FINAL REPORT

ST MARYS CEMENT

CHARLEVOIX, MICHIGAN

2024 RELATIVE ACCURACY TESTING AUDIT (RATA) SOURCE TESTING EUINLINEKILN – TOTAL HYDROCARBONS (THC)

RWDI #2409155

October 1, 2024

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by St Marys Cement Company U.S. LLC (SMC) to complete the Relative Accuracy Testing Audit (RATA) emission sampling program at their facility located at 16000 Bells Bay Road, Charlevoix, Michigan. The test program was conducted to fulfill the requirements of the Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) # MI-ROP-B1559-2014, Permit To Install (PTI) 140-15C, and in accordance with NESHAP for Portland Cement Manufacturing Industry and Standards for Performance for Portland Cement Plants, 40 CFR Part 63, Subpart LLL,40 CFR 52, Subpart X and 40 CFR 60, Subpart F and Appendix B. The testing report only includes the results from the RATA testing on Total Hydrocarbons (THC). The annual RATA testing for nitrogen oxides (NOx), sulfur dioxide (SO_2), oxygen (O_2), and carbon dioxide (CO_2) was completed on June 19th, 2024 and previously reported to EGLE. Mercury RATA results will be provided under a separate report.

In addition, the THC CEMs unit that is owned and operated by SMC is being serviced and was not available during the RATA. SMC has had a rental unit in place at the plant since June of 2024. Therefore, this RATA was completed on the rental unit. SMC plans to complete another RATA on the SMC owned equipment once the repairs are made and the equipment is confirmed to be operating correctly.

The following parameters were measured/calculated in the source testing program:

Kiln Main Stack (EUINLINEKILN):

- Total Hydrocarbons (THC) (ppmv(wet))

The annual RATA was completed under normal operating conditions.

An initial attempt was made (five (5) runs completed) on August 6th, 2024. This data is also included for reference. During the August 6, 2024 event it was determined that the operation of the Reference Method Flame Ionization Analyzer (FIA) fueled by 100% hydrogen was not comparable to the SMC FIA that is fueled by a mixture of hydrogen/helium. Therefore, the RATA was aborted on August 6th, 2024. The September 10, 2024 RATA was completed with a more comparable Reference Method analyzer (fueled by the same hydrogen/helium mix ratio).

Executive Table i: Results Summary – EUINLINEKILN – September 10, 2024

Parameter	Performance Test Data		Relative Accuracy (RA)	
	Reference Method Data	CEMS Data	Performance Demonstrated	Performance Required
Total Hydrocarbons (THC, ppmv(wet))	58.91	53.13	10.8%	20%
Total Number of Runs	12	12	12	--
Number of Runs Used in RA	9	9	9	Minimum of 9
Average Clinker Production (tons/hr)	254.62			--

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1 INTRODUCTION

RWDI USA LLC (RWDI) was retained by St Marys Cement Company U.S. LLC (SMC) to complete the Relative Accuracy Testing Audit (RATA) emission sampling program at their facility located at 16000 Bells Bay Road, Charlevoix, Michigan. The test program was conducted to fulfill the requirements of the Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) # MI-ROP-B1559-2014, Permit To Install (PTI) 140-15C, and in accordance with NESHAP for Portland Cement Manufacturing Industry and Standards for Performance for Portland Cement Plants, 40 CFR Part 63, Subpart LLL,40 CFR 52, Subpart X and 40 CFR 60, Subpart F and Appendix B. The testing report only includes the results from the RATA testing on Total Hydrocarbons (THC). The annual RATA testing for nitrogen oxides (NOx), sulfur dioxide (SO_2), oxygen (O_2), carbon dioxide (CO_2) that was completed on June 19th, 2024 and previously reported to EGLE. Mercury RATA results will be provided under a separate report.

In addition, the THC CEMs unit that is owned and operated by SMC is being serviced and was not available during the RATA. SMC has had a rental unit in place at the plant since June of 2024. Therefore, this RATA was completed on the rental unit. SMC plans to complete another RATA on the SMC owned equipment once the repairs are made and the equipment is confirmed to be operating correctly.

The following parameters were measured/calculated in the source testing program:

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The annual RATA was completed under normal operating conditions.

An initial attempt was made (five (5) runs completed) on August 6th, 2024. This data is also included for reference. During the August 6, 2024 event it was determined that the operation of the Reference Method Flame Ionization Analyzer (FIA) fueled by 100% hydrogen was not comparable to the SMC FIA that is fuel by a mixture of hydrogen/helium. Therefore, the RATA was aborted on August 6th, 2024. The September 10, 2024 RATA was completed with a more comparable Reference Method analyzer (fueled by the same hydrogen/helium mix ratio).

1.1 Location and Dates of Testing

THC RATA testing on EUINLINEKILN on September 10, 2024. The test program was completed at SMC at 16000 Bells Bay Road, in Charlevoix, Michigan.

1.2 Purpose of Testing

The testing was conducted to fulfill the requirements of Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit (ROP) # MI-ROP-B1559-2014, Permit To Install (PTI) 140-15C, and in accordance with NESHAP for Portland Cement Manufacturing Industry and Standards for Performance for Portland Cement Plants, 40 CFR Part 63, Subpart LLL and 40 CFR 60, Subpart F and Appendix B

1.3 Personnel Involved in Testing

Table 1.3.1: Testing Personnel

Personnel (Title & Email)	Affiliation	Phone Number
Laurie Leaman Environmental Manager Laurie.Leaman@vcimentos.com	**St Mary Cement**	(231) 237-1387
Brad Bergeron Technical Director Brad.Bergeron@rwdi.com	**RWDI USA LLC** 24445 Forterra Drive Warren, MI 48089	(248) 234-3885
Steve Smith Project Manager Steve.Smith@rwdi.com		(971) 940-5038
Mason Sakshaug Supervisor, Source Mason.Sakshaug@rwdi.com		(989) 323-0355
Roy Zimmer Field Technician Roy.Zimmer@rwdi.com		
Kate Strang Field Technician Kate.Strang@rwdi.com		(248) 841-8442
Shane Rabideau Field Technician Shane.Rabideau@rwdi.com		

2 SOURCE DESCRIPTION

SMC owns and operates a Portland cement manufacturing facility located on the shores of Lake Michigan at 16000 Bells Bay Road in Charlevoix, Charlevoix County, Michigan. Operations include one dry process in-line rotary kiln, quarry operations; conveying, storage, grinding, and blending systems for raw materials; a preheater tower; a clinker cooler; clinker conveying, storage, and grinding systems; cement storage systems; and shipping facilities.

Particulate from the kiln process is controlled by a baghouse on the kiln exhaust system. Dust collectors, engineered controls, and/or dust suppression systems have been installed at various locations throughout the facility to control particulate matter from other processes.

2.1 Kiln (EUINLINEKILN)

Table 2.1.1: Summary of Sampling Program – Kiln (EUINLINEKILN)

	EUINLINEKILN
Emission Unit Description [Including Process Equipment & Control Device(s)]	Represents the in-line calciner with indirect firing, in-line kiln with indirect firing and equipment associated with the treatment of exhaust gases including the north conditioning tower, south conditioning tower and the Kiln Main Stack baghouse
Parameter Tested	Total Hydrocarbons (THC)
Stack Dimensions	127"
Traverse Points	3
Testing Monitoring Methods	Refer to Section 4.0
Testing Schedule	Refer to Section 1.1

The sampling ports for the RATA testing are located outside the building within the exhaust duct. During the RATA, SMC personnel operated kiln process to ensure they are operating within at least 50% of maximum load. For each 21-minute test, three (3) points were traversed at 16.7%, 50% and 83.3% as noted in the Source Testing Plan and shown in **Figure 1**.

2.2 Operating Data

SMC personnel collected the process data and verified the unit was operating correctly and production was at acceptable capacity. The process data for the Kiln is in **Appendix B**.

2.3 Applicable Permit Number

MI-ROP-B1559-2014 and PTI 140-15C.

2.4 Process Flow Sheet or Diagram (if applicable)

Process flow diagram is available upon request.

2.5 Type and Quantity of Raw and Finished Materials

Raw materials are primarily limestone and smaller portions of iron, alumina, and silica. Finished materials are clinker and cement.

2.6 Process Instrumentation Monitored During the Test

Plant personnel recorded the following process data:

Kiln (EUINLINEKILN)

- CEMS Outputs (ppmv(wet))
- Production Rate (tons per hour)

2.7 Continuous Emission Monitors Specifications

The following is a list of the monitors related to this program at SMC.

Table 2.7.1: Summary of SMC Real Time Monitoring System (Rental) – EUINLINEKILN

Parameter	Flow Rate
Make:	CAI
Model:	700LX HFID
Serial No.:	212115
Span:	200 ppm

2.8 Reference Method Analyzers

The following outlines the Reference Method analyzers used on-site during the RATA testing.

Table 2.8.1: Reference Method (RM) CEMS Analyzers – September 10, 2024

Pollutant	Specifications		
	Manufacturer	Serial Number	Range
Total Hydrocarbons (THC)	CAI 700LX HFID	2402048	0-200 ppm

3 SAMPLING AND ANALYTICAL PROCEDURES

3.1 Description of Sampling Train and Field Procedures

3.1.1 Summary of Specific Methodologies for EUINLINEKILN

3.1.1.1 Relative Accuracy Testing Audit (RATA) Total Hydrocarbons (THC)

To satisfy the Total Hydrocarbons (THC) CEMs data accuracy requirement, the relative accuracy result for a minimum of nine performance test runs must meet the criteria outlined in section 13.2 of the USEPA Performance Specification 2. A 21-minute period is used for each test run. As per Performance Specification 2 Section 8.1.3.2 each sampling point is to be located on a line at 16.7%, 50.0%, and 83.3% of the stack diameter. Each point was 7 minutes in duration for each RATA run. Performance Specification 8A, references Performance Specification 2 as the main guidance document.

RWDI operated the reference method heated line at between 250 and 340°F to avoid any condensation. The RATA data for Total Hydrocarbons was measured as ppmv(wet).

Method Listing:

The following test methods are referenced for the test program. These methods can be found in 40 CFR, Part 60, Appendix A and B.

Method 25A: Determination of Total Hydrocarbon Emissions from Stationary Sources.

Performance Specification 8A: Specifications and Test Procedures for Total Hydrocarbon Continuous Emissions Monitoring Systems in Stationary Sources

EPA Method 25A

THC measurements were taken at the outlet following USEPA Method 25A for Total Hydrocarbon (as Propane). Regular performance checks on the CEMS were carried out by zero and span calibration checks using USEPA Protocol calibration gases. These checks verified the ongoing precision of the monitor with time by introducing pollutant-free (zero) air followed by known calibration gas (span) into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gases was reviewed frequently as an ongoing indication of analyzer performance.

Prior to testing, a 4-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, low, mid, and high-level calibration gases up the heated line to the probe tip. The calibration error check was performed to confirm that the analyzer response is within ±5% of the certified calibration gas introduced. At the conclusion of each test run a system-bias check was performed to evaluate the percent drift from pre- and post-test system bias checks. The system bias checks were used to confirm that the analyzer did not drift greater than ±3% throughout a test run.

Zero and mid gas calibration checks were conducted both before and after each test run to quantify measurement system calibration drift and sampling system bias. During these checks, the calibration gases were introduced into the sampling system at the probe outlet so that the calibration gases were analyzed in the same manner as the flue gas samples.

A gas sample was continuously extracted from the stack and delivered to the gas analyzer, which measures the pollutant or diluent concentrations in the gas. The analyzers were calibrated on-site using EPA Protocol No. 1 certified calibration mixtures. The probe tip was equipped with a sintered stainless-steel filter for particulate removal or heated filter system. The end of the probe was connected to a heated Teflon sample line, which delivered the sample gases from the stack to the CEM system. The heated sample line is designed to maintain the gas temperature above 300°F in order to prevent condensation of stack gas moisture within the line.

3.2 Description of Recovery and Analytical Procedures

All testing used real time data from the analyzers.

3.3 Sampling Port Description

Stack figures can be found in the **Figures Tab**.

4 PERFORMANCE LIMITS

The applicable emission limits are outlined below.

Table 4.1: RA Requirements – EUINLINEKILN

Parameter	Regulatory Reference	Allowable Limit
Total Hydrocarbons (THC)	Part 60, Appendix B, Performance Specification 8A	20%

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Result

Table 5.1.1: Results Summary – EUINLINEKILN – September 10, 2024

Parameter	Performance Test Data		Relative Accuracy (RA)	
	Reference Method Data	CEMS Data	Performance Demonstrated	Performance Required
Total Hydrocarbons (THC, ppmv(wet))	58.91	53.13	10.8%	20%
Total Number of Runs	12	12	12	--
Number of Runs Used in RA	9	9	9	Minimum of 9
Average Clinker Production (tons/hr)	254.62			--

5.2 Discussion of Results

Based on the results of the RATA, THC was determined to be within acceptable Relative Accuracy (RA) tolerances as per USEPA Performance Specification 2, Section 13.2. The results can be found in the following sections:

- EUINLINEKILN:
  - CEMS Data:
    - Table 2;
    - **Appendix A** for Reference Method
    - **Appendix B** for SMC CEMs Data

Field notes are provided in **Appendix C**. Calibration records can be found in **Appendix D**. **Appendix E** contains example calculations and **Appendix F** contains the Approval Letter from EGLE and a copy of the original Source Testing Plan.

5.3 Variations in Testing Procedures

An initial attempt was made (five (5) runs completed) on August 6th, 2024. This data is also included for reference. During the August 6, 2024 event it was determined that the operation of the Reference Method Flame Ionization Analyzer (FIA) fueled by 100% hydrogen was not comparable to the SMC FIA that is fuel by a mixture of hydrogen/helium. Therefore, the RATA was aborted on August 6th, 2024 and rescheduled to September 10, 2024 to complete the RATA with a more comparable Reference Method analyzer (fueled by the same hydrogen/helium mix ratio).

5.4 Modifications to Program

For the EUINLINEKILN, the original second quarter testing was to include the RATA on the Total Hydrocarbons (THC) in ppmv(wet); however due to repairs being completed on the THC CEMs system, the RATA was delayed until the third quarter of 2024.

5.5 Process Upset Conditions During Testing

There were normal process breaks during production.

5.6 Maintenance Performed in Last Three Months

Only routine maintenance has been performed.

5.7 Re-Test

An initial attempt was made (five (5) runs completed) on August 6th, 2024. This data is also included for reference. During the August 6, 2024 event it was determined that the operation of the Reference Method Flame Ionization Analyzer (FIA) fueled by 100% hydrogen was not comparable to the SMC FIA that is fuel by a mixture of hydrogen/helium. Therefore, the RATA was aborted on August 6th, 2024 and rescheduled to September 10, 2024 to complete the RATA with a more comparable Reference Method analyzer (fueled by the same hydrogen/helium mix ratio).

5.8 Audit Samples

This test did not require any audit samples.

5.9 Laboratory Data

No laboratory data for the RATA test.

5.10 Field Data Sheets

Field data sheets can be found in **Appendix C**.

5.11 Calibration Records

Calibration records can be found in **Appendix D**

5.12 Sample Calculations

Sample calculations can be found in **Appendix E**.

5.13 Source Testing Plan

Source testing plan and EGLE correspondence can be found in **Appendix F**.

TABLES

Table 1: EUINLINEKILN - RATA September 10, 2024 Results

Date: Tuesday, September 10, 2024

Test	RWDI Time		THC				Clinker Production Rate tons/hr
	Start Time (CEMS)	End Time (CEMS)	RM (dppm)	RM (cor)	CEM (ppm)	di (ppm)	
1	9:25	9:45	57.60	57.31	51.68	-5.63	253.55
2	9:56	10:16	59.48	58.65	52.49	-6.16	254.70
3	10:30	10:50	60.44	59.64	53.59	-6.05	254.68
4	10:59	11:19	60.19	59.42	53.12	-6.29	254.74
5	11:35	11:55	60.29	60.05	54.26	-5.80	254.75
6	12:08	12:28	~~60.28~~	~~60.77~~	~~53.98~~	~~-6.78~~	254.75
7	12:45	13:05	58.90	58.65	53.14	-5.51	254.72
8	13:20	13:40	57.77	57.45	53.44	-4.01	254.71
9	13:55	14:15	~~59.28~~	~~59.82~~	~~52.71~~	~~-7.11~~	254.70
10	14:26	14:46	~~59.33~~	~~59.80~~	~~53.18~~	~~-6.62~~	254.66
11	14:56	15:16	59.31	59.71	53.10	-6.60	254.74
12	15:45	16:05	58.22	59.29	53.33	-5.96	254.74
		AVERAGE	--	58.91	53.13	-5.78	254.62
		STDS	--	0.98	0.72	0.75	

n	9
Full Scale	100
$t_{0.975}$	2.306
l d l	5.8
l cc l	0.57
Limit	20% RA
Applicable Standard	--
Relative Accuracy	**10.8%**

Notes:

RM = Reference Method (RWDI measurements)
CEM = Continuous Emission Monitors (St Marys data)
di = Difference between CEMS and RM for each point
n = number of tests
l d l = Absolute mean difference between the CEM and RM results
Blue highlighted and striked data was not used in RA calculation as per PS2 and 8

Table 2: EUINLINEKILN - RATA August 6, 2024 Results

Date: Tuesday, August 6, 2024

Test	RWDI Time		THC				Clinker Prod Rate tons/hr
	Start Time (CEMS)	End Time (CEMS)	RM (dppm)	RM (cor)	CEM (ppm)	di (ppm)	
1	8:50	9:10	36.38	35.30	51.53	16.23	257.64
2	9:40	10:00	49.54	47.98	67.43	19.45	257.59
3	10:25	10:45	40.74	39.96	53.36	13.40	254.81
4	11:12	11:32	31.35	30.41	47.38	16.97	245.94
5	11:55	12:15	28.84	27.80	45.25	17.45	245.03
		AVERAGE	--	36.29	52.99	16.70	252.38
		STDS	--	8.03	8.69	2.20	

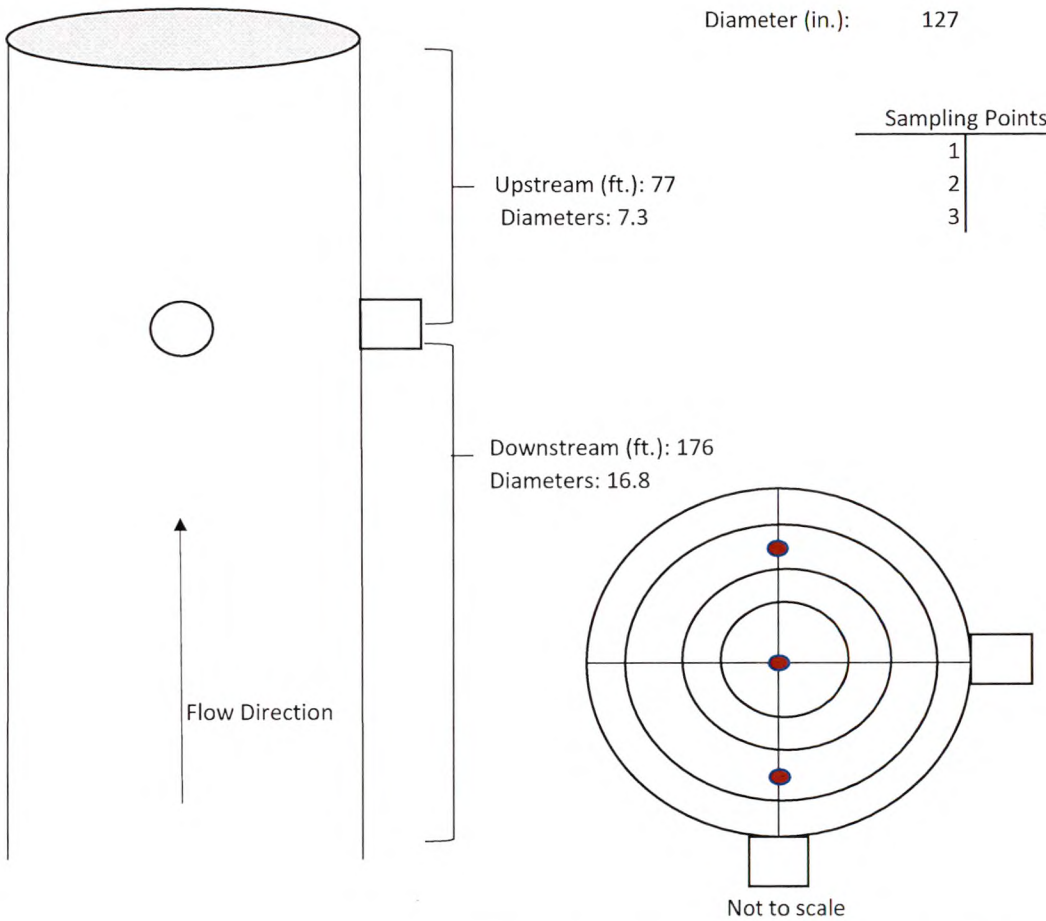
n	5
Full Scale	100
$t_{0.975}$	2.776
I d I	16.7
I cc I	2.73
Limit	20% RA
Applicable Standard	--
Relative Accuracy	**53.5%**

Notes:

RM = Reference Method (RWDI measurements)
CEM = Continuous Emission Monitors (St Marys data)
di = Difference between CEMS and RM for each point
n = number of tests
I d I = Absolute mean difference between the CEM and RM results
Note: St Mary CEMs data is 1-hour behind RWDI CEMs data

FIGURES

Figure No. 1: EUINLINEKILN Stack Diagram

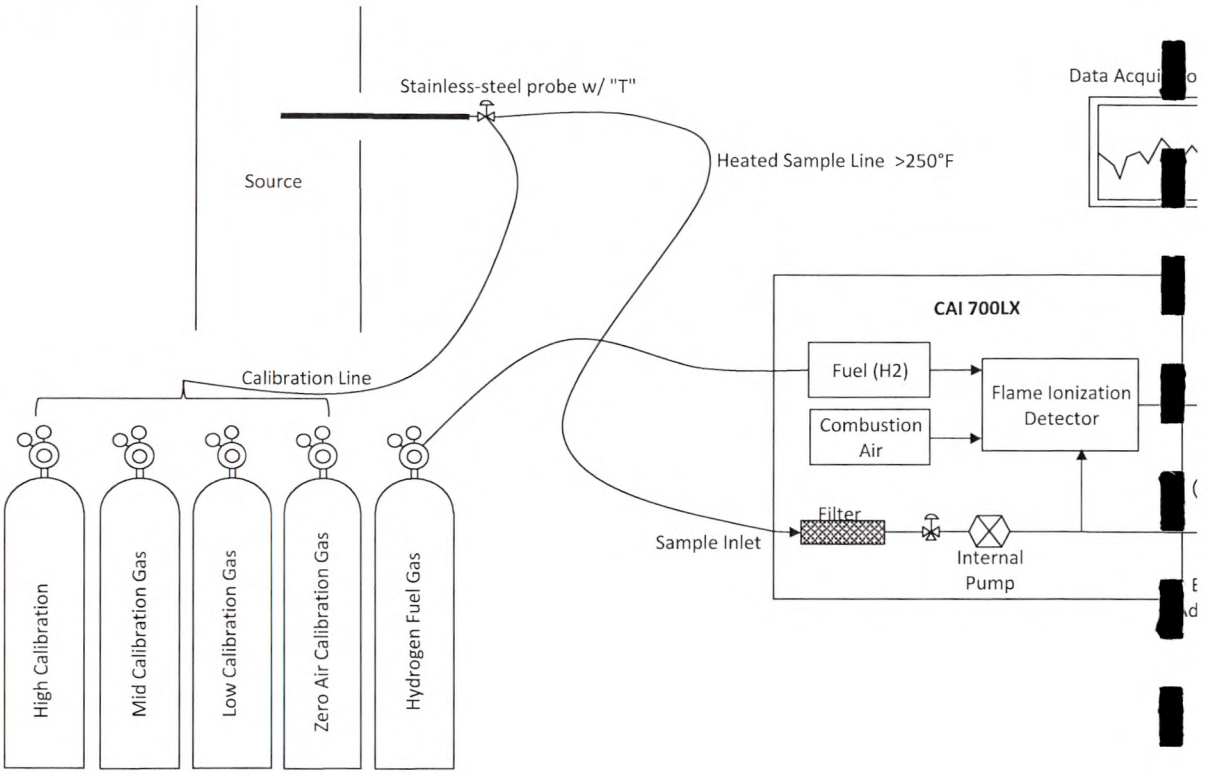


EUINLINEKILN
St Marys Cement U.S., LLC
Charlevoix Plant
Charlevoix, MI

Date:
Aug. 6, 2024 & Sept. 10, 2024

RWDI USA LLC
24445 Forterra Drive
Warren, MI 48089

Figure No. 2: USEPA Method 25A Schematic



USEPA Method 25A

EUINLINEKILN

St Marys Cement U.S., LLC

Charlevoix Plant

Charlevoix, MI

Project# 2409155

Date: Aug. 6th, 2024 and Sept 10, 2024