCO Inlet flowrates were assumed to be equal to the RCO outlet. The RCO is a closed system with no additional gas streams between the inlet and outlet.

4.1 Emission Test Methods

4.1.1 Volumetric Flowrate (USEPA Methods 1 and 2)

USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," was used to evaluate the sampling locations and the number of traverse points for sampling and the measurement of velocity profiles. Figures 1 and 2 in the Appendix depict the source locations and traverse points.

USEPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," was used to measure flue gas velocity and calculate volumetric flowrates. S-type Pitot tubes and thermocouple assemblies, calibrated in accordance with Method 2, Section 10.0, were used during testing. Because the dimensions of the Pitot tubes met the requirements outlined in Method 2, Section 10.1, and are within the specified limits, the baseline Pitot tube coefficient of 0.84 (dimensionless) was assigned. The digital manometer and thermometer are calibrated using calibration standards that are traceable to National Institute of Standards and Technology (NIST). Pitot tube inspection sheets are included in Appendix A.

Cyclonic Flow Check. During previous testing, Apex evaluated whether cyclonic flow was present at the sampling locations. Cyclonic flow is defined as a flow condition with an average null angle greater than 20°. The direction of flow can be determined by aligning the Pitot tube to obtain zero (null) velocity head reading—the direction would be parallel to the Pitot tube face openings or perpendicular to the null position. By measuring the angle of the Pitot tube face openings in relation to the stack walls when a null angle is obtained, the direction of flow is measured. If the absolute average of the flow direction angles is greater than 20°, the flue gas is considered to be cyclonic at that sampling location and an alternative location should be selected.

The average of the measured traverse point flue gas velocity null angles were less than 20° at the sampling locations. The measurements indicate the absence of cyclonic flow.

Field data sheets are included in Appendix C. Computer-generated field data sheets are included in Appendix D.

4.1.2 Molecular Weight (USEPA Method 3)

USEPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight," was used to determine the molecular weight of the flue gas. Flue gas was extracted from the stack through a probe positioned near the centroid of the duct and directed into a Fyrite® gas analyzer. The concentrations of carbon dioxide (CO_2) and oxygen (O_2) were measured by chemical absorption to within ±0.5%. The average CO_2 and O_2 results of the grab samples were used to calculate molecular weight.

4.1.3 Methane (USEPA Method 18)

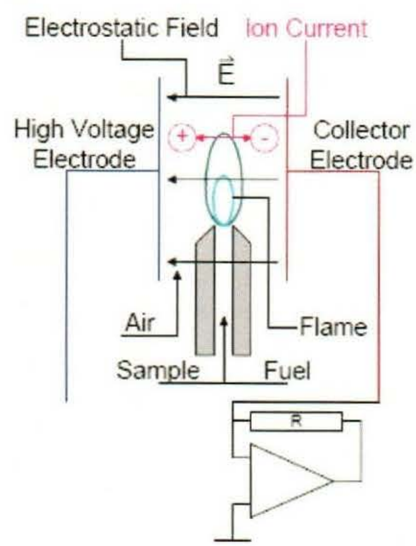
USEPA Method 18, "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography," was used to measure methane concentrations. These concentrations were subtracted from the USEPA Method 25A THC results to provide non-methane THC concentrations.

Flue gas was collected into Tedlar bags for each test run. The samples were transported to Enthalpy Analytical in Durham, North Carolina for analysis using gas chromatography with flame ionization detector. Laboratory results are provided in Appendix F.

4.1.4 Total Hydrocarbons (USEPA Method 25A)

USEPA Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer," was used to measure THC concentrations in the flue gas. Samples were collected through a stainless-steel probe and heated sample line into an analyzer.

A flame ionization detector (FID) determined the average hydrocarbon concentration in part per million by volume (ppmv) of THC as the calibration gas (i.e., propane). The FID is fueled by 100% hydrogen, which generates a flame with a negligible number of ions. Flue gas is introduced into the FID and enters the flame chamber. The combustion of flue gas generates electrically charged ions. The analyzer applies a polarizing voltage between two electrodes around the flame, producing an electrostatic field. Negatively charged ions, anions, migrate to a collector electrode, while positive charged ions, cations, migrate to a high-voltage electrode. The current between the electrodes is directly proportional to the hydrocarbon concentration in the sample. The flame chamber is depicted at right.



Using the voltage analog signal, measured by the FID, the concentration of THCs is recorded by a data acquisition system (DAS). The average concentration of THCs is reported as the calibration gas (i.e., propane) in equivalent units.

Before testing, the analyzer was calibrated by introducing a zero-calibration range gas (<1% of span value) and high-calibration range gas (80-90% span value) to the tip of the sampling probe. Next, a low-calibration range gas (25-35% of span value) and mid-calibration range gas (45-55% of span value) were introduced. The analyzers are considered to be calibrated if the analyzer response is ±5% of the calibration gas value.

At the conclusion of a test run, a calibration drift test was performed by introducing the zero- and low-calibration gas to the tip of the sampling probe. The test run data is considered valid if the calibration drift test demonstrates the analyzers are responding within 3% of the calibration span from pre-test to post-test calibrations.

Figure 4-1 depicts the USEPA Method 25A sampling train.

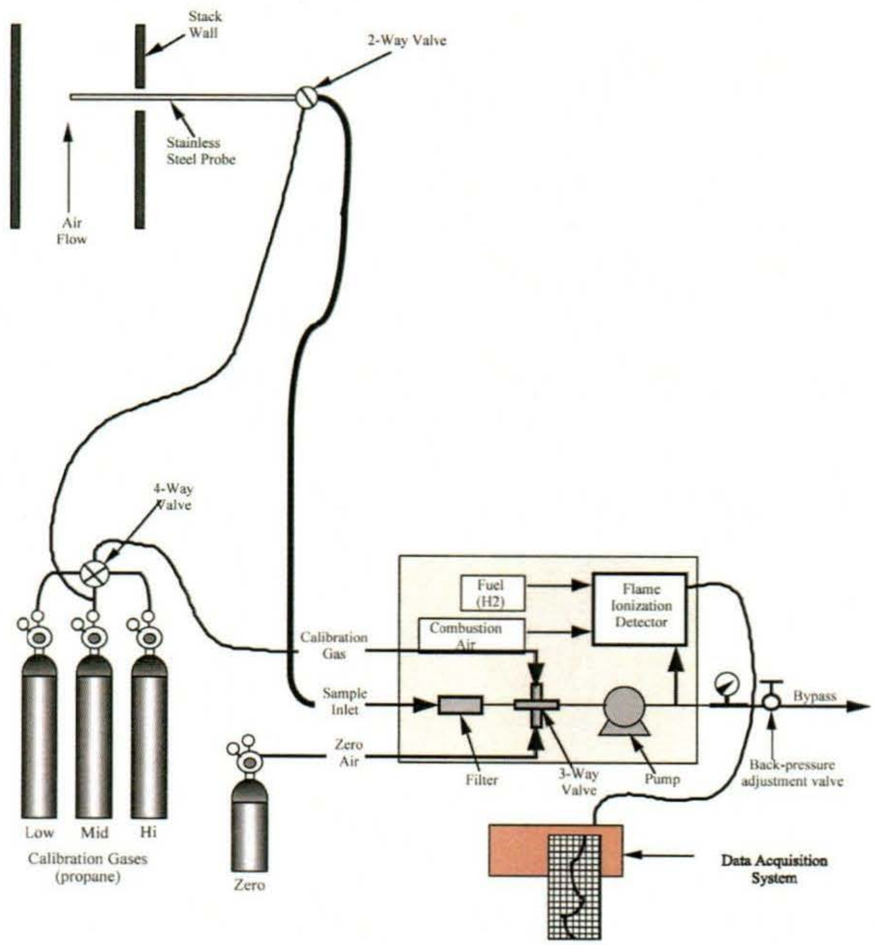


Figure 4-1. USEPA Method 25A Sampling Train

4.1.5 Gas Dilution (USEPA Method 205)

USEPA Method 205, "Verification of Gas Dilution Systems for Field Instrument Calibrations," was used to introduce known values of calibration gases into the analyzers. The gas dilution system consists of calibrated orifices or mass flow controllers and dilutes a high-level calibration gas to within ±2% of predicted values. The gas divider is capable of diluting gases at set increments and was evaluated for accuracy in the field in accordance with USEPA Method 205.

Prior to testing, the gas divider dilutions were measured to evaluate that they were within ±2% of predicted values. Two sets of three dilutions of the high-level calibration gas were performed. In addition, a certified mid-level calibration gas was introduced into an analyzer; this calibration gas concentration was within ± 10% of a gas divider dilution concentration.

4.1.6 Formaldehyde, Methanol, and Moisture Content (USEPA Method 320)

USEPA Method 320, "Measurements of Vapor Phase Organic and Inorganic Emissions by Extractive Fourier Transform Infrared (FTIR) Spectroscopy," was used to measure formaldehyde, methanol, and moisture content in the flue gas. Gaseous samples were withdrawn from the stack and transferred to an MKS Instruments MultiGas 2030 FTIR spectrometer.

The sample gas was directed through a heated probe, heated filter and heated transfer line connected to the FTIR. The probe, filter, transfer line, and FTIR were maintained at 191°C (375°F) during testing. The formaldehyde, methanol, and moisture concentrations were measured based on their infrared absorbance compared to reference spectra. The FTIR analyzer scanned the sample gas approximately once per second. A data point was generated every half minute as the co-addition of 32 scans.

FTIR quality assurance procedures followed USEPA Method 320. A calibration transfer standard (CTS) was analyzed before and after testing. Formaldehyde matrix spiking was performed before and after testing. The analyte spikes were set to a target dilution ratio of 1:10 or less. Valid tests required spike recoveries to be within the Method 320 allowance of 100±30%.

The FTIR data is included in Appendix E. Figure 4-2 depicts the USEPA Method 320 sampling train.

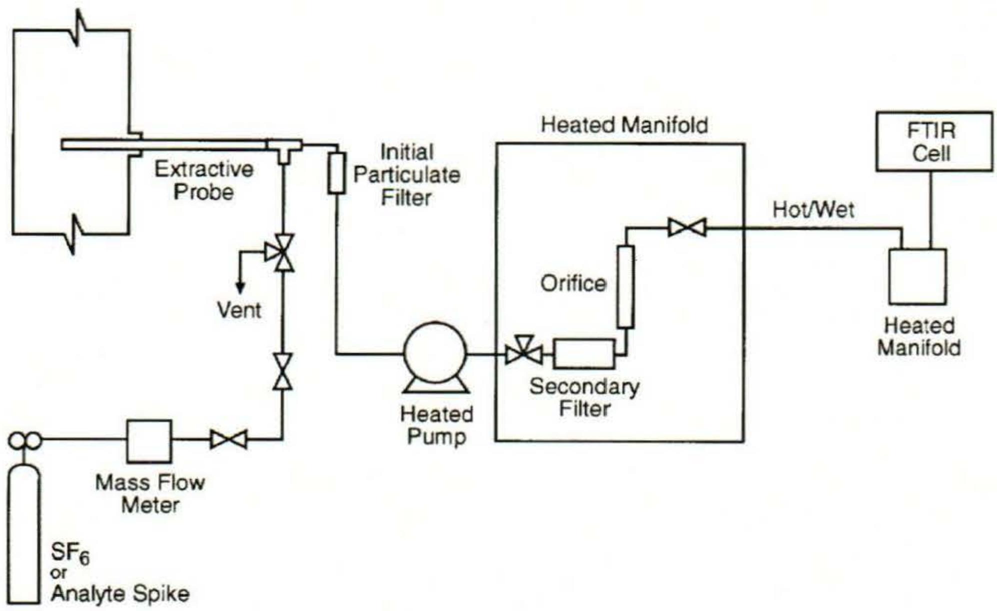


Figure 4-2. USEPA Method 320 Sampling Train

4.2 Process Data

DPI recorded process data during testing. EGLE personnel verified the requested operating and process data were recorded. Process data are included in Appendix G.

5.0 **Quality Assurance and Quality Control**

5.1 QA/QC Procedures

Equipment used in this emissions test program passed quality assurance (QA) and quality control (QC) procedures. Refer to Appendix A for equipment calibrations. Before testing, the sampling equipment was cleaned, inspected, and calibrated according to procedures outlined in the applicable USEPA sampling method and USEPA's "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III, Stationary Source-Specific Methods."

5.2 QA/QC Audits

Onsite QA/QC procedures (i.e., Pitot tube inspections, calibrations) were performed in accordance with the respective USEPA sampling methods. Equipment inspection and calibration measurements are presented in Appendix A.

5.2.1 Instrument Analyzer QA/QC

The instrument analyzer sampling trains described in Section 4.1 were audited for measurement accuracy and data reliability. The analyzers passed the applicable calibration criteria. Table 5-1 summarizes the gas cylinders used during this test program. Analyzer calibration, bias, and drift data are included in Appendix A. Gas cylinder certifications are included in Appendices A and E.

Table 5-1
Calibration Gas Cylinder Information

Parameter	Gas Vendor	Cylinder Serial Number	Cylinder Value	Expiration Date
Nitrogen	Airgas	CC354795	99.9995%	02/04/2029
Ethylene	Airgas	ALM 038716	99.99 ppm	11/10/2023
Formaldehyde Sulfur hexafluoride	Airgas	CC752702	23.77 ppm 5.256 ppm	10/26/2023
Air	Airgas	AAL-13128	--	12/06/2029
Propane	Airgas	ALM008620	85.42 ppm	05/09/2026
Propane	Airgas	CC210802	1,094 ppm	10/03/2027

5.3 Data Reduction and Validation

The emissions testing Project Manager and/or the QA/QC Officer validated computer spreadsheets. The computer spreadsheets were used to ensure that field calculations were accurate. Random inspection of the field data sheets were conducted to verify data have been recorded appropriately. At the completion of a test, the raw field data were entered into computer spreadsheets to provide applicable onsite emissions calculations. The computer data were checked against the raw field sheets for accuracy during review of the report.

5.4 QA/QC Problems

Equipment audits and QA/QC procedures demonstrate sample collection accuracy and compliance for the test runs.

6.0 **Limitations**

The information and opinions rendered in this report are exclusively for use by Decorative Panels International, Inc. Apex Companies, LLC will not distribute or publish this report without consent of Decorative Panels International, Inc. except as required by law or court order. The information and opinions are given in response to a limited assignment and should be implemented only in light of that assignment. Apex Companies, LLC accepts responsibility for the competent performance of its duties in executing the assignment and preparing reports in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages

Submitted by:

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Table

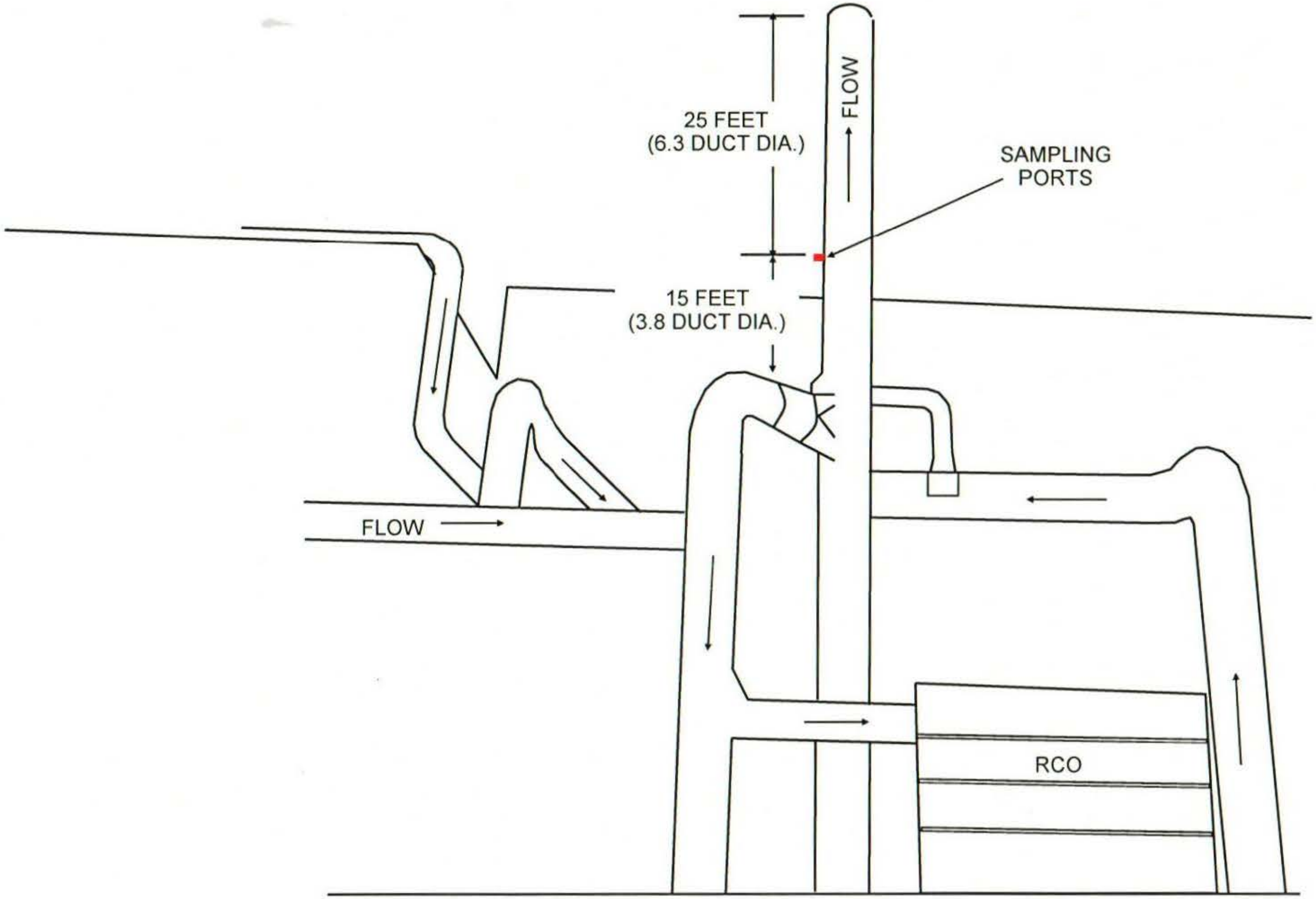
Table 1
RCO Emissions Results
Decorative Panels International, Inc.
Alpena, Michigan
Apex Project No. 23008345
Sampling Date: August 8, 2023

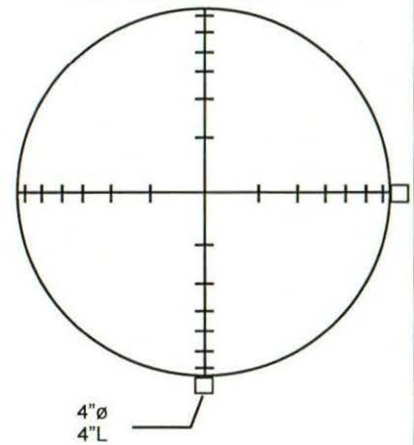
Parameter		Units	Run 1	Run 2	Run 3	Average
Sample Time			1021-1121	1143-1243	1305-1405	
Inlet	Gas Stream Volumetric Flowrate	scfm	30,884	30,826	29,477	30,396
Inlet	Gas Stream Percent Moisture Content	%	2.9	2.9	2.9	2.90
Inlet	Formaldehyde Concentration	ppmv	7.0	7.0	7.5	7.17
Inlet	Formaldehyde Concentration	ppmvd	7.2	7.2	7.7	7.4
Inlet	Formaldehyde Mass Emission Rate	lb/hr	1.0	1.0	1.0	1.0
Inlet	Methanol Concentration	ppmv	6.1	6.5	7.3	6.60
Inlet	Methanol Concentration	ppmvd	6.3	6.7	7.5	6.8
Inlet	Methanol Mass Emission Rate	lb/hr	0.94	1.0	1.1	1.0
Inlet	THC Concentration	ppmv, as propane	100.0	91.7	96.7	96.2
Inlet	THC Concentration	ppmv, as carbon	240.0	220.2	232.1	230.8
Inlet	Methane Concentration	ppmv, as carbon	147	140	137	141
Inlet	NMTHC Concentration	ppmv, as carbon	93.0	80.2	95.1	89.4
Inlet	NMTHC Mass Emission Rate	lb/hr, as carbon	5.4	4.6	5.2	5.1
Outlet	Gas Stream Volumetric Flowrate	scfm	30,884	30,826	29,477	30,396
Outlet	Gas Stream Percent Moisture Content	%	2.8	2.9	2.9	2.8
Outlet	Formaldehyde Concentration	ppmv	7.5	7.7	8.5	7.9
Outlet	**Formaldehyde Concentration**	**ppmvd**	**7.8**	**7.9**	**8.7**	**8.1**
Outlet	Formaldehyde Mass Emission Rate	lb/hr	1.1	1.1	1.2	1.1
Outlet	Methanol Concentration	ppmv	2.1	2.1	2.5	2.2
Outlet	**Methanol Concentration**	**ppmvd**	**2.1**	**2.2**	**2.5**	**2.3**
Outlet	Methanol Mass Emission Rate	lb/hr	0.32	0.33	0.36	0.34
Outlet	THC Concentration	ppmv, as propane	63.9	60.0	58.8	60.9
Outlet	THC Concentration	ppmv, as carbon	153.4	144.0	141.2	146.2
Outlet	Methane Concentration	ppmv, as carbon	129	121	118	123
Outlet	NMTHC Concentration	ppmv, as carbon	24.4	23.0	23.2	23.5
Outlet	**NMTHC Concentration**	**ppmvd, as carbon**	**25.1**	**23.7**	**23.9**	**24.2**
Outlet	NMTHC Mass Emission Rate	lb/hr, as carbon	1.4	1.3	1.3	1.3
Formaldehyde Destruction Efficiency Results		**%**	**-8**	**-10**	**-13**	**-10**
Methanol Destruction Efficiency Results		**%**	**66**	**67**	**66**	**66**
THC Destruction Efficiency Results		**%**	**74**	**71**	**76**	**74**

lb/hr pound per hour
scfm standard cubic feet per minute
ppmv part per million by volume
ppmvd part per million by volume dry basis

Figure

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	1.5
2	5.0
3	9.2
4	15.3
5	32.2
6	38.3
7	42.5
8	46.0





DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/ DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
15 FEET (3.8 DIAMETERS)	25 FEET (6.3 DIAMETERS)

SCALE	NOT TO SCALE
DATE	August 18, 2023
PRJ NO.	23008345

RCO OUTLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

APEX

FIGURE

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