



Source Test Report

Louisiana-Pacific Corporation
Newberry Plant
7299 LP Mill Road
Newberry, MI 49868

Source Tested: Press System (EUPRESS) RCO
Test Date: August 22, 2024

Project No. AST-2024-3713

Prepared By
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Regulatory Information

Permit Nos. Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Renewable Operating Permit No. #M1-ROP-N0780-2018a,
Permit to Install (PTI) No. 43-19B

Source Information

<i>Source Name</i>	<i>Source ID</i>	<i>Target Parameters</i>
Press System RCO Outlet	EUPRESS / Stack SVPRESSRCOSTACK	PM/PM ₁₀ /PM _{2.5} , NO _x , CO, VOC, formaldehyde, MDI, phenol, methanol, methane

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Alliance Technical Group, LLC (Alliance) has completed the source testing as described in this report. Results apply only to the source tested and operating conditions for the specific test date and times 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.



Edward Juers, QSTI
Alliance Technical Group, LLC

9/19/2024

Date

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Introduction

1.0 Introduction

Alliance Technical Group, LLC (Alliance) was retained by Louisiana-Pacific Corporation (LP) to conduct compliance testing at the Newberry, Michigan facility, which operates under Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. #MI-ROP-N0780-2018a and Permit to Install (PTI) No. 43-19B. Testing was conducted to determine the emission rates of particulate matter (PM), particulate matter 10 microns or less in diameter (PM₁₀), particulate matter 2.5 microns or less in diameter (PM_{2.5}), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC), formaldehyde (CH₂O), methylene diphenyl diisocyanate (MDI), phenol (C₆H₅OH), methanol (CH₃OH), and methane (CH₄) at the outlet (Stack SVPRESSRCOSTACK) of the Press System (EUPRESS) Regenerative Catalytic Oxidizer (RCO).

1.1 Facility Description

LP owns and operates this engineered oriented strand board (OSB) siding manufacturing facility, the Newberry Plant, in Newberry, rural Luce County, Michigan. The facility produces strand board siding for building construction.

The strand board siding process begins with green logs loaded into the log ponds to be warmed before moving up the ladders toward the de-barker. The warmed logs are processed through the de-barker and then cut into smaller sections. The waste bark material is routed to the bark bin as fuel for the two Konus thermal oil heaters (EUKONUSTOH). The debarked, sectioned logs are then fed into the Waferizer to create wood flakes. The flakes are routed to one of two green bins as temporary storage before moving into the dryer. The rotating drum dryer is used to reduce the moisture content of the flakes from about 50% to 5.5% moisture content. From the dryer, the flakes are routed to one of two dry bins as temporary storage for the “surface” or “core” of the board. The flakes then move into the respected “surface” or “core” blenders where additives are mixed in to form the desired properties of the product.

The mixture then moves through the former machines to create the “wet matt”. Fines are added to the top, along with paper overlay before the product enters the press. The board press system (EUPRESS) creates the final thickness and moisture content of the board. The pressed boards then move into the finishing section where they are cut to final dimensions, coated with primer, and graded before being packaged and shipped off-site to customers.

1.2 Source and Control System Descriptions

The Press System (EUPRESS) includes the board press. The press has 17 flights with platens on each flight. The press also incorporates fugitive emissions from the mat forming line.

Emissions from EUPRESS are routed to the RCO, which exhausts through Stack SVPRESSRCOSTACK. SVPRESSRCOSTACK is 100 feet above ground and has an exhaust diameter of 80 inches.

1.3 Project Team

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

Table 1-1: Project Team

Facility Personnel	Patrick Rein
Regulatory Agency	EGLE
Alliance Personnel	Ryan Schuth Leo Peters Joel Thompson Chris Warneke

1.4 Site Specific Test Plan & Notification

Testing was conducted in accordance with the Site-Specific Test Plan (SSTP) submitted to the EGLE.

1.5 Test Program Notes

Run 3 was paused between 14:34 and 14:35. During the 3 runs production averaged 17.6 tons finished product/hr; RCO combustion chamber temp averaged 1150F (set point 1150F). EGLE representatives Joseph Scanlan and Clayton DeRonne were on-site to observe stack testing.

Summary of Results

2.0 Summary of Results

Alliance conducted compliance testing at the LP facility in Newberry, MI on August 22, 2024. Testing consisted of determining the emission rates of PM/PM₁₀/PM_{2.5}, NO_x, CO, VOC, formaldehyde, MDI, phenol, methanol, and methane at the Press System RCO Outlet.

Tables 2-1 through 2-3 provide a summary of the emission testing results with comparisons to the applicable EGLE permit limits. Any difference between the summary of results listed in the following tables and the detailed results contained in the appendices is due to rounding for presentation.

Table 2-1: Summary of Results – Particulate Matter

Run Number	Run 1	Run 2	Run 3	Average
Date	8/22/24	8/22/24	8/22/24	--
Particulate Matter Data¹				
Total PM Emission Rate, lb/hr	2.6	1.1	1.6	1.8
Permit PM/PM ₁₀ /PM _{2.5} Limit, lb/hr	--	--	--	6.69
Percent of Limit, %	--	--	--	27
Total PM Emission Rate, ton/yr	11.5	4.8	7.2	7.8
Permit PM/PM ₁₀ /PM _{2.5} Limit, ton/yr	--	--	--	28.09
Percent of Limit, %	--	--	--	28

¹ Total PM is the sum of filterable and condensable PM and is considered PM₁₀ and PM_{2.5}.

Table 2-2: Summary of Results – NO_x, CO, VOC, Formaldehyde, Methanol, & Methane

Run Number	Run 1	Run 2	Run 3	Average
Date	8/22/24	8/22/24	8/22/24	--
Nitrogen Oxides Data				
Emission Rate, lb/hr	0.90	0.95	1.1	0.97
Permit Limit, lb/hr	--	--	--	2.67
Percent of Limit, %	--	--	--	36
Carbon Monoxide Data				
Emission Rate, lb/hr	0.57	0.46	0.43	0.49
Permit Limit, lb/hr	--	--	--	1.92
Percent of Limit, %	--	--	--	25
Emission Rate, ton/yr	2.5	2.0	1.9	2.1
Permit Limit, ton/yr	--	--	--	8.10
Percent of Limit, %	--	--	--	26
Volatile Organic Compounds (NMEHC as Carbon) Data¹				
Emission Rate, lb/hr	0.15	0.25	0.40	0.26
Permit Limit, lb/hr	--	--	--	4.92
Percent of Limit, %	--	--	--	5
Emission Rate, ton/yr	0.65	1.1	1.7	1.2
Permit Limit, ton/yr	--	--	--	20.71
Percent of Limit, %	--	--	--	6
Formaldehyde Data (FTIR)				
Emission Rate, lb/hr	0.84	0.81	0.77	0.81
Permit Limit, lb/hr	--	--	--	1.23
Percent of Limit, %	--	--	--	66
Emission Rate, lb/yr	7,380.1	7,137.7	6,721.0	7,079.6
Permit Limit, lb/yr	--	--	--	10,400
Percent of Limit, %	--	--	--	68
Methanol Data				
Concentration, ppmvd	0.92	0.91	0.88	0.91
Emission Rate, lb/hr	0.33	0.33	0.32	0.33
Methane Data				
Concentration, ppmvd	1.5	1.3	1.2	1.3
Emission Rate, lb/hr	0.26	0.23	0.22	0.24

¹ "NMEHC" is "nonmethane-ethane hydrocarbons."

Table 2-3: Summary of Results – MDI & Phenol

Run Number	Run 1	Run 2	Run 3	Average
Date	8/22/24	8/22/24	8/22/24	--
MDI Data				
Emission Rate, lb/hr	0.070	0.079	0.093	0.081
Permit Limit, lb/hr	--	--	--	0.33
Percent of Limit, %	--	--	--	24
Phenol Data				
Emission Rate, lb/hr	0.077	0.075	0.068	0.073
Permit Limit, lb/hr	--	--	--	3.78
Percent of Limit, %	--	--	--	2

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 D.

Table 3-1: Source Testing Methodology

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Volumetric Flow Rate	1, 2	Full Velocity Traverses
Oxygen/Carbon Dioxide	3A	Instrumental Analysis
Moisture Content	4	Gravimetric Analysis
Particulate Matter	5 & 202	Isokinetic Sampling
Nitrogen Oxides	7E	Instrumental Analysis
Carbon Monoxide	10	Instrumental Analysis
Volatile Organic Compounds	25A	Instrumental Analysis
Formaldehyde/Methanol/Methane/Moisture Content	320	FTIR – Continuous Sampling
MDI	OTM-14	Isokinetic Sampling
Formaldehyde & Phenol	NCASI 98.01	Constant Rate Sampling

3.1 U.S. EPA Reference Test Methods 1 and 2 – Sampling/Traverse Points and Volumetric Flow Rate

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 (for isokinetic sampling) or Figure 1-2 (measuring velocity alone) in U.S. EPA Reference Test Method 1.

Full velocity traverses were conducted in accordance with U.S. EPA Reference Test Method 2 to determine the average stack gas velocity pressure, static pressure and temperature. The velocity and static pressure measurement system consisted of a pitot tube and inclined manometer. The stack gas temperature was measured with a K-type thermocouple and pyrometer.

Stack gas velocity pressure and temperature readings were recorded during each test run. The data collected was utilized to calculate the volumetric flow rate in accordance with U.S. EPA Reference Test Method 2.

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

The oxygen (O₂) and carbon dioxide (CO₂) testing was 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, heated Teflon sample line, 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. The quality control measures are described in Section 3.11.

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 Methods 5 and 202 – Total Particulate Matter

The total particulate matter (filterable and condensable PM) testing was conducted in accordance with U.S. EPA Reference Test Methods 5 and 202. The complete sampling system consisted of a stainless steel nozzle, glass-lined probe, pre-weighed quartz filter, coil condenser, un-weighed Teflon filter, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of a coiled condenser and four (4) chilled impingers. The first, and second impingers were initially empty, the third contained 100 mL of de-ionized water and the last impinger contained 200-300 grams of silica gel. The un-weighed 90 mm Teflon filter was placed between the second and third impingers. The probe liner heating system was maintained at a temperature of $248 \pm 25^{\circ}\text{F}$, and the impinger temperature was maintained at 68°F or less throughout testing. The temperature of the Teflon filter was maintained greater than 65°F but less than or equal to 85°F .

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run. Condensate was collected in the first dry impinger, therefore the front-half of the sample train (the nozzle, probe, and heated pre-weighed filter) was removed in order to purge the back-half of the sample train (coil condenser, first and second impingers and CPM filter). A glass bubbler was inserted into the first impinger. If needed, de-ionized ultra-filtered (DIUF) water was added to the first impinger to raise the water level above the bubbler, then the coil condenser was replaced. Zero nitrogen was connected to the condenser, and a 60-minute purge at 14 liters per minute was conducted. After the completion of the nitrogen purge the impinger contents were measured for moisture gain.

The pre-weighed quartz filter was carefully removed and placed in container 1. The probe, nozzle and front half of the filter holder were rinsed six (6) times with acetone to remove any adhering particulate matter and these rinses were recovered in container 2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for filterable particulate matter analysis.

The contents of impingers 1 and 2 were recovered in container CPM Cont. #1. The back half of the filterable PM filter holder, the coil condenser, impingers 1 and 2 and all connecting glassware were rinsed with DIUF water and then rinsed with acetone, followed by hexane. The water rinses were added to container CPM Cont. #1 while the solvent rinses were recovered in container CPM Cont. #2. The Teflon filter was removed from the filter holder and placed in container CPM Cont. #3. The front half of the condensable PM filter holder was rinsed with DIUF water and then with acetone, followed by hexane. The water rinse was added to container CPM Cont. #1 while the solvent rinses were added to container CPM Cont. #2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory for condensable particulate matter analysis.

3.5 U.S. EPA Reference Test Method 7E – Nitrogen Oxides

The nitrogen oxides (NO_x) testing was conducted in accordance with U.S. EPA Reference Test Method 7E. 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 3.11.

3.6 U.S. EPA Reference Test Method 10 – Carbon Monoxide

The carbon monoxide (CO) testing was conducted in accordance with U.S. EPA Reference Test Method 10. 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 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 3.11.

3.7 U.S. EPA Reference Test Method 25A –Volatile Organic Compounds

The volatile organic compounds (VOC) testing was conducted in accordance with U.S. EPA Reference Test Method 25A. Total hydrocarbon as propane data was collected online and reported in one-minute averages. The sampling system consisted of a stainless-steel probe, heated Teflon sample line(s) and the identified gas analyzer. The quality control measures are described in Section 3.12.

Methane and ethane was measured using EPA Reference Test Method 320 and was subtracted from the total hydrocarbon as propane results to get non-methane/ethane hydrocarbons as propane.

3.8 U.S. EPA Reference Test Method 320 – Formaldehyde, Methanol, Methane, Ethane & Moisture

The concentrations of formaldehyde, methanol, methane, and moisture were determined in accordance with U.S. EPA Reference Test Method 320. Each source gas stream was extracted at a constant rate through a heated probe, heated filter and heated sample line and analyzed with a MKS MultiGas 2030 FTIR operated by a portable computer. The computer has FTIR spectra of calibration gases stored on the hard drive. These single component calibration spectra are used to analyze the measured sample spectra. The gas components to be measured were selected from the spectra library and incorporated into the analytical method. The signal amplitude, linearity, and signal to noise ratio were measured and recorded to document analyzer performance. A leak check was performed on the sample cell. The instrument path length was verified using ethylene as the Calibration Transfer Standard. Dynamic spiking was performed using a certified standard of the target compound or appropriate surrogate in nitrogen with sulfur hexafluoride blended as a tracer to calculate the dilution factor. All test spectra, interferograms, and analytical method information are recorded and stored with the calculated analytical results. The quality control measures are described in Section 3.13.

3.9 U.S. EPA Reference Test Method OTM – 14 – Methylene Diphenyl Diisocyanate (MDI)

The methyl diphenyl diisocyanate (MDI) testing was conducted accordance with U.S. EPA Reference Test Method OTM-14. Gaseous and/or aerosol isocyanates are withdrawn from an emission source at an isokinetic sampling rate and are collected in a multicomponent sampling train. The complete sampling system consisted of a glass nozzle, heated glass-lined probe, gas conditioning train, pump and calibrated dry gas meter. The gas conditioning train consisted of six (6) chilled impingers – the first contained 300 mL of the absorption solution (1-2-pyridyl-piperazine

in toluene), the second and third contained 200 mL of the absorption solution, the fourth was empty, the fifth contained a known amount (2/3 full) of activated charcoal and the sixth contained a known amount of silica gel. The probe liner and filter heating systems was maintained at a temperature of $120 \pm 14^{\circ}\text{C}$ ($248 \pm 25^{\circ}\text{F}$) and the impinger temperature was maintained at 20°C (68°F) or less throughout the testing.

Following the completion of each test run, the sampling train was leak checked at a vacuum pressure greater than or equal to the highest vacuum pressure observed during the run, and the contents of the impingers were measured for moisture gain. The probe and nozzle were rinsed and brushed three (3) times with toluene followed by acetonitrile to remove any adhering particulate matter. This rinse was recovered in container 1. The impinger contents of the first impinger along with the toluene and acetonitrile rinses of the first impinger were also added to container 1. The impinger contents of the second, third and fourth impinger along with the toluene and acetonitrile rinses of these impingers, connecting glassware and condenser were added to container 2. All containers were sealed, labeled and liquid levels marked for transport to the identified laboratory.

3.10 National Council for Air and Stream Improvement Method 98.01 – Formaldehyde & Phenol

The formaldehyde and phenol concentrations were determined in accordance with National Council for Air and Stream Improvement (NCASI) Method 98.01. The source gas was withdrawn at a constant sampling rate through a glass probe, impinger train and a dry gas meter using a leak free pump. The impinger train consisted of three (3) midget impingers with the first two impingers containing 15-20 mL of DI water. The third impinger contained a known mass of silica gel.

Following the completion of each test run, the sample train was leaked checked at a vacuum pressure equal to or greater than the highest vacuum observed during the test run. The contents of the impingers were measured and placed in a 40-mL vial. The impingers and all connecting glassware were rinsed with DI water, and these rinses were added to the sample vial. The samples were sealed, liquid levels marked, labeled and shipped to the identified laboratory for analysis.

3.11 Quality Assurance/Quality Control – U.S. EPA Reference Test Methods 3A, 7E and 10

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 ppmv/% 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 ppmv/% (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 ppmv/% (whichever was less restrictive) was recorded. If the Low-Level gas was zero gas, the response was 0.5 ppmv/% 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 ppmv/% 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 ppmv/% 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 ppmv/% absolute difference. If the drift exceeded 3 percent or 0.5 ppmv/%, 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.

Because the pollutant concentration at each traverse point did not differ more than 5 percent or 0.5 ppmv/0.3% (whichever was less restrictive) of the average pollutant concentration, single point sampling was conducted during the test runs. Copies of stratification check data can be found in the Quality Assurance/Quality Control Appendix.

An NO₂ – NO converter check was performed on the analyzer prior to initiating testing. Mid-level nitrogen oxide protocol 1 calibration gas was mixed at a 1:1 ratio with span level protocol 1 oxygen calibration gas in a Tedlar sample bag to form NO₂ gas. The NO₂ gas was delivered to the nitrogen oxides analyzer directly from a Tedlar sample bag. The response of the analyzer was stable for the 30-minute duration of the test with the variation less than 2.0% at the end of the test from the maximum value of the test.

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.

3.12 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.

3.13 Quality Assurance/Quality Control – U.S. EPA Reference Method 320

EPA Protocol 1 Calibration Gases – 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.

After providing ample time for the FTIR to reach the desired temperature and to stabilize, zero gas (nitrogen) was introduced directly to the instrument sample port. While flowing nitrogen the signal amplitude was recorded, a background spectra was taken, a linearity check was performed and recorded, the peak to peak noise and the root mean square in the spectral region of interest was measured and a screenshot was recorded.

Following the zero gas checks, room air was pulled through the sample chamber and the line width and resolution was verified to be at 1879 cm⁻¹, the peak position was entered and the FWHH was recorded (screenshot). Following these checks, another background spectra was recorded and the calibration transfer standard (CTS) was introduced directly to the instrument sample port. The CTS instrument recovery was recorded and the instrument mechanical response time was measured.

Next, stack gas was introduced to the FTIR through the sampling system and several scans were taken until a stable reading was achieved. The native concentration of our surrogate spiking analyte (acetaldehyde) was recorded. Spike gas was introduced to the sampling system at a constant flow rate $\leq 10\%$ of the total sample flow rate and a corresponding dilution ratio was calculated along with a system response time. Matrix spike recovery spectra were recorded and were within the $\pm 30\%$ of the calculated value of the spike concentration that the method requires.

The matrix spike recovery was conducted once at the beginning of the testing and the CTS recovery procedures were repeated following each test run. The corresponding values were recorded.