FINAL REPORT

GERDAU MACSTEEL, INC

MONROE, MICHIGAN

MONROE MILL:
TESTING REPORT - CO & SO2 RATA

RWDI #2300259

November 21, 2022

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) has been retained by Gerdau MacSteel, Inc (Gerdau) to complete the 2022 Relative Accuracy Testing Audit (RATA) program at the Monroe Mill located at 3000 East Front Street, Monroe, Michigan. The testing evaluated carbon monoxide (CO), sulfur dioxide (SO_2), and flowrate from EUEAF. The test program was completed on September 29th, 2022.

Executive Table i: EUEAF Results

Parameter	Pollutant		
	SO_2	CO	Flowrate
RATA Result (%)	5.0%	7.3%	4.5%

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1 INTRODUCTION

RWDI USA LLC (RWDI) has been retained by Gerdau MacSteel, Inc (Gerdau) to complete the 2022 Relative Accuracy Testing Audit (RATA) program at the Monroe Mill located at 3000 East Front Street, Monroe, Michigan. The testing evaluated carbon monoxide (CO), sulfur dioxide (SO_2), and flowrate from EUEAF. The test program was completed on September 29th, 2022.

1.1 Location and Dates of Testing

The test program was completed September 29th, 2022 at the Gerdau Monroe Mill.

1.2 Purpose of Testing

The testing was conducted to fulfill the requirements of Michigan Department of Environment, Great Lakes, and Energy (EGLE) MI-ROP-B7061-2016 and PTI 75-18.

1.3 Description of Source

Gerdau Monroe Mill is a producer of Special Bar Quality (SBQ) steel. The steel-melting process utilizes Electric Arc Furnace Technology (EAF). The EAF is a refractory-lined cylindrical vessel made of steel plates and having a bowl-shaped hearth and a dome-shaped roof. Water-cooled panels are used for the shell and roof to reduce refractory costs. Three electrodes, powered by a transformer, are mounted on a superstructure above the furnace and are lowered and raised through ports in the furnace roof. The electrode conveys the energy for melting the scrap steel. Supplemental energy is provided by an oxy-fuel burner and an oxygen/coke lance which swings into the slag door area and operates during the melting/refining process. The furnace is mounted on curved rockers, which allow tiling for slagging and bottom tapping. The EAF melts scrap metal in a batch operation referred to as a heat.

1.4 Personnel Involved in Testing

Table 1: Testing Personnel

Personnel (Title & Email)	**Affiliation**	**Phone Number**
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2 SUMMARY OF RESULTS

2.1 Operating Data

Gerdau personnel collected the process data and verified the unit was operating correctly and production was at acceptable capacity. The process data can be found in **Appendix A.**

2.2 Applicable Permit Number

MI-ROP-B7061-2016 and PTI 75-18

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

Emissions from the process within the Melt Shop are directed to two baghouses (DVBAGHOUSE-01 and DVLMFBAGHOUSE). DVBAGHOUSE-01 serves EUEAF and accepts emissions captured by the canopy hood in the Melt Shop. DVBAGHOUSE-01 is a positive pressure baghouse with reverse air cleaning. Three main exhaust fans and one direct evacuation control (DEC) fan. The baghouse is equipped with two exhaust stacks, SVBH-01-STACK1 and SVBH-01-STACK2. CO is combusted in the DEC combustion chamber. Screw conveyors transfer the collected baghouse dust to a pneumatic conveying system which transfers the dust into a silo for storage until removed from the site. The second baghouse (DVLMFBAGHOUSE) serves the LMF and VTD operations in the Melt Shop. DVLMFBAGHOUSE is a positive pressure baghouse with reverse air cleaning and is equipped with a single exhaust stack. Dust collected by DVLMFBAGHOUSE is stored in the baghouse hoppers until it is removed from the site.

3.2 Process Flow Sheet or Diagram (if applicable)

Process flow diagram is available upon request.

3.3 Type and Quantity of Raw and Finished Materials

This facility produces steel.

3.4 Normal Rated Capacity of Process

The rated capacity of each process is 900,000 liquid steel tons per year.

3.5 Process Instrumentation Monitored During the Test

Plant personnel recorded the following process data:

- Cast rate (tons/hr)
- Tap amounts (tons)
- CEMS emissions print outs for CO, SO_2, and flowrate

Table 2: Gerdau CEMS Analyzers

Pollutant	Specifications		
	Manufacturer	Serial Number	Range
Sulfur Dioxide	Teledyne API T100	1592	0-150 ppm
Carbon Monoxide	Thermo Scientific 48iQ	1181220015	0-250 ppm 0-2,500 ppm
Flowrate	Rosemount 3051CD	802633	0-3"

4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

4.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following U.S. EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer or digital manometer. Volumetric flow rates were determined following the equal area method as outlined in U.S. EPA Method 2. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "k" thermocouple in conjunction with a calibrated digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in U.S. EPA Method 3A, "Gas Analysis for the Determination of Dry Molecular Weight".

Stack moisture content was determined through direct condensation and according to U.S. EPA Method 4, "Determination of Moisture Content of Stack Gases". A schematic of the Method 1 to 4 sampling train is provided in the **Figure Tab.** A single (1) 30-minute moisture test was conducted for every three (3) RATA tests.

4.1.2 Sampling for Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Oxygen (O_2) and Carbon Dioxide (CO_2)

SO_2, CO_2, O_2, and CO concentrations were determined utilizing RWDI's continuous emissions monitoring (CEM) system. Prior to testing, a 3-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, mid and high-level calibration gases directly into the analyzer. The calibration error check was performed to confirm that the analyzer response is within ±2% of the certified calibration gas introduced. Prior to each test run, a system-bias test was performed where known concentrations of calibration gases were introduced at the probe tip to measure if the analyzers response was within ±5% of the introduced calibration gas concentrations. 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 upscale calibration checks were conducted both before and after each test run to quantify measurement system calibration drift and sampling system bias. Upscale is either the mid- or high-range gas, whichever most closely approximates the flue gas level. 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 a series of gas analyzers, which measure 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. 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 was designed to maintain the gas temperature above 250°F to prevent condensation of stack gas moisture within the line.

Before entering the analyzers, the gas sample passed directly into a refrigerated condenser, which cools the gas to approximately 35°F to remove the stack gas moisture. After passing through the condenser, the dry gas entered a Teflon-head diaphragm pump and a flow control panel, which delivered the gas in series to the analyzers. Each of these analyzers measured the respective gas concentrations on a dry volumetric basis.

4.2 Description of Recovery and Analytical Procedures

There were no samples to recover during this test program. All testing used real time data from the analyzers.

4.3 Sampling Port Description

Stack figures can be found in the **Figures Tab**. The EUEAF stacks met USEPA Method 1 requirements.

5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

Table 3: Table of Results

Parameter	Pollutant		
	SO_2	CO	Flowrate
RATA Result (%)	5.0%	7.3%	4.5%

5.2 Discussion of Results

The EUEAF was within the limits. The CEMS spreadsheets can be found in **Appendix B** and the flowrate spreadsheets can be found in **Appendix C**.

5.3 Variations in Testing Procedures

The testing program followed the test plan provided in **Appendix D**.

5.4 Process Upset Conditions During Testing

There were normal process breaks during production.

5.5 Maintenance Performed in Last Three Months

Only routine maintenance has been performed.

5.6 Re-Test

This was not a retest.

5.7 Audit Samples

This test did not require any audit samples.

5.8 Calibration Sheets

Calibration sheets can be found in **Appendix E**.

5.9 Sample Calculations

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

5.10 Field Data Sheets

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

5.11 Laboratory Data

There was no laboratory data from this testing program.

TABLE

Table 4

EAF - RATA 2022 Results

Date: Thursday, September 29, 2022

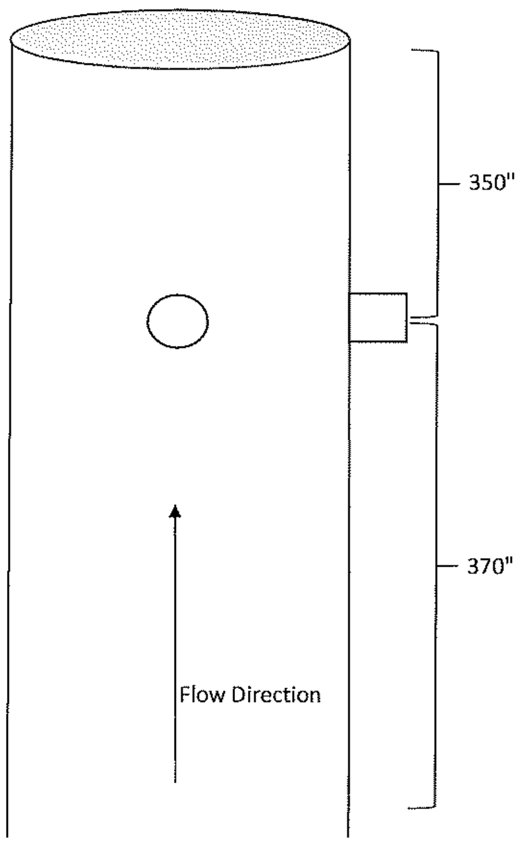
Test	RWDI Time		SO2			CO			Flowrate		
	Start Time	End Time	RM (lb/hr)	CEM (lb/hr)	di (lb/hr)	RM (lb/hr)	CEM (lb/hr)	di (lb/hr)	RM scfm	CEM scfm	di scfm
1	10:13	10:33	11.98	10.9	-1.05	86.9	76.7	-10.19	361,112	335350	-25762.00
2	11:07	11:27	6.40	5.9	-0.54	49.1	33.1	-15.99	330,926	335160	4234.00
3	12:10	12:30	***2.24***	***4.6***	***2.31***	45.7	28.9	-16.71	304507.0	343770	39263.00
4	12:54	13:14	18.26	20.0	1.75	***65.5***	***34.8***	***-30.64***	354479.0	346050	-8429.00
5	13:40	14:00	10.68	12.7	2.06	150.8	130.5	-20.28	309112.0	326010	16898.00
6	14:25	14:45	5.60	5.6	-0.01	31.1	14.2	-16.96	350704.0	344080	-6624.00
7	15:06	15:26	16.73	17.4	0.63	***191.7***	***148.5***	***-43.17***	350884.0	341270	-9614.48
8	15:48	16:08	5.11	6.6	1.48	95.7	86.6	-9.07	***293075.0***	***336150***	***43075.00***
9	16:29	16:49	***7.36***	***9.9***	***2.51***	21.8	18.0	-3.81	***304442.0***	***360680***	***56238.00***
10	17:08	17:28	-1.33	-1.1	0.27	15.7	4.1	-11.57	354479.0	355578	1099.00
11	17:49	18:09	7.83	9.9	2.04	84.3	60.2	-24.06	347657.0	332220	-15437.00
12	--	--	--	--	--	--	--	--	--	--	--
		AVERAGE	9.03	9.77	0.74	64.55	50.26	-14.29	340428.89	339943.06	-485.83
		STDS	6.11	6.45	1.15	43.63	41.51	6.21	20770.08	8753.68	19214.19
	n		9			9			9		
	Full Scale		100			1000			NA		
	$t_{0.975}$		2.306			2.306			2.306		
	I d I		0.74			14.29			485.8307		
	I cc I		0.89			4.77			14769.3080		
	Limit		10% RA			10% RA			20% RA		
	Applicable Standard (lb/hr)		32.50			260.00			-		
	Bias present? (Idl > Iccl)		**no bias**			**bias present**			**no bias**		
	Bias Factor		**1.08**			**0.72**			**1.00**		
	Relative Accuracy (20% limit)		**5.0%**			**7.3%**			**4.5%**		

Notes:

RM = Reference Method (RWDI measurements)
CEM = Continuous Emission Monitors (Gerdau data)
di = Difference between PEMS and RM for each point
n = number of tests
I d I = Absolute mean difference between the CEM and RM results

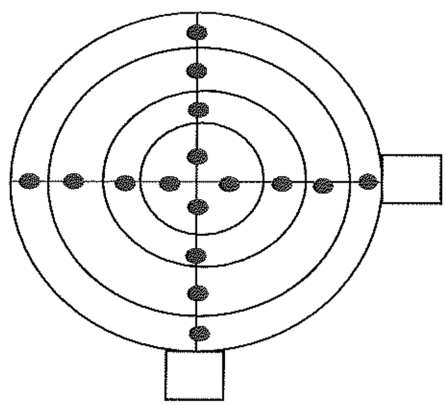
FIGURES

Figure No. #1



Diameter: 135.5

Sampling Points (in.)	
1	4.34
2	14.23
3	26.29
4	43.77
5	91.73
6	109.21
7	121.27
8	131.16



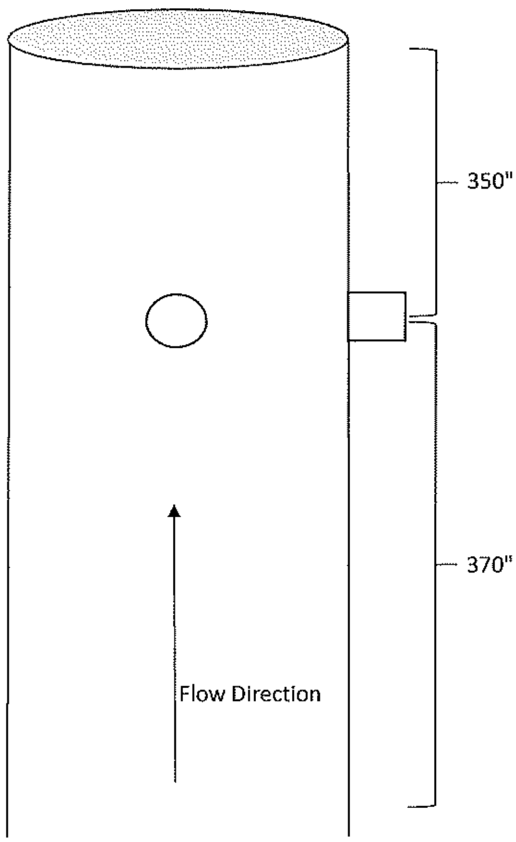
Not to scale

EUEAF East
Gerdau
Monroe Mill
Monroe, Michigan

Date:
September 29, 2022

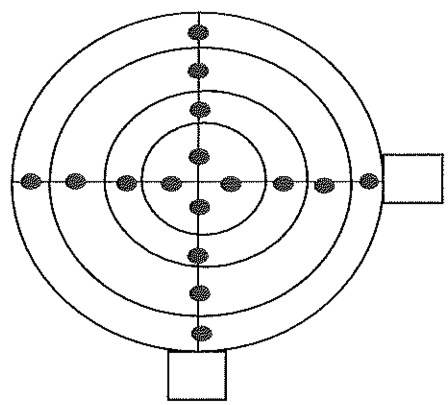
RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309

Figure No. #2



Diameter: 135

Sampling Points (in.)	
1	4.32
2	14.18
3	26.19
4	43.61
5	91.40
6	108.81
7	120.83
8	130.68



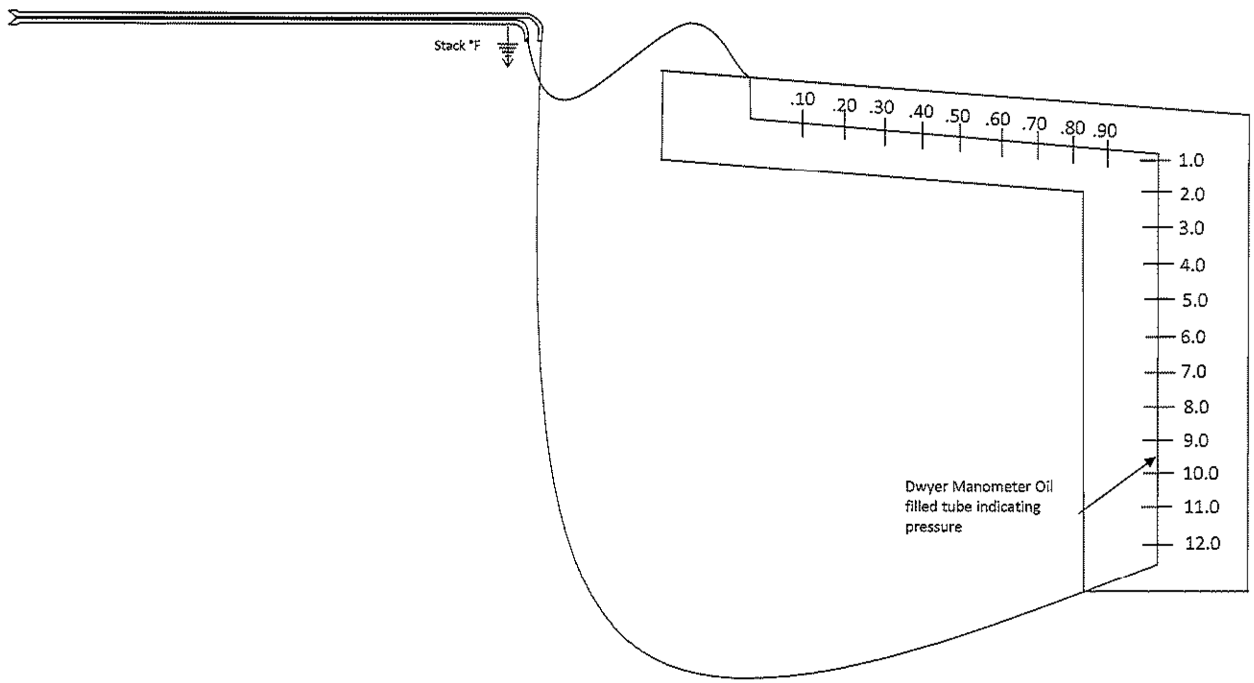
Not to scale

EUEAF West
Gerdau
Monroe Mill
Monroe, Michigan

Date:
September 29, 2022

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309

Figure No.3



USEPA Method 2

Gerdau

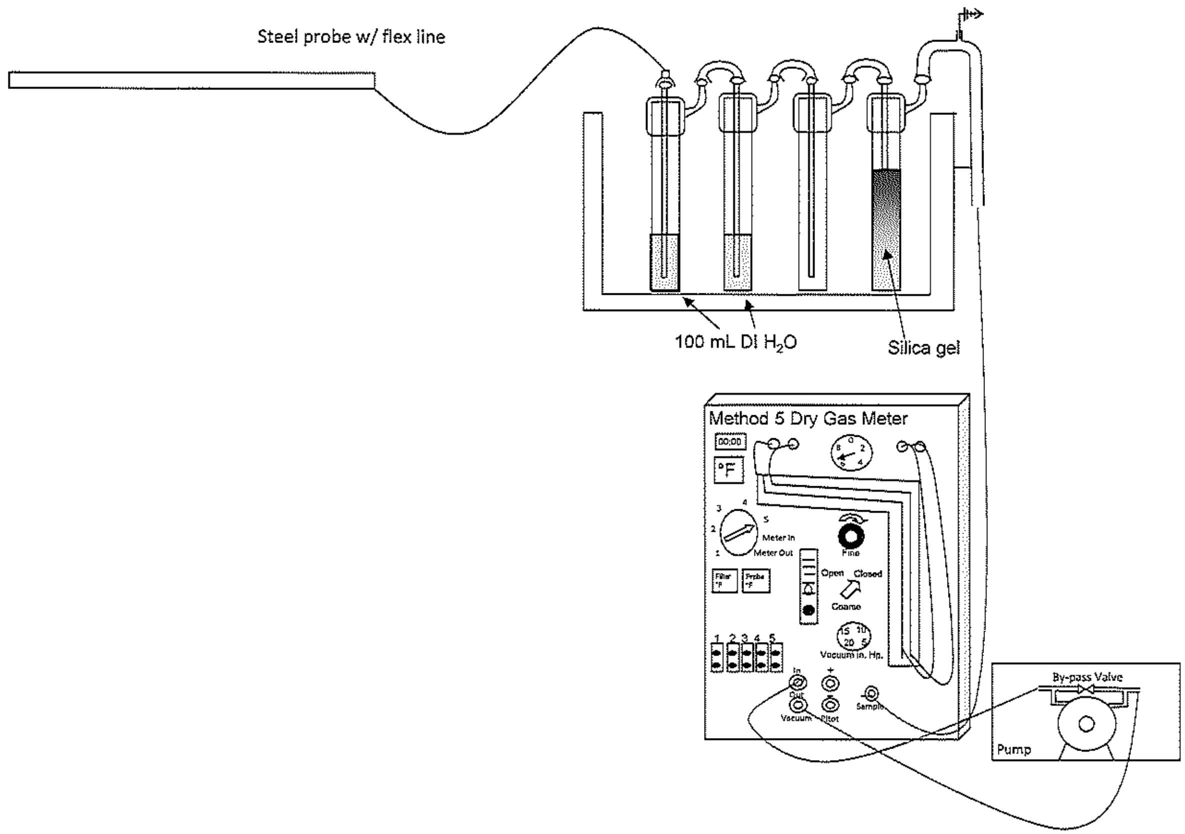
Monroe Mill

EUEAF

Monroe, Michigan

September 29, 2022

Figure No.4

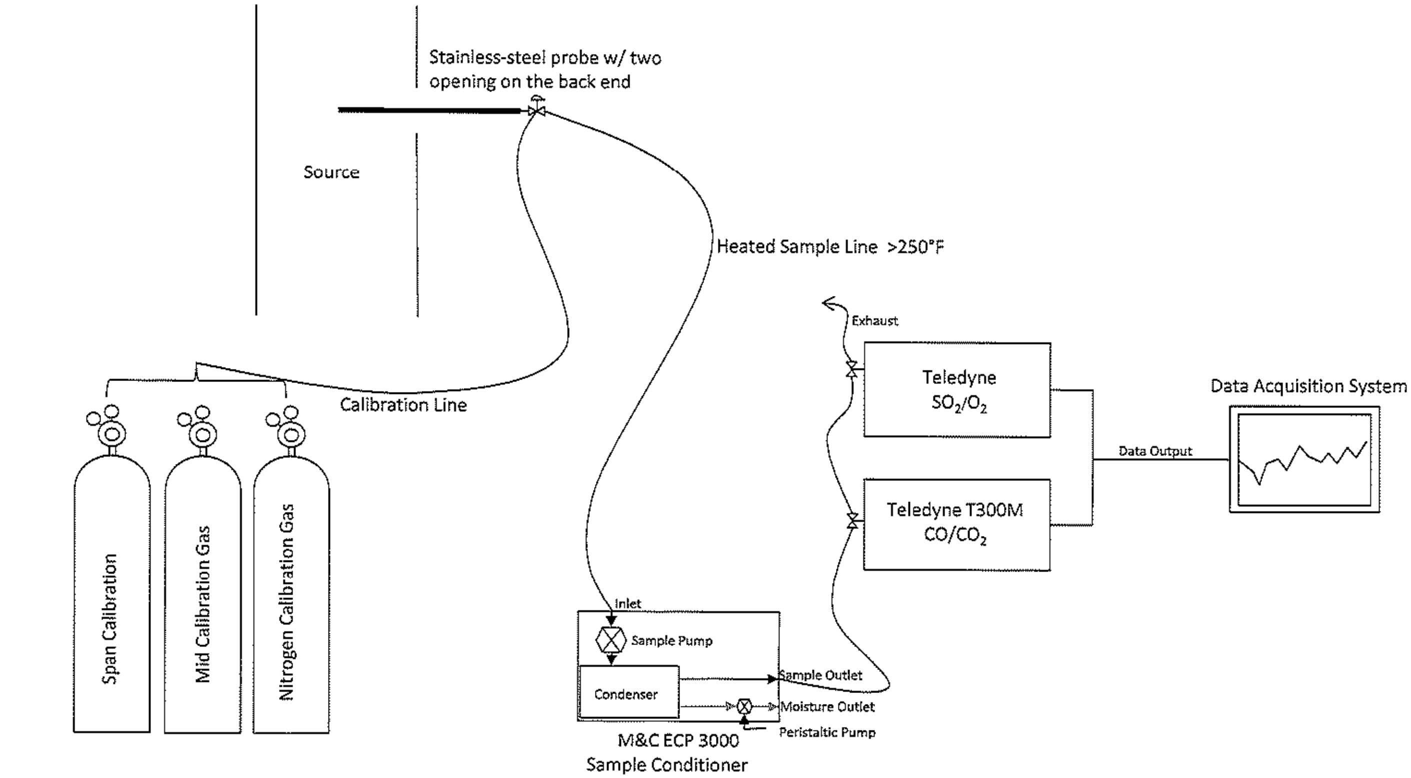


USEPA Method 4

Gerdau
Monroe Mill
EUEAF
Monroe, Michigan

September 29, 2022

Figure No.5



USEPA Method 3A,6C,10

Gerdau

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EUEAF

Monroe, Michigan

September 29, 2022