APEX COMPANIES, LLC

Air Emissions Testing
of
EUBOILER#1 and EUBOILER#2

PREPARED FOR:
Decorative Panels International
416 Ford Street
Alpena, Michigan 49707

State Registration No. B1476

Project No. 11019-000034.01
May 4, 2020

Apex Companies, LLC
46555 Humboldt Drive, Suite 103
Novi, Michigan 48377

May 4, 2020

Scott Ickes
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Decorative Panels International, Inc.
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Apex Project No. 11019-000034.01

Subject: **Air Emissions Test Report**
EUBOILER#1 and EUBOILER#2
Decorative Panels International
SRN B1476
416 Ford Avenue
Alpena, Michigan
Renewable Operating Permit MI-ROP-B1476-2015a

Dear Mr. Ickes:

Apex Companies, LLC submits this report for compliance air emissions testing at the Decorative Panels International facility in Alpena, Michigan. The compliance testing was conducted on March 17, 2020.

If you have any questions, please contact us.

Sincerely,

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Executive Summary

Decorative Panels International retained Apex Companies, LLC to conduct air emissions testing at the Decorative Panels International facility in Alpena, Michigan. The purpose of the air emission testing was to evaluate compliance with certain emission limits in Michigan Department of Environment, Great Lakes, and Energy Renewable Operating Permit MI-ROP-B1476-2015a, effective April 6, 2016. The emission units tested were:

- EUBOILER#1
- EUBOILER#2

The testing followed United States Environmental Protection Agency Reference Methods 1, 3A, 7E, 19, and 205.

Detailed results are presented in Tables 1 and 2 after the Tables Tab of this report. The following table summarizes the results of the testing conducted on March 17, 2020.

Nitrogen Oxide Emissions Results

Source	Unit	Average Result	Permit Limit
EUBOILER#1	lb/MMBtu	0.078	0.10
	lb/hour	7.8	11.53
EUBOILER#2	lb/MMBtu	0.066	0.10
	lb/hour	7.3	11.53

lb/MMBtu: pound per million British thermal units
lb/hr: pound per hour

1.0 Introduction

1.1 Summary of Test Program

Decorative Panels International retained Apex Companies, LLC to conduct air emissions testing at the DPI facility in Alpena, Michigan. The purpose of the air emission testing was to evaluate compliance with certain emission limits in Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit (ROP) MI-ROP-B1476-2015a, effective April 6, 2016.

The testing followed United States Environmental Protection Agency (USEPA) Reference Methods 1, 3A, 7E, 19, and 205.

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

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

Source	Test Parameter	Test Date(s)
EUBOILER#1	Nitrogen oxides (NO_x)	March 17, 2020
EUBOILER#2	Nitrogen oxides	March 17, 2020

1.2 Key Personnel

The key personnel involved in this test program are listed in Table 1-2. Mr. David Kawasaki, Staff Consultant with Apex, led the emission testing program. Mr. Scott Ickes, Senior Manager, Compliance with DPI, provided process coordination and recorded operating parameters.

Table 1-2
Key Contact Information

Client	Apex
Scott Ickes Senior Manager, Compliance **Decorative Panels International** 416 Ford Avenue Alpena, Michigan 49707 Phone: 989.356.8568 scott.ickes@decpanels.com	David Kawasaki, QSTI Staff Consultant **Apex Companies, LLC** 46555 Humboldt Drive, Suite 103 Novi, Michigan 48377 Phone: 248.590.5134 david.kawasaki@apexcos.com
EGLE	
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2.0 Source and Sampling Locations

2.1 Process Description

Decorative Panels International 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.

2.2 Control Equipment Description

2.2.1 EUBOILER#1 and EUBOILER#2

EUBOILER#1 and EUBOILER#2 use multi-clone collectors and an electrostatic precipitator (ESP) to control emissions. The multi-clone collectors use cyclones and centrifugal action to remove particles from the gas stream. As the flue gas enters the cyclones, centrifugal force is applied using Venturis and a conical shaped chamber. The incoming gas is forced into a cyclonic motion, down and along the walls of the chamber. As the air nears the bottom of the chamber it changes directions and flows up through the center of a cyclone tube. The inertial momentum of the entrained particles causes them to move along the side walls and collect at the bottom of the chamber where they accumulate in a hopper. The particle-reduced air exits the cyclone tube and is ducted to another cyclone chamber or into the ESP for further pollution control.

The ESP uses voltage to generate an electrostatic charge on vertically hung collection plates, which attract particulate matter in the flue. By removing the charge from the collection plates and using a series of plate rappers, the particulate matter is released from the plates and collected at the bottom of the ESP in a hopper for removal. The air is then directed to the common SVBOIL123-STK58 stack where it is discharged to atmosphere.

The sampling locations for EUBOILER #1 and EUBOILER#2 are prior to the control equipment. The control equipment is designed for particulate matter control and does not affect results of this testing.

Operating parameters were measured and recorded by DPI personnel during testing. Tables 2-1 and 2-2 summarize the operating conditions during compliance testing of the EUBOILER#1 and EUBOILER#2 sources. Additional operating parameter data are included in Appendix E.

Table 2-1
Summary of EUBOILER#1 Operating Data

Test Run	Natural Gas Use Rate (ft^3/hr)	Heat Input (MMBtu/hr)	Steam Load (lb/hr)
1	97,000	106	68,220
2	88,000	96	66,820
3	88,000	96	68,040
Average	**91,000**	**99**	**67,693**

ft^3/hr: cubic foot per hour
MMBtu/hr: million British thermal unit per hour
lb/hr: pound per hour

Table 2-2
Summary of EUBOILER#2 Operating Data

Test Run	Natural Gas Use Rate (ft^3/hr)	Heat Input (MMBtu/hr)	Steam Load (lb/hr)
1	109,000	119	70,760
2	98,000	107	62,780
3	96,000	105	63,600
Average	**101,000**	**110**	**65,713**

ft^3/hr: cubic foot per hour
MMBtu/hr: million British thermal unit per hour
lb/hr: pound per hour

2.3 Flue Gas Sampling Locations

2.3.1 EUBOILER#1 Outlet Sampling Location

USEPA Methods 1 and 7E describe the sampling point location requirements. Prior to testing, a three-point stratification check was conducted following USEPA Method 7E. Based on the results of the stratification check, one sampling point was used for sampling.

The sampling port is located in a section of a 45.5-inch by 69.5-inch rectangular duct. The sampling port is accessible via the roof. Figure 2-1 presents a photograph of the EUBOILER#1 outlet sampling location. Figure 1 in the Appendix depicts the EUBOILER#1 outlet sampling port and traverse point locations.

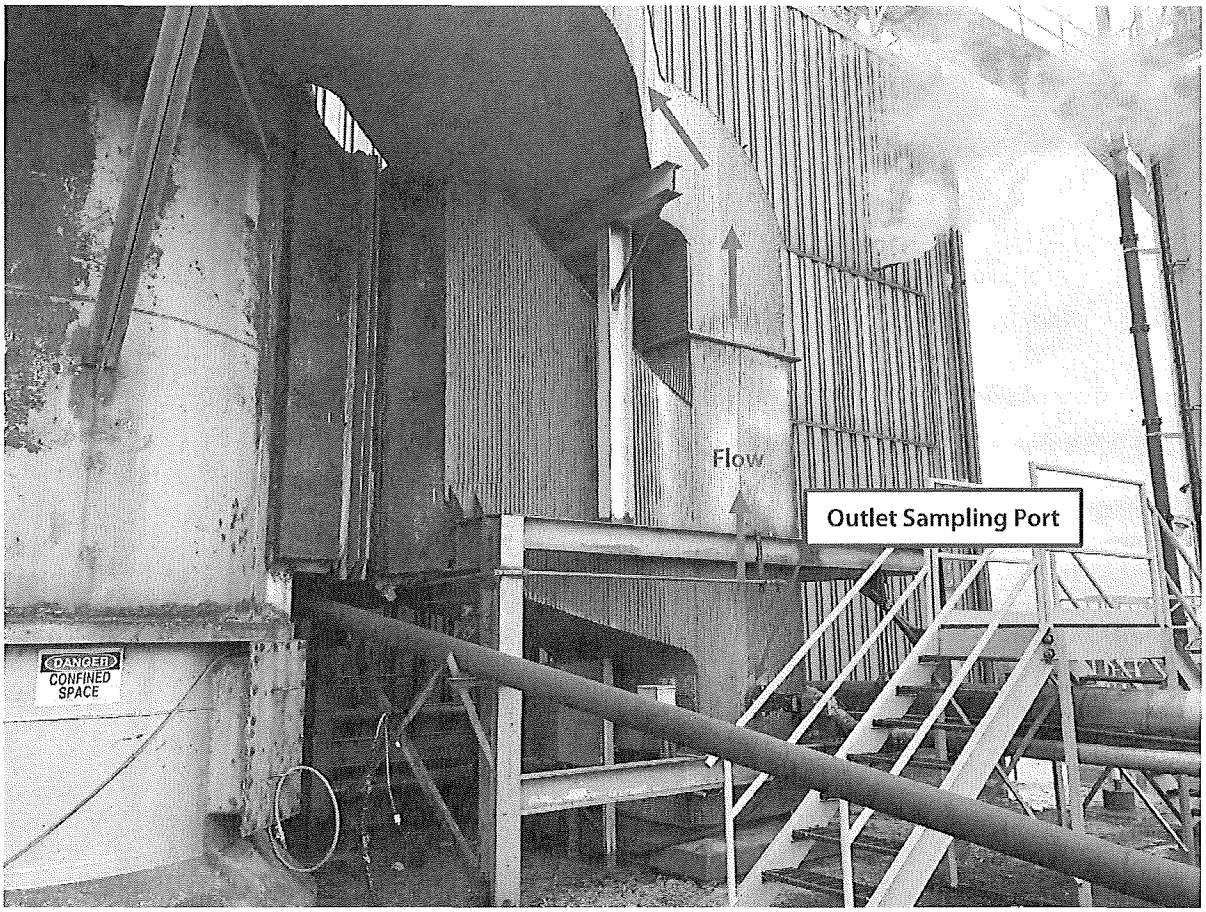

Figure 2-1. EUBOILER#1 Outlet Sampling Location

2.3.2 EUBOILER#2 Outlet Sampling Location

USEPA Methods 1 and 7E describe the sampling points location requirements in comparison to their physical layout. Prior to testing, a three-point stratification check was conducted following USEPA Method 7E. Based on the results of the stratification check, one sampling point was used for sampling.

The sampling port is located in a section of a 47-inch width by 70-inch length rectangular duct. The sampling port is accessible via the roof. A photograph of the EUBOILER#2 outlet sampling location is presented in Figure 2-1. Figure 2 in the Appendix depicts the EUBOILER#2 outlet sampling port and traverse point locations.

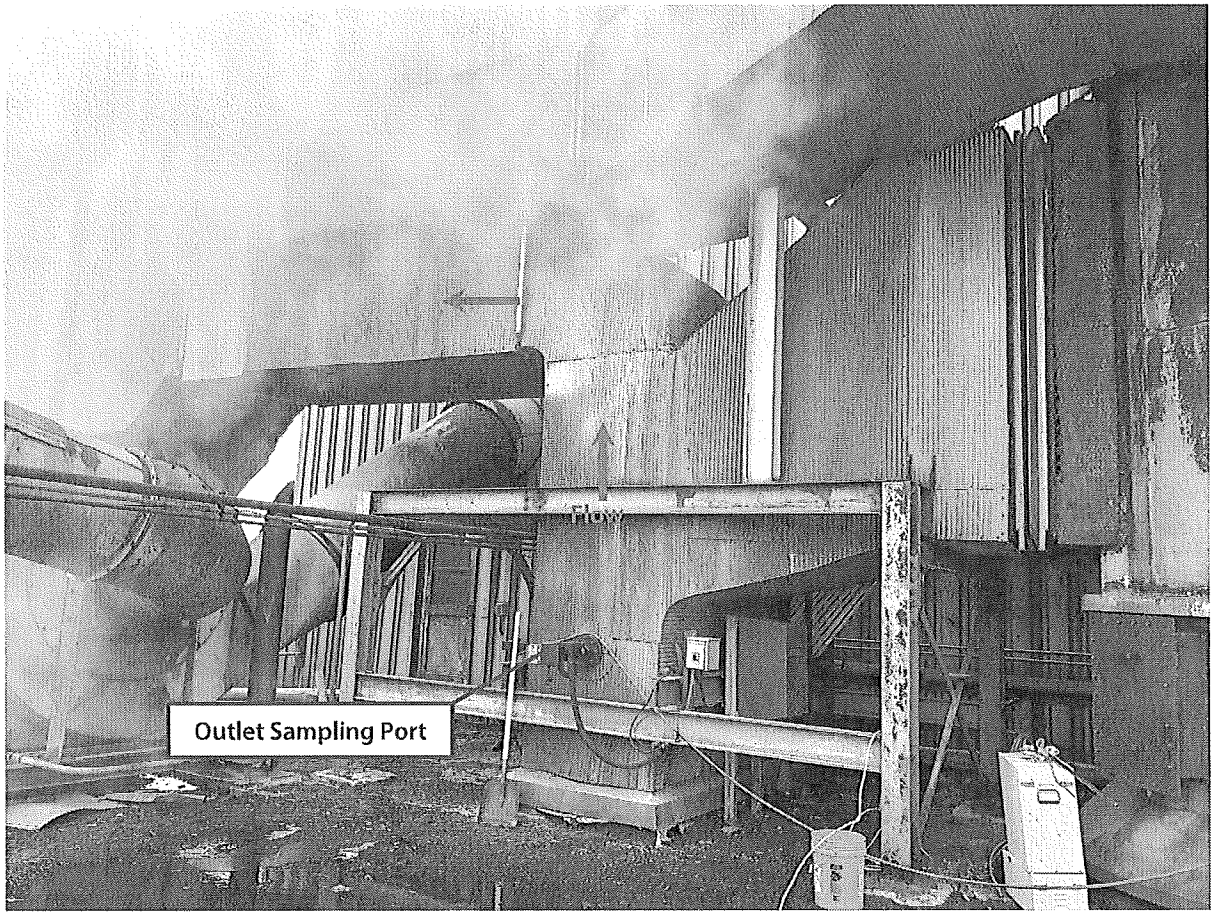

Figure 2-2. EUBOILER#2 Outlet Sampling Location

3.0 Summary and Discussion of Results

3.1 Objectives and Test Matrix

The objective of the air emission testing was to evaluate compliance with certain emission limits in EGLE ROP MI-ROP-B1476-2015a, effective April 6, 2016.

Table 3-1 summarizes the sampling and analytical matrix.

Table 3-1
Sampling and Analytical Matrix

Sampling Location	Sample/Type of Pollutant	Sample Method	Date (2020)	Run	Start Time	End Time
EUBOILER#1	Oxygen, carbon dioxide, nitrogen oxides, emission rate	USEPA 1, 3A, 7E, 19, 205	March 17	1	12:25	13:25
				2	13:32	14:32
				3	14:40	15:40
EUBOILER#2	Oxygen, carbon dioxide, nitrogen oxides, emission rate	USEPA 1, 3A, 7E, 19, 205	March 17	1	8:00	9:00
				2	9:07	10:07
				3	10:17	11:17

3.2 Field Test Changes and Issues

Communication between DPI, Apex, and EGLE allowed the testing to be completed as proposed in the March 6, 2020 Intent-to-Test Plan.

3.3 Summary of Results

The results of testing are presented in Table 3-2. Detailed results are presented in the Appendix Tables 1 and 2 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
Nitrogen Oxide Emissions Results

Source	Unit	Average Result	Permit Limit
EUBOILER#1	lb/MMBtu	0.078	0.10
	lb/hour	7.8	11.53
EUBOILER#2	lb/MMBtu	0.066	0.10
	lb/hour	7.3	11.53

lb/MMBtu: pound per million British thermal units
lb/hr: pound per hour

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	Testing Unit	USEPA Reference	
		Method	Title
Sampling ports and traverse points	•	1	Sample and Velocity Traverses for Stationary Sources
Oxygen (O_2) and carbon dioxide (CO_2)	•	3A	Determination of Oxygen and Carbon Dioxide Emissions from Stationary Sources (Instrument Analyzer Procedure)
Nitrogen oxides (NO_X)	•	7E	Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrument Analyzer Procedure)
Emission rate	•	19	Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates
Gas dilution	•	205	Verification of Gas Dilution Systems for Field Instrument Calibrations

4.1 Emission Test Methods

4.1.1 Volumetric Flowrate (USEPA Method 1)

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.

4.1.2 Oxygen, Carbon Dioxide, and Nitrogen Oxides (USEPA Methods 3A and 7E)

USEPA Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations from Stationary Sources (Instrumental Analyzer Procedure)," was used to measure O_2 and CO_2 concentrations in the flue gas. USEPA Method 7E, "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)," was used to measure NO_X concentrations in the flue gas. Flue gas was continuously sampled in the duct and conveyed to an analyzer for concentration measurements. Flue gas was extracted from the duct through:

- A stainless-steel probe.
- Heated Teflon sample line to prevent condensation.

- A chilled Teflon impinger train (equipped with a peristaltic pump) to remove moisture from the sampled gas stream prior to entering the analyzer.
- O_2, CO_2, and NO_X analyzers.

Figure 4-1 depicts the USEPA Methods 3A and 7E sampling train. Data was recorded at 1-second intervals on a computer equipped with data acquisition software. Recorded concentrations were averaged over the duration of each test run.

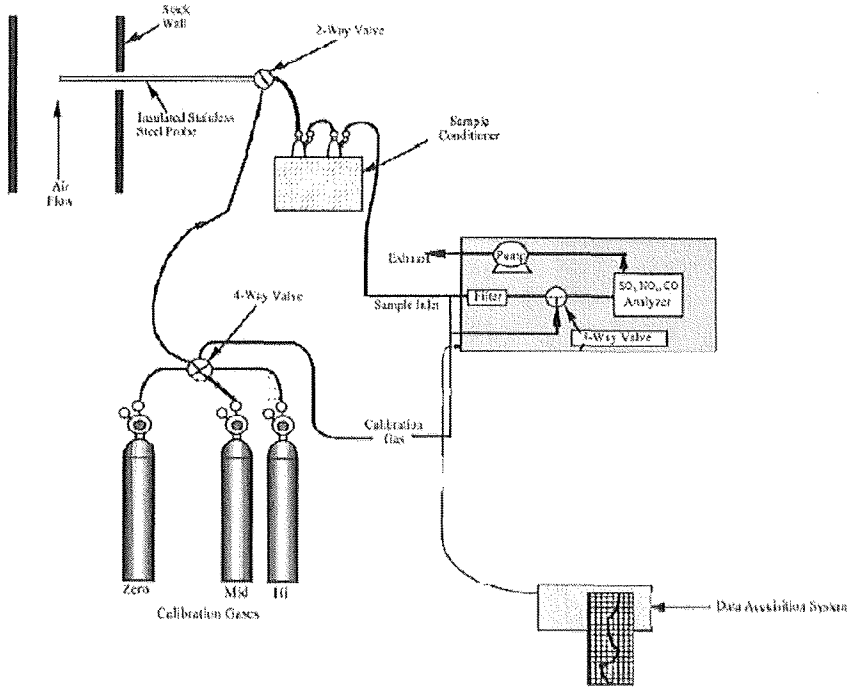

Figure 4-1. USEPA Methods 3A and 7E Sampling Train

Prior to testing, a 3-point stratification test was conducted at 17, 50, and 83% of the duct diameter for at least twice the response time to determine the minimum number of traverse points to be sampled.

The pollutant concentrations were measured using an analyzer calibrated with zero-, mid-, and high USEPA-Traceability- Protocol-certified calibration gases. The mid-level gas was 40 to 60% of the high-level (also referred to as span) gas.

Calibration Error Check. A calibration error check was performed by introducing zero-, mid-, and high-level calibration gases directly into the analyzer. The calibration error check was performed to verify the analyzer response is within ±2% of the certified calibration gas introduced.

System Bias Test. Prior to each test run, a system bias test was performed where known concentrations of calibration gases are introduced at the probe tip to measure if an analyzer's response is within ±5% of the introduced calibration gas concentrations. At the conclusion of each test run, an additional system-bias check was performed to

evaluate the analyzer drift from pre- and post-test system-bias checks. The system-bias check evaluates the analyzer drift against the ±3% quality assurance/quality control (QA/QC) requirement.

The analyzer drift data was used to correct the measured flue gas concentrations. Recorded concentrations were averaged over the duration of each test run.

NO/NO_2 Conversion Check. A NO/NO_2 conversion check was performed prior to testing by introducing an NO_2 calibration gas into the NO_X analyzer. If the analyzer's NO_X concentration response is greater than 90% of the introduced NO_2 calibration gas concentration, the analyzer's NO/NO_2 conversion will meet the converter efficiency requirement of Section 13.5 of USEPA Method 7E.

4.1.3 Emission Rate (USEPA Method 19)

USEPA Method 19, "Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates," was used to calculate emission rates of nitrogen oxides in pounds per million British thermal units and pounds per hour. Calculations utilized O_2 concentrations, NO_X concentrations, and natural gas fuel usage rates. Standard values for F factors and higher heating values of natural gas were used in the calculations.

4.1.4 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.

4.2 Process Data

DPI personnel recorded the following parameters during testing:

- Natural gas usage rate
- Heat input
- Steam load

Process data are included in Appendix E.

5.0 Quality Assurance and Quality Control

5.1 QA/QC Procedures

Equipment used in this emissions test program passed QA/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., calibrations) were performed in accordance with the respective USEPA sampling methods. Equipment inspection and calibration measurements are presented in Appendix A.

5.2.1 Audit Sample Results QA/QC

Quality assurance audit samples were not proposed during this test program. Currently, audit samples for the parameters to be measured are not available from the USEPA Stationary Source Audit Program.

5.2.2 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.

Table 5-1
Calibration Gas Cylinder Information

Parameter	Gas Vendor	Cylinder Serial Number	Cylinder Value	Expiration Date
Nitrogen	Airgas	1535054Y	99.9995%	February 4, 2024
Nitrogen dioxide	Airgas	CC507540	50.94	January 4, 2021
Nitrogen oxides	Airgas	XC034375B	100.6 ppm	August 17, 2025
Nitrogen oxides	Airgas	XC034410B	1,008 ppm	January 3, 2026
Oxygen/carbon monoxide	Airgas	SG9161438BAL	11.04 / 11.10%	June 8, 2024
Oxygen/carbon monoxide	Airgas	XC035409B	22.05 / 22.59 %	March 13, 2028

5.3 Data Reduction and Validation

The emissions testing Project Manager 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.

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. Apex Companies, LLC will not distribute or publish this report without consent of Decorative Panels International 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

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Tables

Table 1
EUBOILER#1 NO_x Results
Decorative Panels International, Inc.
Alpena, Michigan
Apex Project No. 11019-000034.01
Sampling Date: March 17, 2020

Parameter	Run 1	Run 2	Run 3	Average
Run Start Time	12:25	13:32	14:40	
Test Duration (min)	60	60	60	**60**
Natural Gas Usage Rate (ft^3/hr)	97,000	88,000	88,000	**91,000**
Heat Input (MMBtu/hr)	106	96	96	**99**
Steam Prodution (lb/hr)	68,220	66,820	68,040	**67,693**
O_2 Concentration (C_{Avg}, %)	5.8	4.9	5.2	**5.3**
Corrected O_2 Concentration (C_{Gas}, %)	5.7	4.9	5.2	**5.2**
NO_x Concentration (C_{Avg}, ppmvd)	54.1	55.6	55.8	**55.2**
Corrected NO_x Concentration (C_{Gas}, ppmvd)	55.7	56.6	56.7	**56.3**
NO_x Mass Emission Rate (lb/MMBtu)	**0.080**	**0.077**	**0.078**	**0.078**
NO_x Mass Emission Rate (lb/hr)	**8.4**	**7.3**	**7.5**	**7.8**

ft^3/hr: cubic foot per hour
MMBtu/hr: Million British thermal unit per hour
lb/hr: pound per hour
ppmvd: part per million by volume, dry basis
lb/MMBtu: pound per million British thermal unit

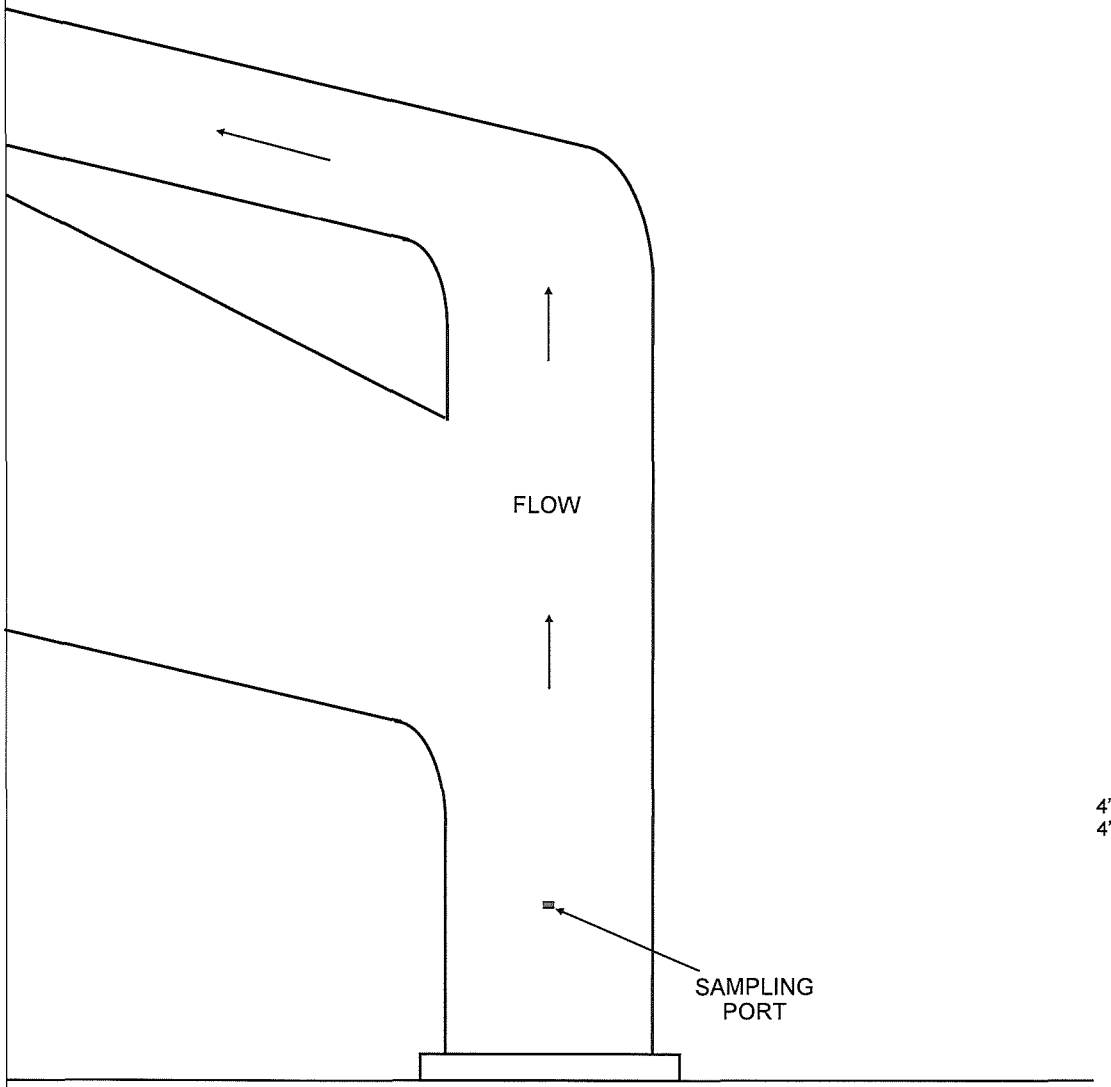
APEX

Table 2
EUBOILER#2 NO_x Results
Decorative Panels International, Inc.
Alpena, Michigan
Apex Project No. 11019-000034.01
Sampling Date: March 17, 2020

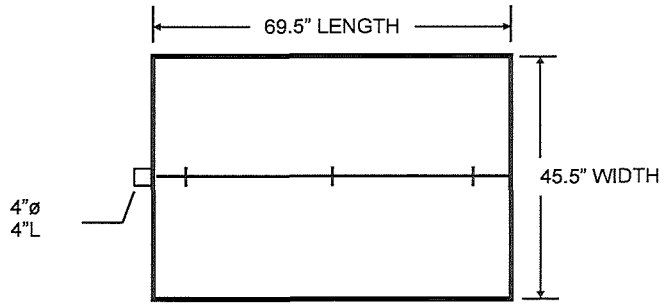
Parameter	Run 1	Run 2	Run 3	Average
Run Start Time	8:00	9:07	10:17	
Test Duration (min)	60	60	60	**60**
Natural Gas Usage Rate (ft^3/hr)	109,000	98,000	96,000	**101,000**
Heat Input (MMBtu/hr)	119	107	105	**110**
Steam Prodution (lb/hr)	70,760	62,780	63,600	**65,713**
O_2 Concentration (C_{Avg}, %)	5.2	4.7	4.8	**4.9**
Corrected O_2 Concentration (C_{Gas}, %)	5.2	4.7	4.8	**4.9**
NO_x Concentration (C_{Avg}, ppmvd)	49.3	46.0	46.3	**47.2**
Corrected NO_x Concentration (C_{Gas}, ppmvd)	50.5	47.3	47.9	**48.6**
NO_x Mass Emission Rate (lb/MMBtu)	**0.070**	**0.063**	**0.065**	**0.066**
NO_x Mass Emission Rate (lb/hr)	**8.3**	**6.8**	**6.7**	**7.3**

ft^3/hr: cubic foot per hour
MMBtu/hr: Million British thermal unit per hour
lb/hr: pound per hour
ppmvd: part per million by volume, dry basis
lb/MMBtu: pound per million British thermal unit

Figures



TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	11.8
2	34.8
3	57.7



SCALE	NOT TO SCALE
DATE	April 3, 2020
PRJ NO.	11019-000034.01

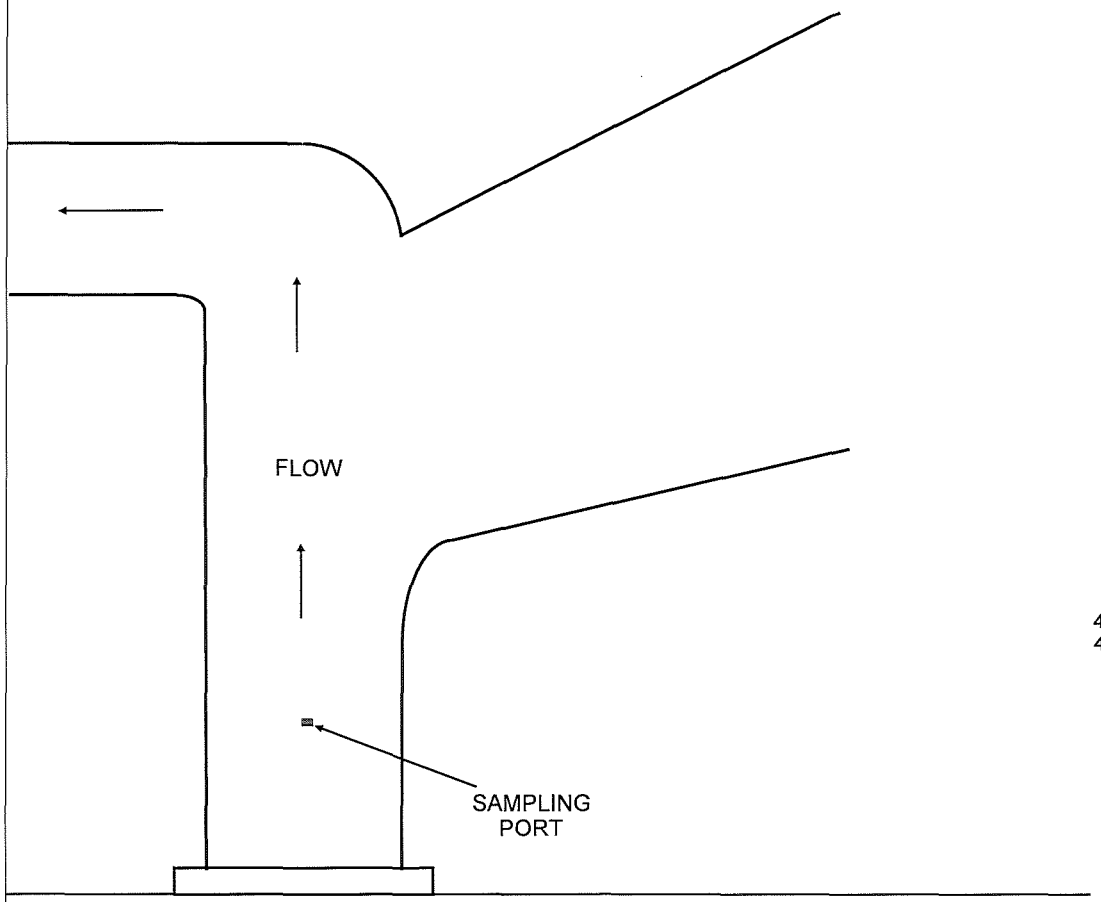
EUBOILER#1 OUTLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

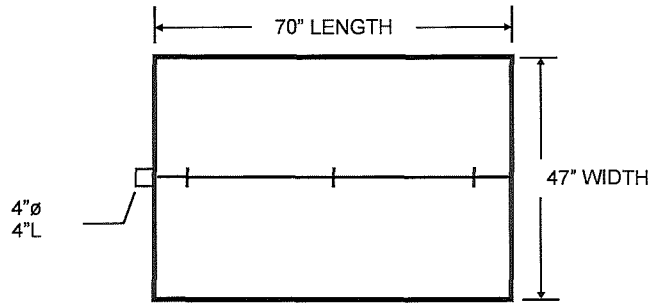
DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

APEX

FIGURE
1

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
1	11.9
2	35
3	58.1





SCALE	NOT TO SCALE
DATE	April 3, 2020
PRJ NO.	11019-000034.01

EUBOILER#2 OUTLET SAMPLING PORTS AND TRAVERSE POINT LOCATIONS

DECORATIVE PANELS INTERNATIONAL, INC.
ALPENA, MICHIGAN

APEX

FIGURE
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