Alliance
TECHNICAL GROUP

Source Test Report

Arauco North America
5851 Arauco Road
Grayling, MI 49738

Source Tested: Dryer RTO
Test Date: October 2, 2024

Project No. AST-2024-4417

Prepared By
Alliance Technical Group, LLC
4508 Westinghouse Blvd., Suite A,
Charlotte, North Carolina 28273

Regulatory Information

Permit No.	Michigan Department of Environment, Great Lakes and Energy (EGLE) Air Quality Permit PTI-59-16H
Regulatory Citation	40 CFR 63, Subpart DDDD

Source Information

Source Name	*Source ID*	*Target Parameter*
Dryer Regenerative Thermal Oxidizer	RTO1	NMHC

Contact Information

Test Location
Arauco North America
5851 Arauco Road
Grayling, MI 49738

Client Contact
James Osga
james.osga@arauco.com
(983) 344-2881

Test Company
Alliance Technical Group, LLC
4508 Westinghouse Blvd., Suite A,
Charlotte, North Carolina 28273

Project Manager
Quentin Best
quentin.best@alliancetg.com
(704) 309-7421

Field Team Leader
Andrew Dickson
andrew.dickson@alliancetg.com
(704) 618-1144

QA/QC Manager
Kathleen Shonk
katie.shonk@alliancetg.com
(812) 452-4785

Report Coordinator
Sean Coyle
sean.coyle@alliancetg.com
(256) 351-0121

Report Reviewer
Kimberly Dyehouse
kimberly.dyehouse@alliancetg.com
(812) 452-4785

Alliance Technical Group, LLC (Alliance) has completed the source testing as described in this report. Results apply only to the source(s) tested and operating condition(s) for the specific test date(s) and time(s) identified within this report. All results are intended to be considered in their entirety, and Alliance is not responsible for use of less than the complete test report without written consent. This report shall not be reproduced in full or in part without written approval from the customer.

To the best of my knowledge and abilities, all information, facts and test data are correct. Data presented in this report has been checked for completeness and is accurate, error-free and legible. Onsite testing was conducted in accordance with approved internal Standard Operating Procedures. Any deviations or problems are detailed in the relevant sections in the test report.

This report is only considered valid once an authorized representative of Alliance has signed in the space provided below; any other version is considered draft. This document was prepared in portable document format (.pdf) and contains pages as identified in the bottom footer of this document.

W. Quentin Best

Quentin Best – Operations Manager
Alliance Technical Group, LLC

11.12.24

Date

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

Introduction

1.0 Introduction

Alliance Technical Group, LLC (Alliance) was retained by Arauco North America (Arauco) to conduct compliance testing at the Grayling, Michigan facility. Portions of the facility are subject to 40 CFR 63 Subpart DDDD for plywood and composite wood products (PCWP) Maximum Achievable Control Technology (MACT) standards, and operates under Michigan Department of Environment, Great Lakes and Energy (EGLE) Air Quality Permit PTI-59-16H Testing was conducted to determine the emission rates non-methane hydrocarbons (NMHC) at the exhaust of the Regenerative Thermal Oxidizer (RTO1).

1.1 Facility Description

Arauco North America, Inc. in Grayling, Michigan is a composite wood products facility producing particleboard panels for the building industry. In the manufacturing of particleboard, the facility utilizes several process lines including debarking, flaking, flake dryers, screening, blending, forming, a continuous press, sanding, sawing and lamination operations. Thermal energy for production is produced by the Thermal Energy Plant. The Thermal Energy Plant combusts wood derived fuel such as sander dust, fines from screening and biomass from debarking operations. The target emission units for the FGDRYERRTO are EUFLAKERS, EUDRYER1, EUDRYER2 and EUENERGY. Emissions from EUENERGY are controlled by the regenerative thermal oxidizer (RTO) serving EUDRYER1 & EUDRYER2.

1.2 Project Team

Personnel involved in this project are identified in the following table.

Table 1-1: Project Team

Facility Personnel	Jim Osga
Regulatory Personnel	Sharon LeBlanc Amy Beaver
Alliance Personnel	Andrew Dickson Rusty Caton Edward Rodriguez

1.3 Site Specific Test Plan & Notification

Testing was conducted in accordance with the Site-Specific Test Plan (SSTP) submitted to EGLE on May 9, 2024. The SSTP was approved by EGLE on August 21, 2024.

Summary of Results

2.0 Summary of Results

Alliance conducted compliance testing at the Arauco facility in Grayling, Michigan on October 2, 2024. Testing consisted of determining the emission rates of NMHCs at the exhaust of RTO1.

Table 2-1 provides a summary of the emission testing results with comparisons to the applicable federal rules or EGLE permit limits. Any difference between the summary of results listed in the following table and the detailed results contained in the appendices is due to rounding for presentation.

Table 2-1: Summary of Results

Emissions Data				
Run Number	**Run 1**	**Run 2**	**Run 3**	**Average**
Date	10/2/24	10/2/24	10/2/24	--
Total Hydrocarbons Data				
Concentration (as C_3H_8), ppmvd	5.1	6.3	6.6	6.0
Concentration (as C_3H_8), ppmvw	4.1	4.9	5.2	4.8
Methane Data				
Concentration (as carbon), ppmvd	15.4	18.8	19.8	18.0
Concentration, ppmvd	0.96	1.4	1.2	1.2
Non-Methane Hydrocarbons Data				
Concentration (as carbon), ppmvd	14.5	17.4	18.6	16.8
Permit Limit (as carbon), ppmvd	--	--	--	20
Percent of Limit, %	--	--	--	**84 %**

Testing Methodology

3.0 Testing Methodology

The emission testing program was conducted in accordance with the test methods listed in Table 3-1. Method descriptions are provided below while quality assurance/quality control data is provided in Appendix C.

Table 3-1: Source Testing Methodology

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Sample Point Determination	1	---
Oxygen/Carbon Dioxide	3A	Instrumental Analysis
Moisture Content	4	Gravimetric Analysis
Methane (Direct Injection on a dry basis)	18	Instrumental Analysis
Total Hydrocarbons	25A	Instrumental Analysis

3.1 U.S. EPA Reference Test Methods 1 – Sampling/Traverse Points

The sampling location and number of traverse (sampling) points were selected in accordance with U.S. EPA Reference Test Method 1. To determine the minimum number of traverse points, the upstream and downstream distances were equated into equivalent diameters and compared to Figure 1-1 in U.S. EPA Reference Test Method 1.

3.2 U.S. EPA Reference Test Method 3A – Oxygen/Carbon Dioxide

The oxygen (O_2) and carbon dioxide (CO_2) testing were conducted in accordance with U.S. EPA Reference Test Method 3A. Data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, Teflon sample line(s), gas conditioning system and the identified gas analyzer. The gas conditioning system was a non-contact condenser used to remove moisture from the stack gas. If an unheated Teflon sample line was used, then a portable non-contact condenser was placed in the system directly after the probe. Otherwise, a heated Teflon sample line was used. The quality control measures are described in Section 3.6.

3.3 U.S. EPA Reference Test Method 4 – Moisture Content

The stack gas moisture content (BWS) was determined in accordance with U.S. EPA Reference Test Method 4. The gas conditioning train consisted of a series of chilled impingers. Prior to testing, each impinger was filled with a known quantity of water or silica gel. Each impinger was analyzed gravimetrically before and after each test run on the same balance to determine the amount of moisture condensed.

3.4 U.S. EPA Reference Test Method 18 –Methane Direct Injection

Methane concentrations and emission rates were determined according to EPA Method 18. Method 18 applies to the measurement of gaseous organic compounds from industrial sources. The gaseous organic components of the effluent were separated by gas chromatography (GC) and individually quantified by flame ionization. The concentration is expressed in parts per million (ppm) as methane and as ethane.

Analysis for methane was performed using one VIG Industries Model 210 Methane analyzer. The principal components of each sampling systems were sequentially:

- A heated stainless-steel sample probe;
- A heated system calibration assembly and filter;

- A heated sample line;
- A dual FID analyzer;
- A gas chromatograph column;
- Calibration gases; and
- A data acquisition system that continuously logs 1-minute concentrations.

Prior to the test series, the heated sample line was heated to 250°F and the hydrocarbon analyzer was heated above 200°C to prevent condensation. After temperatures were stabilized, the hydrocarbon analyzer was ignited using hydrogen fuel and hydrocarbon free air. Calibration procedures commenced with the introduction of zero and high-level calibration gas into the sampling system. The necessary adjustments were made and the responses for low-level and mid-level gases were recorded. The predicted values for the calibration gases and the actual responses were recorded on the field data sheet and by the data acquisition system. High-level and zero gas concentrations were introduced into the measurement system and the response time was recorded on the field data sheet. Sampling was initiated immediately following instrument calibration.

3.5 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 3A

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Low Level gas was introduced directly to the analyzer. After adjusting the analyzer to the Low-Level gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas. For the Calibration Error Test, Low, Mid, and High-Level calibration gases were sequentially introduced directly to the analyzer. All values were within 2.0 percent of the Calibration Span or 0.5% absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe and the time required for the analyzer reading to reach 95 percent or 0.5% (whichever was less restrictive) of the gas concentration was recorded. The analyzer reading was observed until it reached a stable value, and this value was recorded. Next, Low-Level gas was introduced at the probe and the time required for the analyzer reading to decrease to a value within 5.0 percent or 0.5% (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5% or 5.0 percent of the upscale gas concentration (whichever was less restrictive). The analyzer reading was observed until it reached a stable value and this value was recorded. The measurement system response time and initial system bias were determined from these data. The System Bias was within 5.0 percent of the Calibration Span or 0.5% absolute difference.

High or Mid-Level gas (whichever was closer to the stack gas concentration) was introduced at the probe. After the analyzer response was stable, the value was recorded. Next, Low-Level gas was introduced at the probe, and the analyzer value recorded once it reached a stable response. The System Bias was within 5.0 percent of the Calibration Span or 0.5% absolute difference or the data was invalidated, and the Calibration Error Test and System Bias were repeated.

Drift between pre- and post-run System Bias was within 3 percent of the Calibration Span or 0.5% absolute difference. If the drift exceeded 3 percent or 0.5%, the Calibration Error Test and System Bias were repeated.

To determine the number of sampling points, a gas stratification check was conducted prior to initiating testing. The pollutant concentrations were measured at three points (16.7, 50.0 and 83.3 percent of the measurement line). Each traverse point was sampled for a minimum of twice the system response time.

If the diluent concentration at each traverse point did not differ more than 5 percent or 0.3% (whichever was less restrictive) of the average pollutant concentration, then single point sampling was conducted during the test runs. If the pollutant concentration did not meet these specifications but differed less than 10 percent or 0.5% from the average concentration, then three (3) point sampling was conducted (stacks less than 7.8 feet in diameter - 16.7, 50.0 and 83.3 percent of the measurement line; stacks greater than 7.8 feet in diameter – 0.4, 1.0, and 2.0 meters from the stack wall). If the pollutant concentration differed by more than 10 percent or 0.5% from the average concentration, then sampling was conducted at a minimum of twelve (12) traverse points. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the Alliance server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at Alliance's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

3.6 Quality Assurance/Quality Control – U.S. EPA Reference Test Method 25A

Cylinder calibration gases used met EPA Protocol 1 (+/- 2%) standards. Copies of all calibration gas certificates can be found in the Quality Assurance/Quality Control Appendix.

Within two (2) hours prior to testing, zero gas was introduced through the sampling system to the analyzer. After adjusting the analyzer to the Zero gas concentration and once the analyzer reading was stable, the analyzer value was recorded. This process was repeated for the High-Level gas, and the time required for the analyzer reading to reach 95 percent of the gas concentration was recorded to determine the response time. Next, Low and Mid-Level gases were introduced through the sampling system to the analyzer, and the response was recorded when it was stable. All values were less than +/- 5 percent of the calibration gas concentrations.

Mid-Level gas was introduced through the sampling system. After the analyzer response was stable, the value was recorded. Next, Zero gas was introduced through the sampling system, and the analyzer value recorded once it reached a stable response. The Analyzer Drift was less than +/- 3 percent of the span value.

A Data Acquisition System with battery backup was used to record the instrument response in one (1) minute averages. The data was continuously stored as a *.CSV file in Excel format on the hard drive of a computer. At the completion of testing, the data was also saved to the Alliance server. All data was reviewed by the Field Team Leader before leaving the facility. Once arriving at Alliance's office, all written and electronic data was relinquished to the report coordinator and then a final review was performed by the Project Manager.

Appendix A

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Run No. /Method Run 1 / Method 3A

CO_2 - Outlet Concentration (C_{CO_2}), % dry

$$C_{CO_2} = (C_{obs} - C_0) \times \left(\frac{C_{MA}}{(C_M - C_0)} \right)$$

where,

C_{obs}	2.6	= average analyzer value during test, % dry
C_o	0.1	= average of pretest & posttest zero responses, % dry
C_{MA}	10.0	= actual concentration of calibration gas, % dry
C_M	10.0	= average of pretest & posttest calibration responses, % dry
C_{CO_2}	2.5	= CO_2 Concentration, % dry

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Run No. /Method Run 1 / Method 3A

O_2 - Outlet Concentration (C_{O_2}), % dry

$$C_{O_2} = (C_{obs} - C_0) \times \left(\frac{C_{MA}}{(C_M - C_0)} \right)$$

where,

C_{obs}	17.3	= average analyzer value during test, % dry
C_o	0.0	= average of pretest & posttest zero responses, % dry
C_{MA}	12.5	= actual concentration of calibration gas, % dry
C_M	12.4	= average of pretest & posttest calibration responses, % dry
C_{O_2}	17.5	= O_2 Concentration, % dry

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Run No. /Method Run 1 / Method 25A

THC - Outlet Concentration (as C3H8) (C_{THC}), ppmvd

$$C_{THC} = \frac{C_{THCw}}{1 - BWS}$$

where,

C_{THCw}	4.1	= THC - Outlet Concentration (as C3H8), ppmvw
BWS	0.198	= moisture fraction, unitless
C_{THC}	5.1	= ppmvd

Appendix B

Alliance TECHNICAL GROUP

Location Arauco North America - Grayling, MI
Source RTO Exhaust Stack
Project No. AST-2024-4417

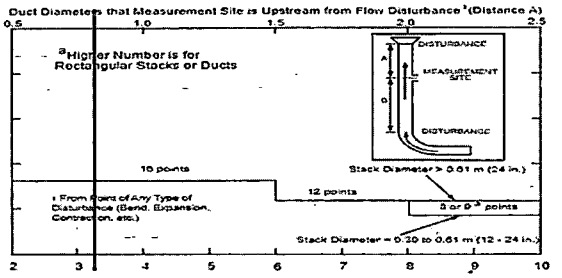
Run Number		Run 1	Run 2	Run 3	Average
Date		10/2/24	10/2/24	10/2/24	--
Start Time		13:22	16:26	17:38	--
Stop Time		14:21	17:25	18:37	--
Input Data - Outlet					
Moisture Fraction, dimensionless	BWS	0.198	0.215	0.207	0.207
Calculated Data - Outlet					
O_2 Concentration, % dry	C_{O_2}	17.5	17.1	17.0	17.2
CO_2 Concentration, % dry	C_{CO_2}	2.5	2.7	2.8	2.7
THC (as C_3H_8) Concentration, ppmvd	C_{THC}	5.1	6.3	6.6	6.0
THC (as C_3H_8) Concentration, ppmvw-from run tab	C_{THCw}	4.1	4.9	5.2	4.8
CH4 (as Carbon) Concentration, ppmvd	C_{CH4cc}	15.4	18.8	19.8	18.0
CH4 Concentration, ppmvd	C_{CH4}	0.96	1.4	1.2	1.2
NMHC (as Carbon) Concentration, ppmvd	C_{NMEHCc}	14.5	17.4	18.6	16.8

Method 1 Data

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Date: 10/01/24

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	129.50	in
Nipple Length:	6.50	in
Depth of Duct:	123.00	in
Cross Sectional Area of Duct:	82.52	ft^2
No. of Test Ports:	4	
Number of Readings per Point:	2	
Distance A:	39.0	ft
Distance A Duct Diameters:	3.8	(must be ≥ 0.5)
Distance B:	33.0	ft
Distance B Duct Diameters:	3.2	(must be ≥ 2)
Actual Number of Traverse Points:	3	
Measurer (Initial and Date):	ERZ	
Reviewer (Initial and Date):	RUC	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

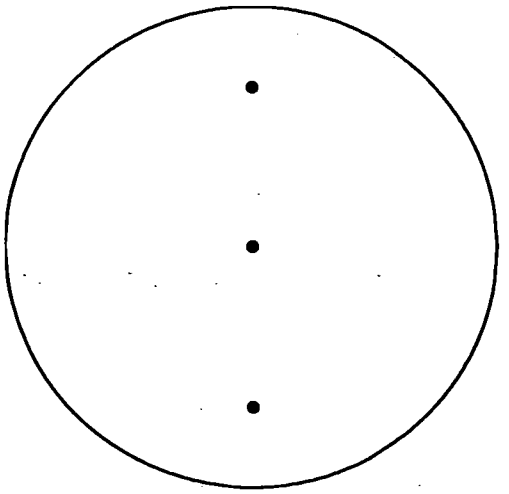
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	16.7	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	50.0	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	83.3	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

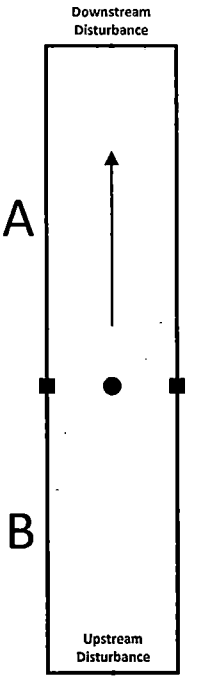
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	16.7	20.54	27.04
2	50.0	61.50	68.00
3	83.3	102.46	108.96
4	--	--	--
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 39 ft.
B = 33 ft.
Depth of Duct = 123 in.

Cross Sectional Area





Alliance TECHNICAL GROUP

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Date: 10/2/24

Time / Unit / Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	THC - Outlet ppmvw Valid	CH4 - Outlet ppmvd Valid
Uncorrected Run Average (C_{obs})	17.31	2.55	4.12	0.96
Cal Gas Concentration (C_{MA})	12.51	9.98	51.12	30.00
Pretest System Zero Response	0.04	0.09	0.05	-0.05
Posttest System Zero Response	0.01	0.03	1.50	0.01
Average Zero Response (Co)	0.03	0.06	0.78	-0.02
Pretest System Cal Response	12.44	9.99	50.82	29.90
Posttest System Cal Response	12.40	9.96	50.06	29.88
Average Cal Response (C_M)	12.42	9.97	50.44	29.89
Corrected Run Average (Corr)	17.45	2.51	NA	NA
13:22	17.21	2.63	4.15	0.01
13:23	17.25	2.60	4.20	0.00
13:24	17.23	2.62	4.09	0.21
13:25	17.23	2.64	3.81	0.50
13:26	17.14	2.68	4.39	0.50
13:27	17.19	2.64	4.18	3.18
13:28	17.17	2.64	3.94	6.92
13:29	17.25	2.60	2.72	6.93
13:30	17.17	2.65	4.81	4.04
13:31	17.26	2.58	4.26	0.00
13:32	17.24	2.59	4.64	0.01
13:33	17.25	2.61	2.87	0.00
13:34	17.23	2.64	4.03	0.01
13:35	17.29	2.58	4.07	0.00
13:36	17.31	2.55	5.05	0.13
13:37	17.40	2.51	2.59	0.30
13:38	17.29	2.59	3.74	0.30
13:39	17.29	2.59	3.94	0.32
13:40	17.38	2.52	3.97	0.35
13:41	17.32	2.55	3.92	0.35
13:42	17.28	2.59	3.91	0.18
13:43	17.21	2.64	4.23	0.00
13:44	17.28	2.60	4.18	0.00
13:45	17.31	2.56	3.84	0.03
13:46	17.33	2.54	3.84	0.05
13:47	17.25	2.60	4.26	0.04
13:48	17.27	2.59	4.21	0.32
13:49	17.33	2.54	4.06	0.60
13:50	17.36	2.53	3.94	0.59
13:51	17.24	2.61	4.47	0.40
13:52	17.25	2.61	4.40	0.19
13:53	17.36	2.52	4.29	0.19
13:54	17.42	2.49	2.88	1.55
13:55	17.38	2.51	5.26	2.91
13:56	17.33	2.55	4.11	2.91
13:57	17.39	2.50	4.22	1.65
13:58	17.44	2.46	3.06	0.40
13:59	17.39	2.48	4.70	0.40
14:00	17.32	2.55	3.73	0.24
14:01	17.33	2.53	4.52	0.10
14:02	17.47	2.43	3.47	0.10
14:03	17.45	2.43	3.98	0.05
14:04	17.41	2.48	4.14	0.00
14:05	17.39	2.49	4.17	0.01
14:06	17.48	2.42	4.28	0.01
14:07	17.44	2.44	4.23	0.00
14:08	17.38	2.49	4.49	0.01
14:09	17.27	2.56	4.44	0.03
14:10	17.31	2.53	4.17	0.05
14:11	17.37	2.49	4.07	0.04
14:12	17.35	2.50	4.49	1.63
14:13	17.30	2.56	4.43	3.21
14:14	17.32	2.54	4.40	3.21
14:15	17.39	2.48	4.19	1.61
14:16	17.31	2.52	4.69	0.00
14:17	17.35	2.51	4.65	0.01
14:18	17.25	2.57	4.45	1.51
14:19	17.35	2.51	3.13	3.01
14:20	17.28	2.54	5.66	3.00
14:21	17.29	2.55	4.31	3.36

Alliance TECHNICAL GROUP

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Date: 10/2/24

Time / Unit / Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	THC - Outlet ppmvw Valid	CH4 - Outlet ppmvw Valid
Uncorrected Run Average (C_{obs})	16.88	2.75	4.93	1.13
Cal Gas Concentration (C_{MA})	12.51	9.98	51.12	30.00
Pretest System Zero Response	0.01	0.03	1.50	0.01
Posttest System Zero Response	0.05	0.03	1.34	0.02
Average Zero Response (Co)	0.03	0.03	1.42	0.02
Pretest System Cal Response	12.40	9.96	50.06	29.88
Posttest System Cal Response	12.36	9.94	51.07	29.78
Average Cal Response (C_M)	12.38	9.95	50.57	29.83
Corrected Run Average (Corr)	17.07	2.74	NA	NA
16:26	16.82	2.79	4.61	0.24
16:27	16.82	2.79	4.39	1.21
16:28	16.82	2.79	4.95	1.30
16:29	16.83	2.79	4.89	1.30
16:30	16.83	2.79	4.96	0.70
16:31	16.84	2.79	4.51	0.65
16:32	16.85	2.79	5.36	0.65
16:33	16.85	2.79	5.17	0.51
16:34	16.86	2.78	4.92	0.50
16:35	16.86	2.78	3.54	0.49
16:36	16.87	2.78	5.74	0.08
16:37	16.86	2.78	5.09	0.05
16:38	16.86	2.78	5.29	0.05
16:39	16.86	2.78	3.80	0.18
16:40	16.85	2.78	5.08	0.19
16:41	16.84	2.79	5.25	0.19
16:42	16.83	2.79	6.04	0.47
16:43	16.83	2.79	3.66	0.49
16:44	16.83	2.79	4.71	0.50
16:45	16.83	2.79	5.08	0.35
16:46	16.83	2.78	4.88	0.35
16:47	16.83	2.78	4.83	0.35
16:48	16.84	2.77	4.79	0.11
16:49	16.85	2.76	5.01	0.10
16:50	16.85	2.76	4.99	0.10
16:51	16.85	2.76	4.62	0.46
16:52	16.86	2.75	4.43	0.50
16:53	16.87	2.75	5.06	0.50
16:54	16.87	2.74	4.87	0.68
16:55	16.88	2.74	4.91	0.70
16:56	16.88	2.74	4.44	0.70
16:57	16.88	2.73	5.35	0.14
16:58	16.88	2.74	5.13	0.09
16:59	16.88	2.74	5.05	0.10
17:00	16.88	2.74	3.71	0.28
17:01	16.87	2.74	5.86	0.29
17:02	16.87	2.75	5.03	0.30
17:03	16.87	2.75	5.28	0.69
17:04	16.87	2.74	3.88	0.70
17:05	16.87	2.74	5.72	0.70
17:06	16.88	2.74	4.60	3.05
17:07	16.88	2.74	6.25	3.06
17:08	16.88	2.73	3.77	3.06
17:09	16.89	2.73	4.90	0.05
17:10	16.89	2.73	5.37	0.04
17:11	16.89	2.73	6.28	0.05
17:12	16.89	2.73	4.26	4.06
17:13	16.89	2.73	5.10	4.06
17:14	16.90	2.73	5.31	4.06
17:15	16.90	2.73	5.27	7.28
17:16	16.91	2.73	4.92	7.28
17:17	16.92	2.73	4.77	7.27
17:18	16.92	2.73	5.18	0.25
17:19	16.93	2.73	5.15	0.25
17:20	16.95	2.73	5.18	0.25
17:21	16.96	2.72	4.76	1.55
17:22	16.97	2.71	5.56	1.55
17:23	16.99	2.71	5.27	1.55
17:24	17.00	2.70	5.06	0.45
17:25	17.01	2.69	3.79	0.45

Alliance TECHNICAL GROUP

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Date: 10/2/24

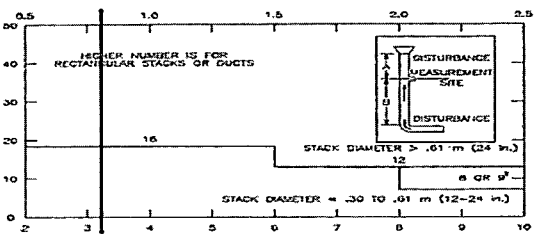
Time Unit Status	O_2 - Outlet % dry Valid	CO_2 - Outlet % dry Valid	THC - Outlet ppmvw Valid	CH4 - Outlet ppmvw Valid
Uncorrected Run Average (C_{obs})	16.79	2.83	5.25	0.99
Cal Gas Concentration (C_{MA})	12.51	9.98	51.12	30.00
Pretest System Zero Response	0.05	0.03	1.34	0.02
Posttest System Zero Response	0.02	0.10	1.47	-0.01
Average Zero Response (Co)	0.04	0.07	1.41	0.01
Pretest System Cal Response	12.35	9.94	51.07	29.78
Posttest System Cal Response	12.35	9.96	50.89	29.70
Average Cal Response (C_M)	12.35	9.95	50.98	29.74
Corrected Run Average (Corr)	17.03	2.79	NA	NA
17:38	16.73	2.87	6.20	0.51
17:39	16.73	2.87	4.42	0.25
17:40	16.74	2.86	5.89	0.24
17:41	16.74	2.86	3.65	0.15
17:42	16.74	2.86	5.79	0.00
17:43	16.75	2.85	4.36	0.00
17:44	16.75	2.85	6.26	0.19
17:45	16.76	2.84	3.90	0.44
17:46	16.77	2.84	5.04	0.44
17:47	16.78	2.83	5.21	0.43
17:48	16.78	2.83	6.11	0.40
17:49	16.78	2.83	3.74	0.39
17:50	16.78	2.82	4.81	0.27
17:51	16.78	2.82	5.12	0.10
17:52	16.78	2.82	5.92	0.10
17:53	16.79	2.82	4.48	0.12
17:54	16.79	2.81	4.85	0.14
17:55	16.79	2.81	5.54	0.14
17:56	16.79	2.81	5.60	1.32
17:57	16.79	2.81	5.06	2.95
17:58	16.79	2.80	4.05	2.96
17:59	16.80	2.80	4.59	1.75
18:00	16.80	2.79	6.59	0.05
18:01	16.80	2.79	5.31	0.05
18:02	16.80	2.79	4.04	2.03
18:03	16.80	2.79	5.18	4.82
18:04	16.81	2.79	6.03	4.82
18:05	16.81	2.79	4.52	2.95
18:06	16.82	2.80	4.86	0.55
18:07	16.83	2.79	4.94	0.55
18:08	16.84	2.79	5.32	0.55
18:09	16.84	2.79	5.33	0.55
18:10	16.85	2.79	4.88	0.55
18:11	16.86	2.78	4.83	0.34
18:12	16.85	2.79	5.25	0.15
18:13	16.86	2.79	5.04	0.15
18:14	16.86	2.78	4.71	0.17
18:15	16.86	2.78	4.64	0.19
18:16	16.86	2.79	5.76	0.20
18:17	16.86	2.79	5.69	0.80
18:18	16.85	2.79	5.60	1.40
18:19	16.83	2.80	5.39	1.40
18:20	16.82	2.80	5.80	1.30
18:21	16.81	2.81	5.95	1.20
18:22	16.80	2.82	5.55	1.20
18:23	16.78	2.83	4.70	0.63
18:24	16.77	2.84	6.01	0.04
18:25	16.76	2.85	6.29	0.05
18:26	16.75	2.85	5.82	2.88
18:27	16.74	2.86	4.33	5.72
18:28	16.74	2.86	5.63	5.72
18:29	16.74	2.88	6.62	3.11
18:30	16.73	2.88	6.20	0.50
18:31	16.73	2.88	4.01	0.50
18:32	16.73	2.88	5.35	0.30
18:33	16.73	2.88	5.67	0.10
18:34	16.74	2.88	6.53	0.09
18:35	16.75	2.87	4.47	0.15
18:36	16.76	2.87	5.47	0.20
18:37	16.77	2.86	5.83	0.19

Method 1 Data

Location: Arauco North America - Grayling, MI
Source: RTO Exhaust Stack
Project No.: AST-2024-4417
Date:

Stack Parameters

Duct Orientation:	Vertical	
Duct Design:	Circular	
Distance from Far Wall to Outside of Port:	129.50	in
Nipple Length:	6.50	in
Depth of Duct:	123.00	in
Cross Sectional Area of Duct:	82.52	ft^2
No. of Test Ports:	4	
Distance A:	39.0	ft
Distance A Duct Diameters:	3.8	(must be > 0.5)
Distance B:	33.0	ft
Distance B Duct Diameters:	3.2	(must be > 2)
Minimum Number of Traverse Points:	16	
Actual Number of Traverse Points:	16	
Measurer (Initial and Date):	LEW	
Reviewer (Initial and Date):	RUC	



CIRCULAR DUCT

LOCATION OF TRAVERSE POINTS

Number of traverse points on a diameter

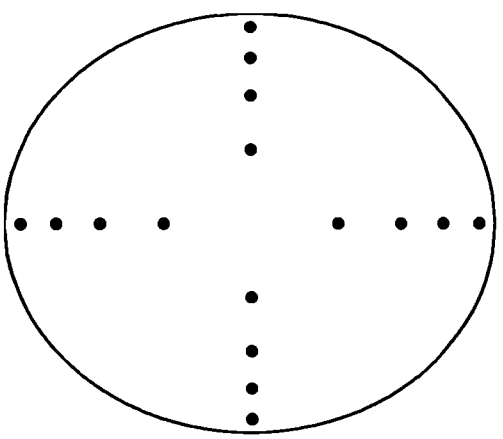
	2	3	4	5	6	7	8	9	10	11	12
1	14.6	--	6.7	--	4.4	--	3.2	--	2.6	--	2.1
2	85.4	--	25.0	--	14.6	--	10.5	--	8.2	--	6.7
3	--	--	75.0	--	29.6	--	19.4	--	14.6	--	11.8
4	--	--	93.3	--	70.4	--	32.3	--	22.6	--	17.7
5	--	--	--	--	85.4	--	67.7	--	34.2	--	25.0
6	--	--	--	--	95.6	--	80.6	--	65.8	--	35.6
7	--	--	--	--	--	--	89.5	--	77.4	--	64.4
8	--	--	--	--	--	--	96.8	--	85.4	--	75.0
9	--	--	--	--	--	--	--	--	91.8	--	82.3
10	--	--	--	--	--	--	--	--	97.4	--	88.2
11	--	--	--	--	--	--	--	--	--	--	93.3
12	--	--	--	--	--	--	--	--	--	--	97.9

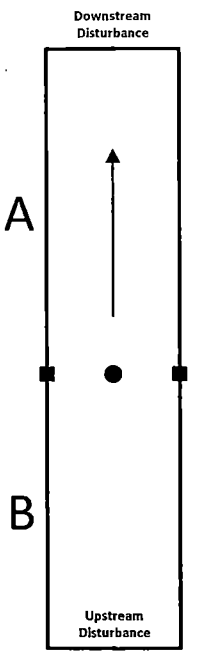
**Percent of stack diameter from inside wall to traverse point.*

Traverse Point	% of Diameter	Distance from inside wall	Distance from outside of port
1	3.2	3.94	10 7/16
2	10.5	12.92	19 7/16
3	19.4	23.86	30 3/8
4	32.3	39.73	46 1/4
5	--	--	--
6	--	--	--
7	--	--	--
8	--	--	--
9	--	--	--
10	--	--	--
11	--	--	--
12	--	--	--

Stack Diagram
A = 39 ft.
B = 33 ft.
Depth of Duct = 123 in.

Cross Sectional Area





Alliance TECHNICAL GROUP

Cyclonic Flow Check

Location Arauco North America - Grayling, MI
Source RTO Exhaust Stack
Project No. AST-2024-4417
Date 10/2/24

Sample Point	Angle (ΔP=0)
1	5
2	8
3	9
4	6
5	5
6	5
7	5
8	5
9	8
10	9
11	9
12	7
13	4
14	5
15	7
16	9
Average	6.6

Location Arauco North America - Grayling, MI

Source RTO Exhaust Stack

Project No. AST-2024-4417

		Run No.	1	2	3
		Date	10/2/24	10/2/24	10/2/24
		Status	VALID	VALID	VALID
		Start Time	13:22	16:26	17:38
		Stop Time	14:28	17:29	18:41
		Leak Check	Pass	Pass	Pass
Moisture Fraction	(BWS)		0.198	0.215	0.207
O2 Concentration, %	(O2)		17.45	17.07	17.03
CO2 Concentration, %	(CO2)		2.51	2.74	2.79
Molecular Weight, lb/lb-mole (dry)	(Md)		29.10	29.12	29.13
Molecular Weight, lb/lb-mole (wet)	(Ms)		26.91	26.73	26.83

Alliance TECHNICAL GROUP

Method 4 Data

Location Arauco North America - Grayling, MI
Source RTO Exhaust Stack
Project No. AST-2024-4417
Parameter(s) BWS, VFR
Console Units / Method ft3 M4

Run No.		1					2					3				
Date		10/2/24					10/2/24					10/2/24				
Status		VALID					VALID					VALID				
Start Time		13:22					16:26					17:38				
End Time		14:28					17:29					18:41				
Run Time, min	(θ)	60					60					60				
Meter ID		C-5000-4					C-5000-4					C-5000-4				
Meter Correction Factor	(Y)	0.986					0.986					0.986				
Orifice Calibration Value	(ΔH @)	1.811					1.811					1.811				
Max Vacuum, in. Hg		4					3					3				
Post Leak Check, ft3/min (at max vac.)		0.010					0.002					0.002				
Meter Volume, ft3																
0		531.072					577.454					623.023				
5		534.880					581.300					626.740				
10		538.560					585.110					630.470				
15		542.321					588.932					634.226				
20		545.120					592.830					638.040				
25		549.950					596.850					641.820				
30		553.730					600.302					645.599				
35		558.170					604.070					649.400				
40		561.480					607.820					653.150				
45		565.191					611.572					656.900				
50		568.990					615.320					660.610				
55		572.820					619.050					664.300				
60		576.615					622.793					668.089				
Total Meter Volume, ft3	(Vm)	45.543					45.339					45.066				
Temperature, °F		Meter	Probe	Filter	Vacuum	Imp. Exit	Meter	Probe	Filter	Vacuum	Imp. Exit	Meter	Probe	Filter	Vacuum	Imp. Exit
0		67	256	--	3	66	69	254	--	3	60	72	231	--	3	61
5		67	256	--	3	52	69	260	--	3	45	73	254	--	3	55
10		68	248	--	3	55	69	261	--	3	47	75	263	--	3	47
15		68	255	--	4	67	70	254	--	3	49	75	265	--	3	47
20		71	264	--	4	63	71	260	--	3	53	76	258	--	3	50
25		72	262	--	4	60	73	260	--	3	53	76	259	--	3	52
30		71	264	--	4	67	73	256	--	3	53	76	257	--	3	53
35		73	258	--	4	51	74	258	--	3	54	77	257	--	3	52
40		73	259	--	4	51	74	260	--	3	55	76	255	--	3	53
45		72	261	--	4	50	75	261	--	3	56	76	259	--	3	54
50		73	257	--	4	49	75	259	--	3	55	77	263	--	3	54
55		74	258	--	4	49	75	260	--	3	55	77	260	--	3	53
60		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Average Temperature, °F	(Tm)	71	258	--	4	57	72	259	--	3	53	76	257	--	3	53
Average Temperature, °R	(Tm)	530	718	--	--	--	532	718	--	--	--	535	716	--	--	--
Minimum Temperature, °F		67	248	--	3	49	69	254	--	3	45	72	231	--	3	47
Maximum Temperature, °F		74	264	--	4	67	75	261	--	3	60	77	265	--	3	61
Barometric Pressure, in. Hg	(Pb)	28.60					28.56					28.53				
Meter Orifice Pressure , in. WC	(ΔH)	1.800					1.800					1.800				
Meter Pressure, in. Hg	(Pm)	28.73					28.69					28.66				
Standard Meter Volume, ft3	(Vmstd)	42.899					42.527					41.971				
Analysis Type		Gravimetric					Gravimetric					Gravimetric				
Impinger 1, Pre/Post Test, g		H2O		713.4	846.8	133.4	H2O		712.1	889.5	177.4	H2O		846.8	935.2	88.4
Impinger 2, Pre/Post Test, g		H2O		702.4	764.5	62.1	H2O		755.2	803.9	48.7	H2O		764.5	888.1	123.6
Impinger 3, Pre/Post Test, g		Empty		643.8	657.8	14.0	Empty		614.2	622.1	7.9	Empty		657.8	669.2	11.4
Impinger 4, Pre/Post Test, g		Silica		798.3	812.9	14.6	Silica		808.9	821.8	12.9	Silica		812.9	821.7	8.8
Volume Water Collected, mL	(Vlc)	224.1					246.9					232.2				
Standard Water Volume, ft³	(Vwstd)	10.569					11.644					10.951				
Moisture Fraction Measured	(BWS)	0.198					0.215					0.207				
Gas Molecular Weight, lb/lb-mole (dry)	(Md)	29.10					29.10					29.10				
DGM Calibration Check Value	(Yqa)	-2.0					-2.7					-3.7				