1. Introduction

AECOM Technical Services Inc. (AECOM) was contracted by DDP Specialty Electronic Materials US, LLC(DuPont) in Midland, Michigan, Specialty Monomers (Spec Mono) Plant to conduct performance testing on their site Tar Incinerator (EU95) during the week of June 7, 2021. The performance testing consisted of measurements for nitrogen oxides (NO_X) emissions. The following sections present the regulatory background, objectives, description, and schedule of the planned testing program.

Table 7 of the Commercial and Industrial Solid Waste Incineration Units (CISWI) Guidelines Rule (40 CFR 60, Subpart DDDD) requires that observations for fugitive ash be conducted during performance testing; however, the incinerator does not create ash or have an ash handling system. DDP/DuPont proposed using the installed Continuous Opacity Monitoring System (COMS) currently installed on the unit to demonstrate compliance with this requirement of the rule.

The results of testing are presented in Table 1-1. Details supporting these data are presented in the balance of this report.

Table 1-1 Emissions Testing Results

Sample Type	Test Method	Sampling Time (min/run)	Allowable Emission Rate	Actual Emission Rate
NO_X	EPA Method 7E	60 min	76 ppmv @ 7% O_2	60.84 ppmv @ 7% O_2

1.1 Regulatory Background

On March 21, 2011, in parallel with the publication of the Boiler National Emission Standards for Hazardous Air Pollutants (NESHAP) rules and the Non-Hazardous Secondary Materials (NHSM) rule, EPA promulgated the final updates to the New Source Performance Standards (NSPS) and Emission Guidelines (EG) for Existing CISWI Units, collectively referred to as the "2011 CISWI Rules." The 2011 CISWI Rules impact any facility that owns an emission unit that "combusts, or has combusted in the preceding six months, any solid waste as that term is defined in 40 CFR Part 241.2." The CISWI rules were then reconsidered and amended in 2013. The final version of the CISWI Rules/Guidelines were published in the Federal Register on February 7, 2013. The final rule is titled: Subpart DDDD—Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) then promulgated the state rules on January 2, 2019: Rule R 336.1974 Emissions Standards for Existing Commercial and Industrial Solid Waste Incinerators.

Per Section 60.2720(a)(3) of the Federal CISWI rule as referenced by the Michigan Rule R 336.1974(9)(g), DDP reduced the frequency of testing for certain constituents to a triennial frequency following successful completion of the two tests in July 2018 and June 2019. The next performance test will include the entire list of constituents that will be performed in 2022.

The successful completion of the June 2020 performance test included measurements for only nitrogen oxides (NOx). These results showed the NOX test results were at a level equal to or less than 75% of the applicable emission limit.

Parameters measured during the June 2021 performance test include nitrogen oxides (NOX) with O2 concentrations measured for excess air correction.

This test report addresses the compliance performance test for NOx emissions.

The table below illustrates the summary of the parties involved as well as information related to the emission testing.

Responsible Groups	• DDP Specialty Electronic Materials US, LLC (DuPont) • Michigan Department of Environment, Great Lakes, and Energy (EGLE) • United States Environmental Protection Agency (US EPA)
Applicable Regulations	• MI-ROP-P1027-2020 • 40 CFR Part 60 Commercial and Industrial Solid Waste Incineration Units MACT (Subpart DDDD) • EGLE Air Quality Division Part 9, Rule 336.1974
Industry/Plant	• Specialty Monomers, 1130 Building
Plant Location	• Midland, Michigan I-Park Facilities, 48640
Unit Initial Start-up	• 1990
Air Pollution Control Equipment	• N/A
Emission Points	• EU-95 Tar Incinerator)
Pollutants/Diluent Measure	• Nitrogen Oxides (NO_x) • Oxygen (O_2)
Test Date	• June 8, 2021

1.2 Key Personnel

The key personnel coordinating this test program are:

- Alex Gagliardi (DuPont) provided support as the Process Focal Point. The Process Focal Point is responsible for coordinating the plant operation during the test and ensuring the unit is operating at the agreed-upon conditions in the test plan. They also serve as the key contact for collecting any process data required and providing all technical support related to process operation.

- Teresa Schwartz and Michael Holmes (DuPont) provided support as the Environmental Focal Point for this test. The Environmental Focal Point is responsible for ensuring that all regulatory requirements and citations are reviewed and considered for the testing. All agency communication will be completed through this role. Contact information is 989-264-7105 for Teresa and 989-264-7032 for Michael.

- James Edmister (AECOM) served as the Test Plan Coordinator. The Test Plan Coordinator is responsible for the overall leadership of the sampling program. They also develop the overall testing plan and determine the correct sample methods.

- Wayne Washburn (AECOM) provided support as a technical review of the test data.

- Randy Reinke (AECOM) served as the Sample Team Leader. The sample Team Leader is responsible for ensuring the data generated meets the quality assurance objectives of the plan. Quincy Crawford (AECOM) and Cheyanne Laux (AECOM) assisted as the sampling technicians.

2. Plant and Sampling Location Descriptions

2.1 Facility Description

DuPont operates a tar incinerator (EU95) at its Midland, Michigan chemical manufacturing facility. EU95 is a boiler that produces steam from the heat input of natural gas and process tars. The process tars contain distillation heavies from the 1130 building process and process aids from the distillation process. The boiler heat input is rated for 48 MMBtu/hr while the burner is rated for 15 MMBtu/hr. EU95 must meet the requirements of the CISWI Rule promulgated under Subpart DDDD of 40 CFR Part 60, as referenced by EGLE Rule R 336.1974, and is regulated as an Energy Recovery Unit under the rule.

2.2 Performance Test Operations

The Performance Test was conducted at one operating condition to demonstrate the system performance with regard to the emission standards listed in Table 1-1. During each test run, Continuous Monitoring System (CMS) parameters were monitored, and stack gas emissions were measured. The following sections briefly summarize these activities associated with the Performance test.

2.2.1 Unit Process Data

Process monitoring information pertinent to establishing that the unit was operating at normal conditions were recorded during the test by the EU-95 Tars Incinerator data acquisition system. One-minute average data was obtained from the process control system during each test run for each operating parameter specified in the test plan. For each operating parameter, an average value was calculated for each test run.

Figure 1 EU95 Tar Incinerator Process Schematic

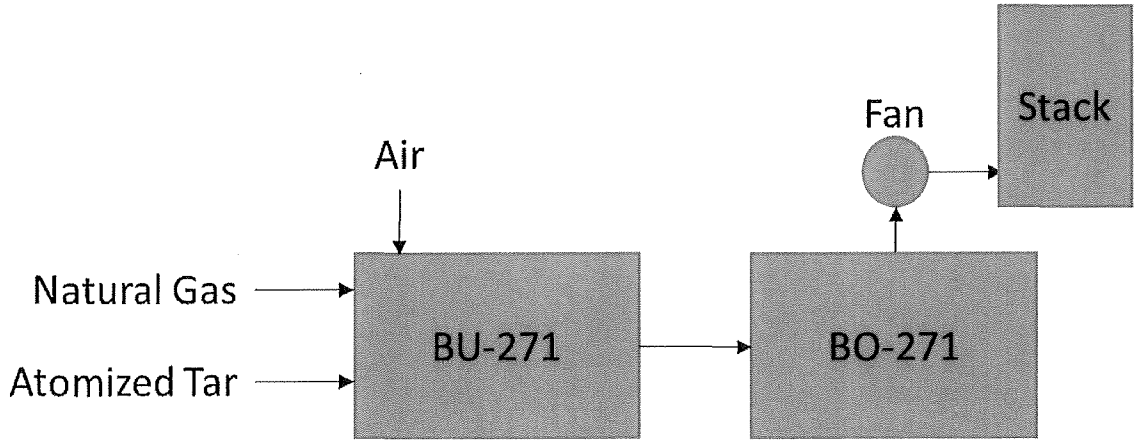


Table 2-1 Manufacturer's Name and Model Number

Equipment	Manufacturer	Model Number
BU-271	Bloom	S-1610-022
BO-271	Johnston	509 Series

3. Summary and Discussion of Performance Test

3.1 Objectives and Test Matrix

The primary objective of this testing is to demonstrate compliance with the requirements of 40 CFR 60, Subpart DDDD. The Performance Testing of the Incinerator Stack NO_x emissions was performed in strict accordance with the procedures specified in 40 CFR 60, Appendix A. This test report describes the instrumental measurements procedures performed on the Incinerator Stack located within the DuPont Specialty Monomers Plant.

Emission parameters measured during the June 2021 Performance Test included NO_X. O_2 diluent gas concentrations were also measured for excess air correction of NOx emissions. The NOx emission concentrations in the exhaust gas were measured using the following methods and procedures:

Table 3-1 presents the exhaust gas parameters, test methods, and emission limits.

Table 3-1 Test Matrix and Objectives

Parameter	Test Method	Regulation	Emission Limit
O_2/CO_2	EPA Method 3A	40 CFR 60, Subpart DDDD	N/A
NO_X	EPA Method 7E	40 CFR 60, Subpart DDDD	76 ppmv @ 7% O_2

The compliance test was conducted on June 8, 2021 under normal process operating conditions. The emissions testing of the Incinerator Stack consisted of three (4) test runs for NO_X. The second (2) run was invalidated due to an AECOM sample conditioner malfunction.

3.2 Process Operating Rates

As required by the federal regulations and EGLE guidance, all sampling was completed at normal operating conditions. The table below outlines the normal and tested operating rates.

Parameter	Normal Operating Rate	Operating Rate During Testing
Heat Input (MMBtu/hr)	4-13	8-9
Tars Feed Rate (lb/hr)	180-420	408 - 422
Natural Gas Feed Rate (scfh)	1450-9000	1419 - 1505
O_2 in Vent Stack (%)	9-15	10.3 - 10.8

The normal operating rates were determined by reviewing the process data from the previous six months of operation and deciding the typical operating range of the unit. The average values do not include data recorded during CMS calibration, process startup, process shutdown, process malfunction, or data obtained when not burning waste.

Table 3-2 Reference Method Test Runs Data (NO_x)

	Run 1	Run 2*	Run 3	Run 4	Average For Validated Runs
Run Date	6/8/2021	6/8/2021	6/8/2021	6/8/2021	
Run Times	9:00-10:00	10:21-11:21	13:45-14:45	15:04-16:04	
Stack Gas O_2 (%)	12.69	12.57	12.45	12.66	12.60
Nitrogen Oxides					
ppmvd (actual)	36.9	37.11	35.2	36.71	36.31
ppmvd @ 7% O_2	62.5	61.92	58.03	61.92	60.84

*Run 2 was invalidated to due to an AECOM gas conditioner malfunction. Data from the invalidated second run will be in the appendix.

4. Sampling and Analytical Procedures

4.1 Sampling Time

The duration of each test run for instrumental analyzer measurements of NOx and O_2 was sixty (60) minutes.

4.2 Number of Test Runs

Four (4) test runs were performed for each parameter concurrently. The second (2) run was invalidated due to an AECOM sample conditioner malfunction.

4.3 Sample Port Location

The stack is approximately 40-ft high with an inside diameter of 35 inches at the elevation of the sampling ports. The sampling ports are approximately 64 inches downstream from the closest disturbance (stack breach) and 108 inches upstream from the next nearest disturbance (stack exit). The number of sampling points at this port location was determined in accordance with EPA Method 7E for instrumental analyzer measurements. Figure 2 and Figure 3 present schematics of the sampling points and test port locations.

4.4 Instrumental Analyzer Methods

Exhaust gas was withdrawn from the Incinerator Stack and transported to the AECOM instrumental analyzers located in a mobile laboratory at ground level. A stainless-steel sampling probe was inserted into the stack and used to collect sample gas. A heated Teflon sample line was used to transport the sample gas from the sampling probe to the sample conditioning system. At the mobile laboratory, stack exhaust gas was dried using a condenser and routed to the individual analyzers for analysis on a dry basis. Data were collected using a dedicated data acquisition system. The system stores the data as fifteen-second averages.

Each analyzer was calibrated before testing using gas standards as specified by EPA Methods 7E and 3A for NOx and O_2, respectively. Only EPA Protocol gases or certified pure zero nitrogen and air gases were used for calibration.

Method compliance is ensured by performing:

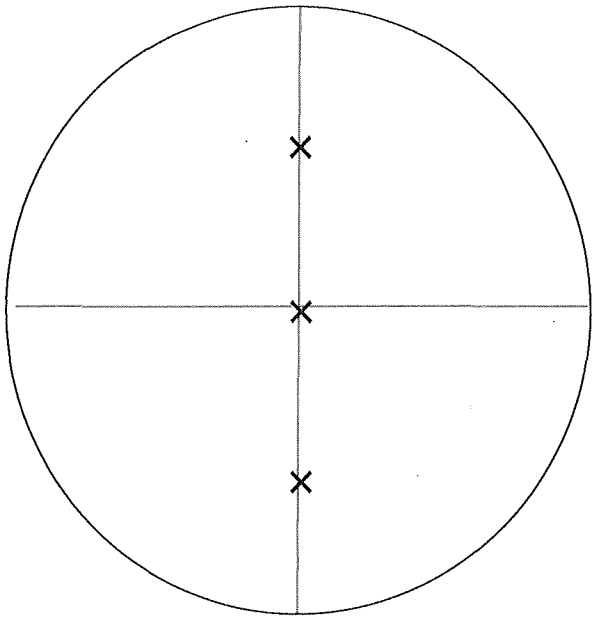
- Calibration error (challenging the instrument directly at three levels, zero, mid, and high)
- System bias (challenging the overall system at two levels, zero and mid)
- System response time testing
- Stratification check to determine the level of stratification and, subsequently, the number of sample points to be traversed during each test run
- System drift (repeating the system bias test after each run)

A schematic of the instrumental sampling system is shown in Figure 4.

The following instruments were used:

- EPA Method 3A (O_2) – Servomex 4900 Multi-gas; paramagnetic
- EPA Method 7E (NO_X) – Thermo Scientific IQ Series 42; chemiluminescent NO detector.

Figure 2 Sample Points



Stack Diameter 2.9 feet

Point	Percentage of Diameter	Distance from Wall (feet)
1	16.7	0.48
2	50.0	1.45
3	83.3	2.42

*A three-point traverse was used in accordance with EPA Method 7E to determine stratification, after a stratification check was performed the source was found to be not stratified. Therefore, single point sampling was acceptable.

Figure 3 Sample Ports Location

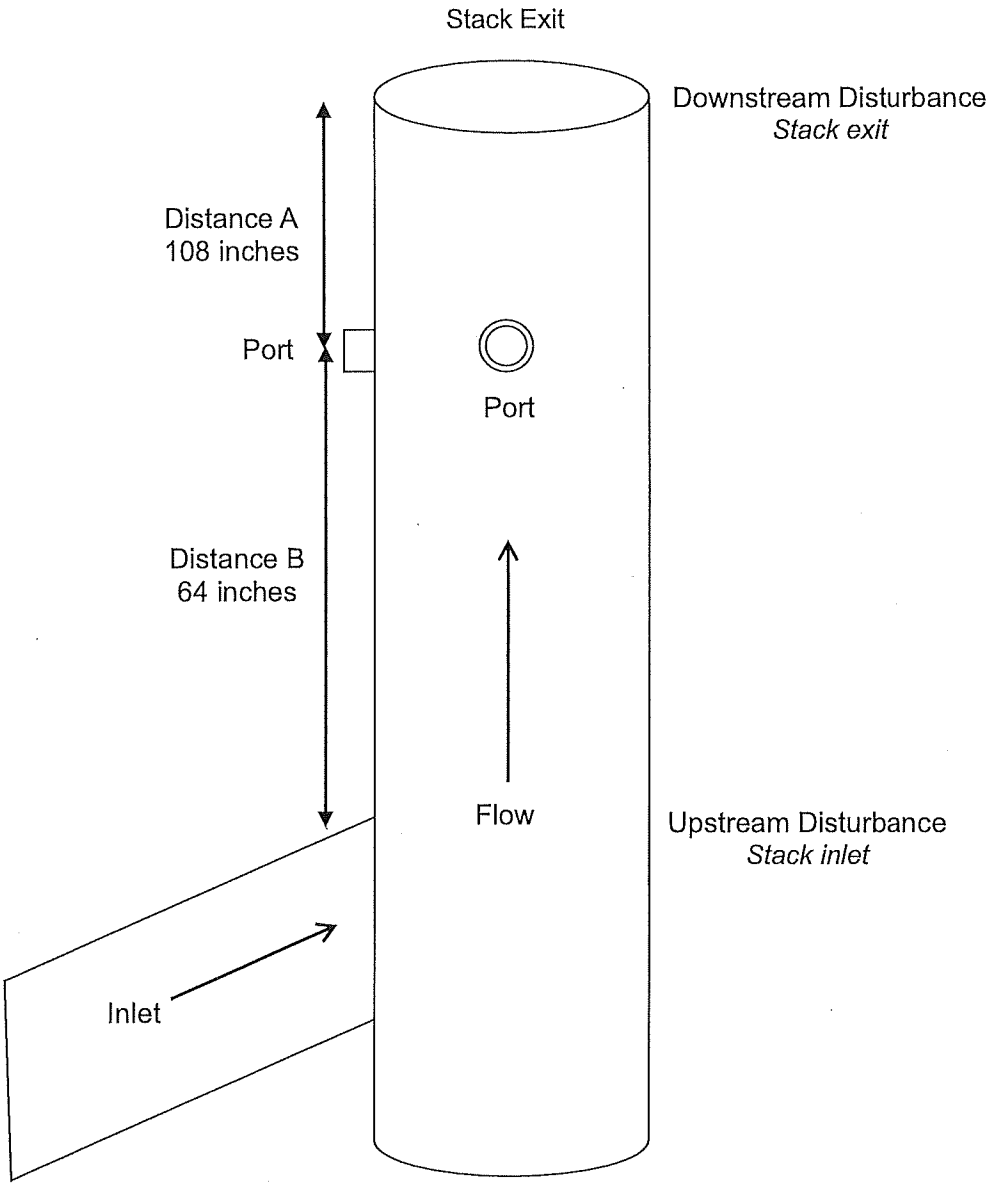
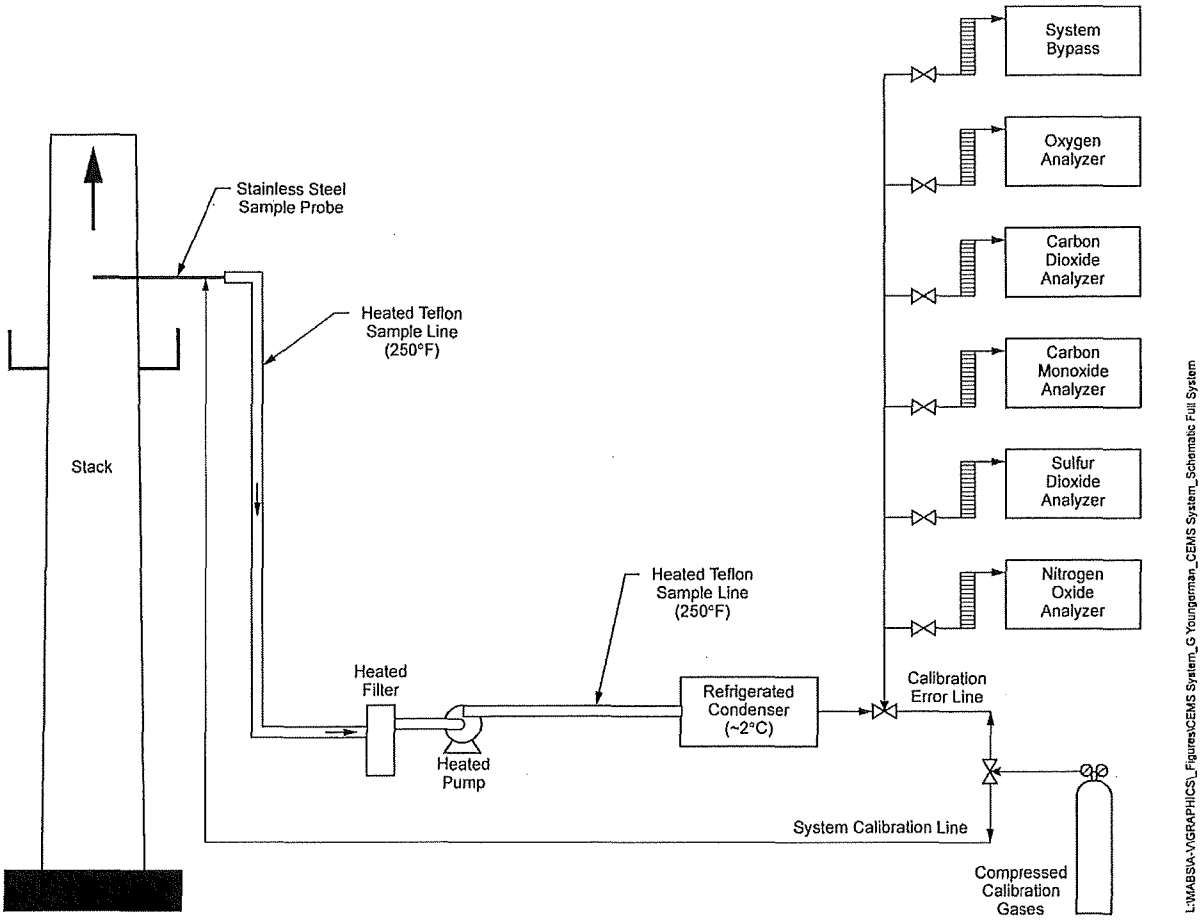


Figure 4 Schematic of AECOM Instrumental Measurements System



5. Calculation Examples

Analyzer Calibration Error Calculations

The calibration error test consisted of challenging each reference method analyzer directly at three measurement points against known calibration gas values. Calibration error for each analyzer is calculated using the following equation:

$$CE_{RM} = \frac{|Analyzer\ Response - Calibration\ Gas\ Value|}{Span\ of\ Analzyer} \times 100$$

Reference O_2 Calibration Error Example (Run 1)

$$CE_{RM} = \frac{|(0.0\ \%) - (0.00\ \%)|}{(19.95\ \%)} \times 100 = \underline{0.0\ \%}$$

$$CE_{RM} = \frac{|(20.00\ \%) - (19.95\ \%)|}{(19.95\ \%)} \times 100 = \underline{0.3\ \%}$$

$$CE_{RM} = \frac{|(10.11\ \%) - (10.06\ \%)|}{(19.95\ \%)} \times 100 = \underline{0.3\ \%}$$

System Bias Calculations

The system bias test consisted of challenging the reference method sample acquisition and conditioning system at two measurement points against the calibration gas values. System bias calculations for the reference method system are calculated using the following equation:

$$SB_{RM} = \frac{System\ Calibration\ Response - Analzyer\ Calibration\ Response}{Span\ of\ Analzyer} \times 100$$

Reference O_2 Initial System Bias Example (Run 1)

$$SB_{RM} = \frac{|(0.04\%) - (0.00\ \%)|}{(19.95\ \%)} \times 100 = \underline{0.2\ \%}$$

$$SB_{RM} = \frac{|(9.96\ \%) - (10.11\ \%)|}{(19.95\ \%)} \times 100 = \underline{-0.8\ \%}$$

System Drift Calculations

The system bias and drift tests were conducted at the beginning and end of each run. Analyzer maintenance, repair, or adjustment were not performed until each post run system drift response was recorded. System drift for the reference method result is calculated using the following equation:

$$SD_{RM} = \frac{|Final\ System\ Cal\ Response - Initial\ System\ Cal\ Response|}{Span\ of\ Analzyer} \times 100$$

Reference O_2 System Drift Run #1 Example

$$SD_{RM} = \frac{|(0.07\ \%) - (0.04\ \%)|}{(19.95\ \%)} \times 100 = \underline{0.2\ \%}$$

$$SD_{RM} = \frac{|(9.96\ \%) - (9.96\ \%)|}{(19.95\ \%)} \times 100 = \underline{0.0\ \%}$$

System Bias and Drift Correction

The test run average gas concentrations measured by the reference method analyzers are corrected for system calibration bias and drift. The concentrations are calculated using the following equations:

$$C_{Gas} = (\overline{C} - C_O)\left(\frac{C_{MA}}{C_M - C_O}\right)$$

where: C_{Gas} = Bias Corrected Effluent Concentration, dry ppm or %
$\overline{C}$ = Average Measured Concentration, ppm or %
C_O = Average Initial and Final System Calibration Responses for Zero Gas, ppm or %
C_M = Average Initial and Final System Calibration Responses for Upscale Calibration Gas, ppm or %
C_{MA} = Certified Concentration of Upscale Calibration Gas, ppm or %

O_2 System Bias and Drift Correction for Run #1 Example

$$C_{Gas} = (12.55\ \% - 0.06\ \%)\left(\frac{10.06\ \%}{9.96\% - 0.06\ \%}\right) = \underline{12.69\%}$$

Effluent Concentration Correction for Exhaust Gas Oxygen

The test run average gas concentrations are corrected to seven percent exhaust gas oxygen (@ 7% O_2). The O_2 corrected concentrations are calculated using the following equation:

$$P_{Corr} = P_{meas} \times \frac{20.9 - O_{2\,std}}{20.9 - O_{2\,meas}}$$

P_{Corr} = Pollutant Concentration, corrected to the oxygen standard

P_{meas} = Measured concentration of Pollutant

$O_{2\,std}$ = Oxygen concentration to be used for a standard

$O_{2\,meas}$ = Oxygen concentration measured

Effluent Concentration Corrected for Oxygen Concentration Run #1 Example

For NOx, Run 1

P_{meas}		36.96	ppm
$O_{2\,std}$		7.00	%
$O_{2\,meas}$	=	12.69	%

$$P_{Corr} = 36.91 \times \frac{(\ 20.90 - 7.00\ )}{(\ 20.90 - 12.69\ )}$$

P_{Corr} = 62.57ppm

6. Field test Data

Emission Summary Table
1130 CISWI 2021
1130 (DuPont)
1046 Throx

Run Identification	1046 Throx Run 1	1046 Throx Run 2 - Invalidated	1046 Throx Run 3	1046 Throx Run 4	Average of Validated Runs
Run Date	6/8/21	6/8/21	6/8/21	6/8/21	
Run Time	09:00-10:00	10:21-11:21	13:45-14:45	15:04-16:04	
Exhaust Gas Conditions					
Oxygen (dry volume %)	12.69	12.57	12.45	12.66	12.60
Nitrogen Oxides					
Concentration (ppmvd)	36.96	37.11	35.27	36.71	36.31
Concentration (ppmvd @7% Oxygen)	62.57	61.92	58.03	61.92	60.84

1130 CISWI 2021

Oxygen Calibration Data Summary

Facility:	1130 (Dupont)
Source:	1046 Throx
Project Number:	60630292
Date:	8-Jun-21
Instrument Make/Model:	Servomex 4900 MultiGas
Instrument Name/ID	100286
Calibration Span Value:	19.95
Analyzer Range:	25
Units:	%vol dry
Technician(s):	Crawford

Calibration Error Test Results

	Cylinder ID	Certified Value	Time	CEM Response	Absolute Difference	Cal Error (% of Span)
					0.5% Limit	2.0% Limit
zero gas	Nitrogen	0.00	7:15	0.00	0.00	0.0%
span gas	EB0013219	19.95	7:35	20.00	0.05	0.3%
mid-range	EB0013518	10.06	7:39	10.11	0.05	0.3%

Calibration Error Test Results

	Cylinder ID	Certified Value	Time	CEM Response	Absolute Difference	Cal Error (% of Span)
					0.5% Limit	2.0% Limit
zero gas	Nitrogen	0.00	12:14	0.01	0.01	0.1%
span gas	EB0013219	19.95	12:34	20.01	0.06	0.3%
mid-range	EB0013518	10.06	12:36	10.12	0.06	0.3%

CEMS Calibration Bias and Drift Tests

Cylinder Value	Calibration Error CEMS Response	Time	Pre-Test CEMS Response	Bias (% of Span) 5.0% Limit	Time	Post-Test CEMS Response	Bias (% of Span) 5.0% Limit	Drift (% of Span) 3.0% Limit	Calculated Factors from Equation 7E-5	
0.00	0.00	7:48	0.04	0.2%	10:06	0.07	0.4%	0.2%	C_O	0.057
10.06	10.11	7:55	9.96	-0.8%	10:13	9.96	-0.8%	0.0%	$C_{MA}/(C_M-C_O)$	1.016
0.00	0.00	10:06	0.07	0.4%	11:25	0.10	0.5%	0.1%	C_O	0.087
10.06	10.11	10:13	9.96	-0.8%	13:24	10.29	0.9%	1.7%	$C_{MA}/(C_M-C_O)$	1.002
0.00	0.01	11:25	0.10	0.5%	13:17	0.60	3.0%	2.5%	C_O	0.350
10.06	10.12	13:24	10.29	0.9%	14:57	10.29	0.9%	0.0%	$C_{MA}/(C_M-C_O)$	1.012
0.00	0.01	13:17	0.60	3.0%	14:51	0.62	3.1%	0.1%	C_O	0.610

1130 CISWI 2021

Nitrogen Oxides Calibration Data Summary

Facility:	1130 (Dupont)
Source:	1046 Throx
Project Number:	60630292
Date:	8-Jun-21
Instrument Make/Model:	ThermoScientific IQ Series
Instrument Name/ID	1190952425
Calibration Span Value:	60.66
Analyzer Range:	100
Units:	ppmv dry
Technician(s):	Crawford

Calibration Error Test Results

	Cylinder ID	Certified Value	Time	CEM Response	Absolute Difference	Cal Error (% of Span)
					0.5ppm Limit	2.0% Limit
zero gas	Nitrogen	0.00	7:15	-0.04	0.04	0.1%
span gas	CC206057	60.66	7:23	60.69	0.03	0.1%
mid-range	CC406550	29.90	7:25	30.03	0.13	0.2%

NO_2 Challenge Gas Converter Efficiency Test Results

Cylinder ID	Certified Value	Time	CEM Response	Recovery (%)	≥90%?
CC503946	49.90	7:32	46.93	94.0	PASS

Calibration Error Test Results

	Cylinder ID	Certified Value	Time	CEM Response	Absolute Difference	Cal Error (% of Span)
					0.5ppm Limit	2.0% Limit
zero gas	Nitrogen	0.00	12:14	-0.01	0.01	0.0%
span gas	CC206057	60.66	12:21	60.17	0.49	0.8%
mid-range	CC406550	29.90	12:31	29.71	0.19	0.3%

CEMS Calibration Bias and Drift Tests

Cylinder Value	Calibration Error CEMS Response	Time	Pre-Test CEMS Response	Bias (% of Span) 5.0% Limit	Time	Post-Test CEMS Response	Bias (% of Span) 5.0% Limit	Drift (% of Span) 3.0% Limit	Calculated Factors from Equation 7E-5	
0.00	-0.04	7:48	0.57	1.0%	10:06	0.57	1.0%	0.0%	C_O	0.568
29.90	30.03	7:50	29.67	-0.6%	10:09	29.39	-1.1%	-0.5%	$C_{MA}/(C_M-C_O)$	1.032
0.00	-0.04	10:06	0.57	1.0%	11:25	0.67	1.2%	0.2%	C_O	0.618
29.90	30.03	10:09	29.39	-1.1%	13:21	28.90	-1.9%	-0.8%	$C_{MA}/(C_M-C_O)$	1.048
0.00	-0.01	11:25	0.67	1.1%	13:17	0.44	0.7%	-0.4%	C_O	0.557
29.90	29.71	13:21	28.90	-1.3%	14:54	29.25	-0.8%	0.6%	$C_{MA}/(C_M-C_O)$	1.048
0.00	-0.01	13:17	0.44	0.7%	14:51	0.53	0.9%	0.1%	C_O	0.485
29.90	29.71	14:54	29.25	-0.8%	16:15	29.41	-0.5%	0.3%	$C_{MA}/(C_M-C_O)$	1.037

Response Time
Method 7E

Applicable to Performance of EPA Methods 3A, 6C, 7E and 10

Project Name	1130 CISWI 2021
Project Number	60630292
Date	8-Jun-21
Facility	1130 (Dupont)
Source	1046 Throx

Parameter		Oxides of Nitrogen		Oxygen		Oxides of Nitrogen		Oxygen	
Analyzer Make and Model		ThermoScientific IQ Series		Servomex 4900		ThermoScientific IQ Series		Servomex 4900 MultiGas	
Analyzer Name		1190952425		100286		1190952425		100286	
Analyzer Range		100		25		100		25	
From		Zero	Upscale	Zero	Upscale	Zero	Upscale	Zero	Upscale
To		Upscale	Zero	Upscale	Zero	Upscale	Zero	Upscale	Zero
Start Time (hh:mm) [1]		8:03:00	8:06:40	8:16:40	8:21:10	13:28:30	13:32:00	13:34:50	13:37:10
Instrument Readings at individual Times	10 sec	0.41	59.8	0.02	19.74	0.41	58.43	0.59	19.83
	20 sec	0.4	59.8	0.02	19.74	0.4	58.45	0.59	19.84
	30 sec	0.39	59.78	0.02	19.75	0.4	58.45	0.59	19.84
	40 sec	0.4	59.79	0.02	19.75	0.39	58.46	0.6	19.84
	50 sec	0.05	60.24	0.58	19.52	0.39	58.38	0.6	19.81
	60 sec	7.83	52.03	9.5	11.6	0.48	58.36	0.62	19.69
	70 sec	52.28	2.25	16.11	3.32	-0.29	26.52	0.7	13.57
	80 sec	51.71	2.44	18.36	1.07	45.52	22.78	6.59	4.61
	90 sec	51.62	1.22	19.18	0.48	53.01	4.65	15.04	1.75
	100 sec	52.67	1.19	19.45	0.31	52.83	1.01	18.16	0.99
	110 sec	59.15	0.97	19.55	0.24	52.63	0.77	19.28	0.76
	120 sec	59.19	0.96	19.59	0.21	57.2	0.73	19.65	0.69
	130 sec	59.4	0.84	19.62	0.19	58.1	0.63	19.77	0.66
	140 sec	59.42	0.83	19.64	0.18	58.22	0.61	19.81	0.64
	150 sec	59.54	0.77	19.65	0.17	58.24	0.55	19.83	0.64
	160 sec	59.57	0.76	19.66	0.16	58.25	0.54	19.83	0.66
	170 sec	59.73	0.7	19.67	0.15	58.25	0.5	19.84	0.66
	180 sec								
	190 sec								
	200 sec								
	210 sec								
Response Time 2		110	70	90	90	120	100	110	100
Analyzer Response Time 3		110		90		120		110	

1 – Clock time when valve turned to change instrument.

2 – Time to reach 95% of final stable value (seconds)

3 – Greater of upscale and downscale response time

Stratification Determination – EPA Method 7E

Applicable to Performance of EPA Methods 3A, 6C, 7E and 10

Analyte: Oxygen
Facility: 1130 (Dupont)
Source: 1046 Throx
Project Number: 60630292
Date: 8-Jun-21
Instrument Make/Model: Servomex 4900 MultiGas
Instrument Name/ID 100286
Calibration Span Value: 19.95
Analyzer Range: 25
Units: %vol dry
Technician(s): Crawford

Traverse Points (3 are required)	Time of Day	Concentration	Difference from Mean	Percent Difference from Mean
1	9:04:00	12.55	0.02	0.19
2	9:08:10	12.63	0.10	0.82
3	9:12:20	12.40	0.13	1.01
4	--	--	--	--
5	--	--	--	--
6	--	--	--	--
7	--	--	--	--
8	--	--	--	--
9	--	--	--	--
10	--	--	--	--
11	--	--	--	--
12	--	--	--	--
Mean Concentration of all Traverse Points		12.53		
Maximum Deviation from Mean			0.13	
Maximum Percent Deviation from Mean				1.01

Stratification Test Criteria			
Do the concentrations at each traverse point differ from the mean concentration by no more than:	(a) ±5.0% of the mean or (b) ±0.5 ppm {0.3% O_2 or CO_2} *whichever is less restrictive*	YES	**Use 1 point**
If the criterion above is not met. Do the concentrations at each traverse point differ from the mean concentration by no more than:	(a) ±10.0% of the mean or (b) ±1.0 ppm {0.5% O_2 or CO_2} *whichever is less restrictive*	NO	
	If the criteria above are not met	NO	

Project: 1130 CISWI 2021
Facility: 1130 (Dupont)
Source: 1046 Throx
Project ID: 60630292

Corrected Oxygen Concentration					
8-Jun-21	Time	Uncorrected Concentration (%)	Eq. 7E-5 Factors		Bias Corrected Concentration (%)
			C_O	$C_{MA}/(C_M-C_O)$	
1046 Throx Run 1	09:00-10:00	12.55	0.06	1.02	12.69
1046 Throx Run 2 - Invalidated	10:21-11:21	---	0.34	1.03	---
1046 Throx Run 3	13:45-14:45	12.59	0.61	1.04	12.45
1046 Throx Run 4	15:04-16:04	12.79	0.61	1.04	12.66

Corrected Nitrogen Oxides Concentration					
8-Jun-21	Time	Uncorrected Concentration (ppmv)	Eq. 7E-5 Factors		Bias Corrected Concentration (ppmv)
			C_O	$C_{MA}/(C_M-C_O)$	
1046 Throx Run 1	09:00-10:00	36.31	0.57	1.03	36.9
1046 Throx Run 2 - Invalidated	10:21-11:21	---	0.51	1.04	---
1046 Throx Run 3	13:45-14:45	34.16	0.49	1.05	35.2
1046 Throx Run 4	15:04-16:04	35.86	0.49	1.04	36.7

SUMMARY DATA - COMPLIANCE TESTING

08-Jun-21

	Time	Oxides of Nitrogen (ppmv dry)	Oxygen (%vol dry)
1046 Throx Run 1	09:00-10:00	36.31	12.55
1046 Throx Run 2 - Invalidated	10:21-11:21	37.11	12.57
1046 Throx Run 3	13:45-14:45	34.16	12.59
1046 Throx Run 4	15:04-16:04	35.86	12.79

CALIBRATION SUMMARY

08-Jun-21

	Time	Oxides of Nitrogen (ppmv dry)	Oxygen (%vol dry)
Cal Error Zero 1 - Nitrogen	7:15	-0.04	0.00
Cal Error Hi 1 - CC206057	7:23	60.69	0.00
Cal Error Mid 1 - CC406550	7:25	30.03	0.00
Conv Check 1 - CC503946	7:32	46.93	0.09
Cal Error Hi 1 - EB0013219	7:35	0.20	20.00
Cal Error Mid 1 - EB0013518	7:39	0.04	10.11
System Bias Zero 1 - Nitrogen	7:48	0.57	0.04
System Bias Mid 1 - CC406550	7:50	29.67	0.03
System Bias Mid 1 - EB0013518	7:55	0.68	9.96
Strat Check 1 -	9:04	37.31	12.55
Strat Check 2 -	9:08	37.78	12.63
Strat Check 3 -	9:12	34.81	12.40
System Bias Zero 2 - Nitrogen	10:06	0.57	0.07
System Bias Mid 2 - CC406550	10:09	29.39	0.05
System Bias Mid 2 - EB0013518	10:13	0.64	9.96
System Bias Zero 3 - Nitrogen	11:25	0.67	0.10
Cal Error Zero 2 - Nitrogen	12:14	-0.01	0.01
Cal Error Hi 2 - CC206057	12:21	60.17	0.01
Cal Error Mid 2 - CC406550	12:31	29.71	0.01
Cal Error Hi 2 - EB0013219	12:34	0.02	20.01
Cal Error Mid 2 - EB0013518	12:36	-0.02	10.12
System Bias Zero 4 - Nitrogen	13:17	0.44	0.60
System Bias Mid 3 - CC406550	13:21	28.90	0.59
System Bias Mid 3 - EB0013518	13:24	0.57	10.29
System Bias Zero 5 - Nitrogen	14:51	0.53	0.62
System Bias Mid 4 - CC406550	14:54	29.25	0.60