COMPLIANCE STACK EMISSION TEST REPORT

DESULFURIZATION OPERATION (EUBOFDESULF)

Determination of Filterable Particulate Matter, Particulate Matter less than 10 microns, Particulate Matter less than 2.5 microns, Manganese, and Lead Emissions

Utilizing US EPA Methods 1, 2, 3, 4, 5, 29, and 202

Test Date(s): September 4-6, 2019
Facility ID: A8640
Source Location: Dearborn, Michigan
Permit: EGLE Renewable Operating Permit
No. MI-ROP-A8640-2016a

Prepared For:

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TEST RESULTS SUMMARY-1

Source Name:	**Desulfurization Operation**
Source ID Number:	**EUBOFDESULF**
Control Device:	**Baghouse**
Sampling Location:	**Exhaust Stack**
Sampling Location ID:	**SVDESULFBH**
Test Date:	**September 4-5, 2019**
EUBOFDESULF Production Rate (ton/hr)*	**725.2**
PM_{10} / $PM_{2.5}$ Emissions (lb/hr)†	**<0.73**
Permit Limit - PM_{10} / $PM_{2.5}$ (lb/hr)	*3.60*
Compliance Permit Requirement Met (YES/NO)	*YES*
Filterable PM Emissions (lb/hr)	**0.5**
Permit Limit - Filterable PM (lb/hr)	*7.7*
Compliance Permit Requirement Met (YES/NO)	*YES*
Filterable PM Emissions (grains/dscf)	**0.001**
Permit Limit - Filterable PM (grains/dscf)	*0.01*
Compliance Permit Requirement Met (YES/NO)	*YES*
EGLE Permit No.	**MI-ROP-A8640-2016a**

* Production data was provided by AK Steel Corporation-Dearborn Works personnel.

† The compound was not present in quantities above the Minimum Detection Limit (MDL) in at least one fraction of the analytical method.

TEST RESULTS SUMMARY-2

Source Name:	**Desulfurization Operation**
Source ID Number:	**EUBOFDESULF**
Control Device:	**Baghouse**
Sampling Location:	**Exhaust Stack**
Sampling Location ID:	**SVDESULFBH**
Test Date:	**September 5-6, 2019**
Product Throughput Rate (tons/hr)*	**631.8**
Lead Emissions (lb/hr)	**0.0004**
Permit Limit - Lead (lb/hr)	*0.0016*
Compliance Permit Requirement Met (YES/NO)	*YES*
Manganese Emissions (lb/hr)	**0.001**
Permit Limit - Manganese (lb/hr)	*0.013*
Compliance Permit Requirement Met (YES/NO)	*YES*
EGLE Permit No.	**MI-ROP-A8640-2016a**

* Production data was supplied by AK Steel Corporation-Dearborn Works personnel.

REVIEW AND CERTIFICATION

The results of the Compliance Test conducted on September 4-6, 2019 are a product of the application of the United States Environmental Protection Agency (US EPA) Stationary Source Sampling Methods listed in 40 CFR Part 60, Appendix A, that were in effect at the time of this test.

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature: ______________________ Date: 10/28/19

Name: Steven Smith Title: Client Project Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature: ______________________ Date: 10-28-19

Name: Randal Tysar Title: District Manager

1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

The AK Steel Corporation-Dearborn Works (Facility ID: A8640), located in Dearborn, Michigan, contracted Montrose Air Quality Services, LLC (Montrose) of Detroit, Michigan, to conduct compliance stack emission testing for their Desulfurization Operation (EUBOFDESULF). Testing was performed to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit MI-ROP-A8640-2016a. The testing was performed on September 4-6, 2019.

Sampling was performed at the EUBOFDESULF Baghouse Exhaust Stack (SVDESULFBH) to determine the emissions of filterable particulate matter (PM) and PM less than 10-microns (PM_{10}) / PM less than 2.5-microns ($PM_{2.5}$) (PM_{10} / $PM_{2.5}$). Sampling was also performed at the EUBOFDESULF Baghouse Exhaust Stack to determine the emissions of manganese (Mn) and lead (Pb). Testing was conducted during normal shop operations. During this test emissions from EUBOFDESULF were controlled by a baghouse.

The test methods that were conducted during this test were US EPA Methods 1, 2, 3, 4, 5, 29, and 202.

1.2 KEY PERSONNEL

The key personnel who coordinated this test program (and their phone numbers) were:

- David Pate, Senior Environmental Engineer, AK Steel Dearborn Works, 313-323-1261
- Regina Angellotti, Michigan Department of Environment, Great Lakes, and Energy (EGLE), 313-418-0895
- Jonathan Lamb, EGLE, 313-456-4683
- Steven Smith QI, Client Project Manager, Montrose, 734-751-9701
- Paul Diven QI, Field Project Manager, Montrose, 248-548-7980
- Mason Sakshaug QI, Field Project Manager, Montrose, 248-548-8070
- Jacob Young QI, Field Technician, Montrose (Detroit), 248-548-7980
- David Koponen, Field Technician, Montrose (Detroit), 248-548-8070

2.0 SUMMARY AND DISCUSSION OF TEST RESULTS

2.1 OBJECTIVES AND TEST MATRIX

The purpose of this test was to determine the emissions of filterable PM, PM_{10} / $PM_{2.5}$ at the EUBOFDESULF Baghouse Exhaust Stack during normal shop operating conditions. The purpose of this test was also to determine the emissions of Mn and Pb at the EUBOFDESULF Baghouse Exhaust Stack during normal shop operating conditions. Testing was performed to satisfy the emissions testing requirements pursuant to EGLE Renewable Operating Permit MI-ROP-A8640-2016a.

The specific test objectives for this test were as follows:

2.1.1 US EPA Method 5 and 202 Sampling

- Measure the concentration of filterable PM and condensable PM at the EUBOFDESULF Baghouse Exhaust Stack.
- Measure the actual and dry standard volumetric flow rate of the stack gas at the EUBOFDESULF Baghouse Exhaust Stack.
- Utilize the above variables to determine the emissions of filterable PM and PM_{10} / $PM_{2.5}$ at the EUBOFDESULF Baghouse Exhaust Stack during normal shop operations.

2.1.2 US EPA Method 29 Sampling

- Measure the concentrations of Pb and Mn at the EUBOFDESULF Baghouse Exhaust Stack.
- Measure the actual and dry standard volumetric flow rate of the stack gas at the EUBOFDESULF Baghouse Exhaust Stack.
- Utilize the above variables to determine the emissions of Pb and Mn at the EUBOFDESULF Baghouse Exhaust Stack during normal shop operations.

Table 2.1 presents the sampling matrix log for this test.

2.2 FIELD TEST CHANGES AND PROBLEMS

No field test changes or problems occurred during the performance of this test that would bias the accuracy of the results of this test.

2.3 PRESENTATION OF RESULTS

2.3.1 US EPA Method 5 and 202 Sampling

One sampling train was utilized at the EUBOFDESULF Baghouse Exhaust Stack to determine the emissions of filterable PM and PM_{10} / $PM_{2.5}$. This sampling train measured the stack gas volumetric flow rate, dry molecular weight, moisture content, and concentration of filterable PM and condensable PM. Note that PM_{10} / $PM_{2.5}$ emissions were calculated as the sum of the filterable PM and condensable PM fractions as measured by US EPA Methods 5 and 202.

Table 2.2 displays the emissions of filterable PM and PM_{10} / $PM_{2.5}$ measured at the EUBOFDESULF Baghouse Exhaust Stack during normal shop operating conditions.

Concentration values in Table 2.2 denoted with a '<' were measured to be below the minimum detection limit (MDL) of at least one fraction of the applicable analytical method or were measured to be below the minimum detection limit (MDL) of the applicable analytical method. Emissions denoted with a '<' in Table 2.2 were calculated utilizing the applicable MDL concentration value instead of the "as measured" concentration value.

2.3.2 US EPA Method 29 Sampling

One sampling train was utilized at the EUBOFDESULF Baghouse Exhaust Stack to determine the emissions of Mn and Pb. This sampling train measured the stack gas volumetric flow rate, moisture content, and concentration of Mn and Pb.

Table 2.3 displays the emissions of Mn and Pb measured at the EUBOFDESULF Baghouse Exhaust Stack during normal shop operating conditions.

2.4 METHOD DEVIATIONS

As outlined in the EGLE Test Plan Approval Letter dated July 2, 2019 (See Appendix Section E), each sample run consisted of a minimum of three desulfurization heats with a duration of at least 60 minutes. Testing was only conducted when desulfurization or slag skimming was taking place. Port changes were delayed and occurred between desulfurization heats. In several cases, a port had to be repeated to reach the 60-minutes of sampling time. A different repeat port was used for each test series run.

TABLE 2.1
SAMPLING MATRIX OF TEST METHODS UTILIZED

Date	Run No.	Sampling Location	US EPA METHODS 1/2 (Flow) Sampling Time / Duration (min)	US EPA METHOD 3 (Dry Molecular Wt.) Sampling Time / Duration (min)	US EPA METHOD 4 (%H2O) Sampling Time / Duration (min)	US EPA METHOD 5 (Filterable PM) Sampling Time / Duration (min)	US EPA METHOD 202 (Condensable PM) Sampling Time / Duration (min)
9/4/2019	1	EUBOFDESULF Baghouse Exhaust Stack	8:58 - 13:02 / 67.5	9:00 - 12:01 / 3	8:58 - 13:02 / 67.5	8:58 - 13:02 / 67.5	8:58 - 13:02 / 67.5
9/4/2019	2	EUBOFDESULF Baghouse Exhaust Stack	14:07 - 17:13 / 68	14:10 - 17:36 / 3	14:07 - 17:13 / 68	14:07 - 17:13 / 68	14:07 - 17:13 / 68
9/5/2019	3	EUBOFDESULF Baghouse Exhaust Stack	7:49 - 11:48 / 70	7:55 - 11:31 / 3	7:49 - 11:48 / 70	7:49 - 11:48 / 70	7:49 - 11:48 / 70

Date	Run No.	Sampling Location	US EPA METHODS 1/2 (Flow) Sampling Time / Duration (min)	US EPA METHOD 3 (Dry Molecular Wt.) Sampling Time / Duration (min)	US EPA METHOD 4 (%H2O) Sampling Time / Duration (min)	US EPA METHOD 29 (Pb/Mn) Sampling Time / Duration (min)
9/5/2019	1	EUBOFDESULF Baghouse Exhaust Stack	12:42 - 15:05 / 62	12:42 - 15:05 / 62	12:42 - 15:05 / 62	12:42 - 15:05 / 62
9/6/2019	2	EUBOFDESULF Baghouse Exhaust Stack	8:08 - 10:37 / 74	8:08 - 10:37 / 74	8:08 - 10:37 / 74	8:08 - 10:37 / 74
9/6/2019	3	EUBOFDESULF Baghouse Exhaust Stack	11:27 - 15:51 / 74	11:27 - 15:51 / 74	11:27 - 15:51 / 74	11:27 - 15:51 / 74

TABLE 2.2
US EPA METHOD 5/202 EMISSION RESULTS

Parameter	EUBOFDESULF Baghouse Exhaust Stack			
	Run 1	**Run 2**	**Run 3**	**Average**
Total Particulate Matter Emissions (lb/hr)†	<1.10	<0.57	<0.52	<0.73
Filterable Particulate Matter Emissions (lb/hr)	0.8	0.5	0.4	0.5
Filterable Particulate Matter Concentration (grains/dscf)	0.001	0.001	0.001	0.001
Condensable Particulate Matter Emissions (lb/hr)‡	<0.34	<0.09	<0.12	<0.18
Condensable Particulate Matter Concentration (grains/dscf)‡	<0.00052	<0.00014	<0.00017	<0.00028
Stack Gas Average Flow Rate (acfm)	87,509	85,714	88,695	87,306
Stack Gas Average Flow Rate (scfm)	78,359	75,020	80,246	77,875
Stack Gas Average Flow Rate (dscfm)	77,128	73,938	79,195	76,753
Stack Gas Average Velocity (fpm)	3,673	3,597	3,723	3,664
Stack Gas Average Static Pressure (in-H_2O)	-0.60	-0.60	-0.60	-0.60
Stack Gas Average Temperature (°F)	116	130	116	121
Stack Gas Percent by Volume Moisture (%H_2O)	1.57	1.44	1.31	1.44
Measured Stack Inner Dimensions (in)§	47 X 73			
Percent by Volume Carbon Dioxide in Stack Gas (%-dry)	0.00	0.00	0.00	0.00
Percent by Volume Oxygen in Stack Gas (%-dry)	20.90	20.90	20.90	20.90
Percent by Volume Nitrogen in Stack Gas (%-dry)	79.10	79.10	79.10	79.10

† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of at least one fraction of the analytical method. See Section 2.3 for details.
‡ The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.
§ The EUBOFDESULF Baghouse Exhaust Stack was rectangular in shape.

TABLE 2.3
US EPA METHOD 29 EMISSION RESULTS

Parameter	EUBOFDESULF Baghouse Exhaust Stack			
	Run 1	**Run 2**	**Run 3**	**Average**
Lead Emissions (lb/hr)	0.0003	0.0002	0.0006	0.0004
Lead Concentration (mg/dscm)	0.0009	0.0007	0.0024	0.0013
Manganese Emissions (lb/hr)	0.002	0.001	0.001	0.001
Manganese Concentration (mg/dscm)	0.0056	0.0045	0.0034	0.0045
Stack Gas Average Flow Rate (acfm)	89,781	87,317	84,488	87,195
Stack Gas Average Flow Rate (scfm)	79,178	77,115	73,703	76,665
Stack Gas Average Flow Rate (dscfm)	78,037	75,839	72,409	75,428
Stack Gas Average Velocity (fpm)	3,768	3,665	3,546	3,660
Stack Gas Average Static Pressure (in-H_2O)	-0.60	-0.60	-0.60	-0.60
Stack Gas Average Temperature (°F)	130	126	134	130
Stack Gas Percent by Volume Moisture (%H_2O)	1.44	1.65	1.75	1.62
Percent by Volume Carbon Dioxide in Stack Gas (%-dry)	0.00	0.00	0.00	0.00
Percent by Volume Oxygen in Stack Gas (%-dry)	20.90	20.90	20.90	20.90
Percent by Volume Nitrogen in Stack Gas (%-dry)	79.10	79.10	79.10	79.10

3.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

3.1 PROCESS DESCRIPTION AND OPERATION

AK Steel Corporation - Dearborn Works is a steel-producing facility. The facility operates a Desulfurization Station (EUBOFDESULF) which was in operation during this testing event. For further description of the process and its operations see Sections 1.b - 1.f of Test Plan M049AS-561063 dated June 3, 2019 in Appendix E.

Figure 3.1 depicts the process and sampling location schematic.

3.2 CONTROL EQUIPMENT DESCRIPTION

During this test, emissions from EUBOFDESULF were controlled by a baghouse.

3.3 SAMPLING LOCATION(S)

The EUBOFDESULF Baghouse Exhaust Stack was rectangular in shape with a measured width of 47.0-inches and a measured depth of 73.0-inches. The stack was oriented in the vertical plane and was accessed from a permanent platform. Three sampling ports were located equidistant from one another at a location that met US EPA Method 1, Section 11.1.1 criteria. Prior to emissions sampling, the stack was traversed to verify the absence of cyclonic flow. An average yaw angle of 1.04° was measured. Therefore, the sampling location also met US EPA Method 1, Section 11.4.2 criteria. During emissions sampling, the stack was traversed for stack gas volumetric flow rate, moisture content, filterable PM, condensable PM, Pb, and Mn concentration determinations. Grab samples were taken for stack gas dry molecular weight determination.

Figure 3.2 schematically illustrates the traverse point and sample port locations utilized.

3.4 PROCESS SAMPLING LOCATION(S)

The US EPA Reference Test Methods performed did not specifically require that process samples were to be taken during the performance of this testing event. It is in the best knowledge of Montrose that no process samples were obtained and therefore no process sampling location was identified in this report.

FIGURE 3.1
EUBOFDESULF PROCESS AND SAMPLING LOCATION SCHEMATIC

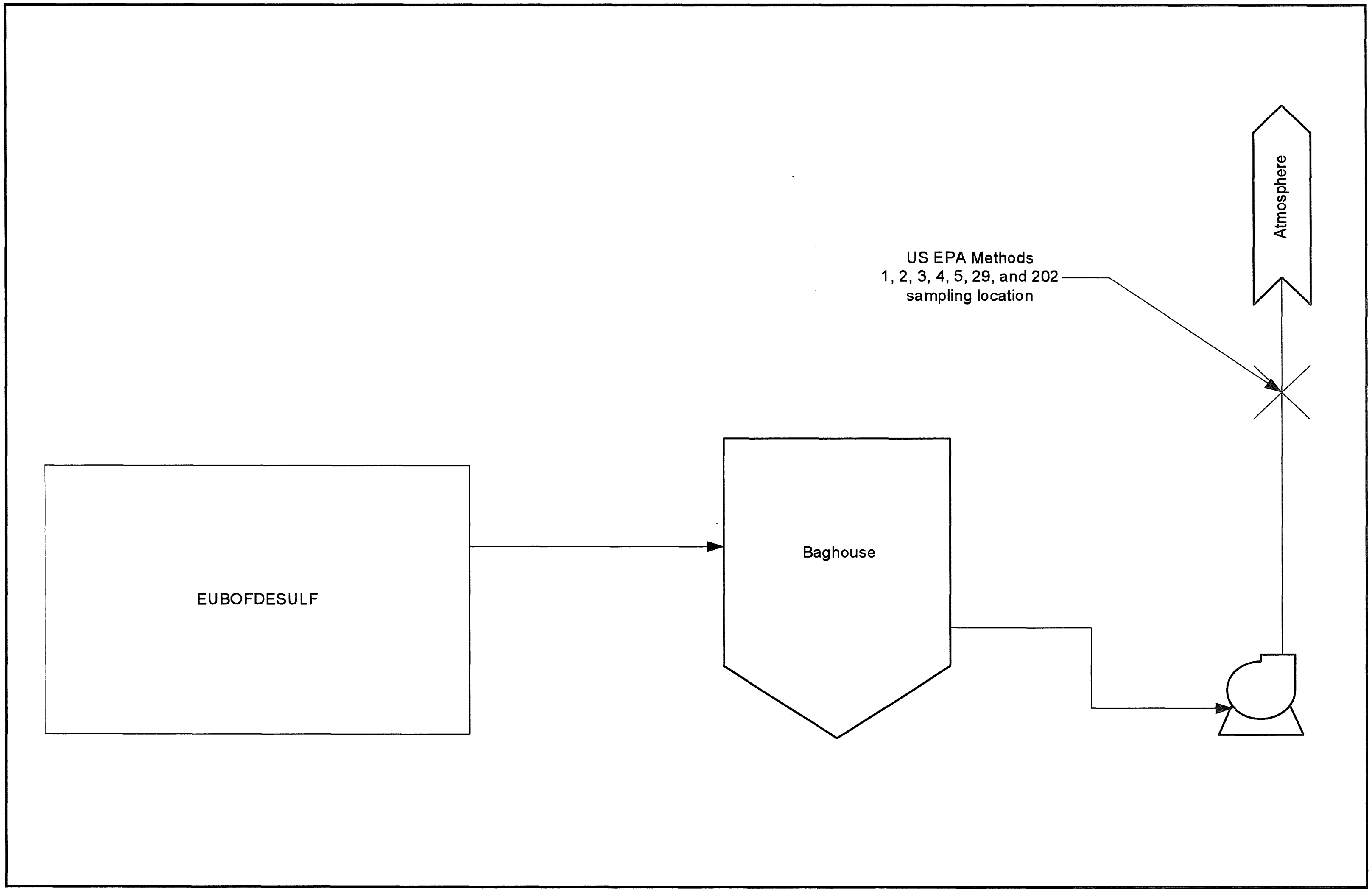
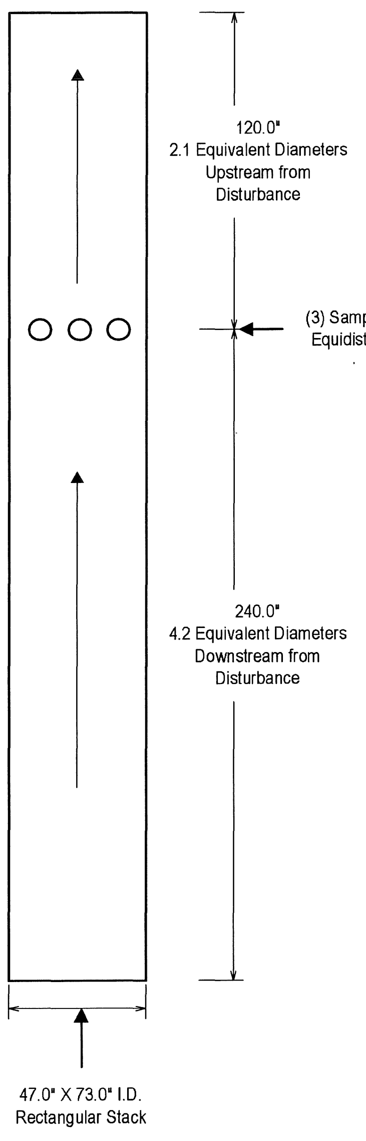
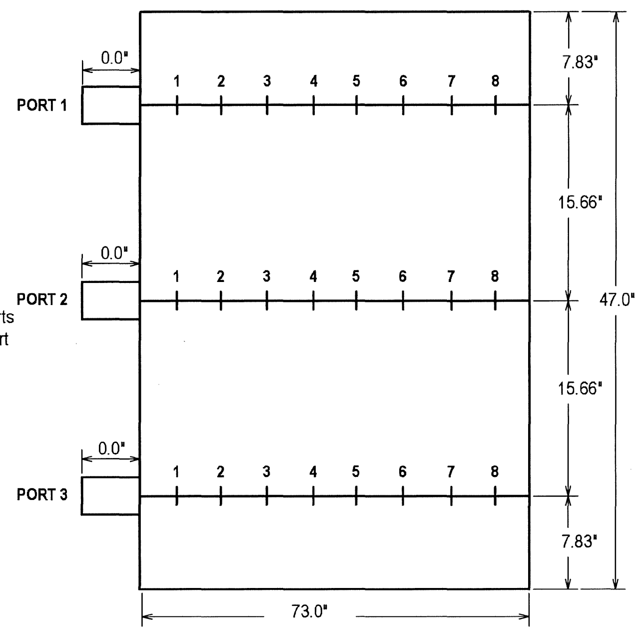


FIGURE 3.2
EUBOFDESULF BAGHOUSE EXHAUST TRAVERSE POINT LOCATION DRAWING





Point	% of Stack Depth	Distance from Inside Wall (in.) PORT 1	Distance from Inside Wall (in.) PORT 2	Distance from Inside Wall (in.) PORT 3
1	6.3	4.6	4.6	4.6
2	16.8	13.7	13.7	13.7
3	31.3	22.8	22.8	22.8
4	43.8	31.9	31.9	31.9
5	56.3	41.1	41.1	41.1
6	68.7	50.2	50.2	50.2
7	81.3	59.3	59.3	59.3
8	93.8	68.4	68.4	68.4

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

4.1.1 US EPA Method 1: "Sample and Velocity Traverses for Stationary Sources"

Principle: To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.2 US EPA Method 2: "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

Principle: The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.3 US EPA Method 3: "Gas Analysis for the Determination of Dry Molecular Weight"

Principle: A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2, percent O_2, and if necessary, for percent CO. For dry molecular weight determination, either an Orsat or a Fyrite analyzer may be used for the analysis. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.4 US EPA Method 4: "Determination of Moisture Content in Stack Gases"

Principle: A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.5 US EPA Method 5: "Determination of Particulate Emissions from Stationary Sources (Filterable PM Only)"

Principle: Particulate matter is withdrawn isokinetically from the source and collected on a glass fiber filter maintained at a temperature of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which includes any material that condenses at or above the filtration temperature, is determined gravimetrically after the removal of uncombined water. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.6 US EPA Method 29: "Determination of Metals Emissions from Stationary Sources"

Principle: A stack sample is withdrawn isokinetically from the source, particulate emissions are collected in the probe and on a heated filter, and gaseous emissions are then collected in an aqueous acidic solution of hydrogen peroxide (analyzed for all metals including Hg) and an aqueous acidic solution of potassium permanganate (analyzed only for Hg). The recovered samples are digested, and appropriate fractions are analyzed for Hg by cold vapor atomic absorption spectroscopy (CVAAS) and for Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Mn, Ni, P, Se, Ag, Tl, and Zn by inductively coupled argon plasma emission absorption spectroscopy (AAS). Graphite furnace atomic absorption spectroscopy (GFAAS) is used for analysis of Sb, As, Cd, Co, Pb, Se, and Tl if these elements require greater analytical sensitivity than can be obtained by ICAP. Additionally, if desired, the tester may use AAS for analysis of all listed metals if the resulting in-stack method detection limits meet the goal of the testing program. Only Pb and Mn were sampled during this test event. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.7 US EPA Method 202: "Determination of Condensable Particulate Emissions from Stationary Sources"

Principle: Condensable Particulate Matter (CPM) is collected in dry impingers after filterable PM has been collected on a filter maintained as specified in either Method 5 of appendix A-3 to part 60, US EPA Method 17 of appendix A-6 to part 60, or US EPA Method 201A of appendix M to this part. The organic and aqueous fractions of the impingers and an out-of-stack CPM filter are then taken to dryness and weighed. The total of the impinger fractions and the CPM filter represents the CPM. Compared to the version of US EPA Method 202 that was promulgated on December 17, 1991, this method eliminates the use of water as the collection media in impingers and includes the addition of a condenser followed by a water dropout impinger immediately after the final in-stack or heated filter. This method also includes the addition of one modified Greenburg Smith impinger (backup impinger) and a CPM filter following the water dropout impinger. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 51, Appendix M.

The sampling trains utilized during this testing project are depicted in Figures 4.1 and 4.2.

4.2 PROCEDURES FOR OBTAINING PROCESS DATA

Process data was recorded by AK Steel Corporation-Dearborn Works personnel utilizing their typical record keeping procedures. Recorded process data was provided to Montrose personnel at the conclusion of this test event. The process data is located in the Appendix A.

FIGURE 4.1
US EPA METHOD 5/202 SAMPLING TRAIN SCHEMATIC

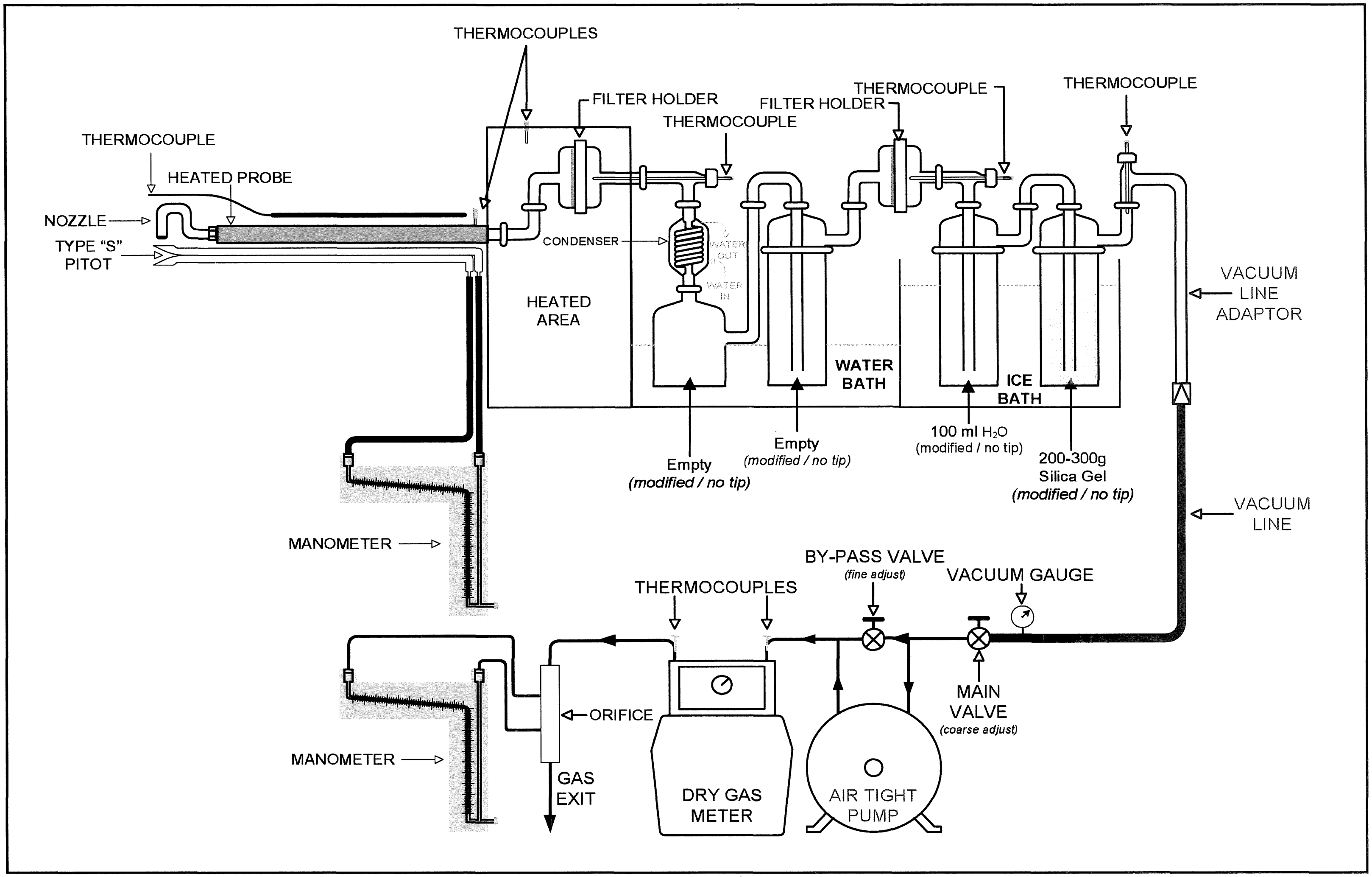
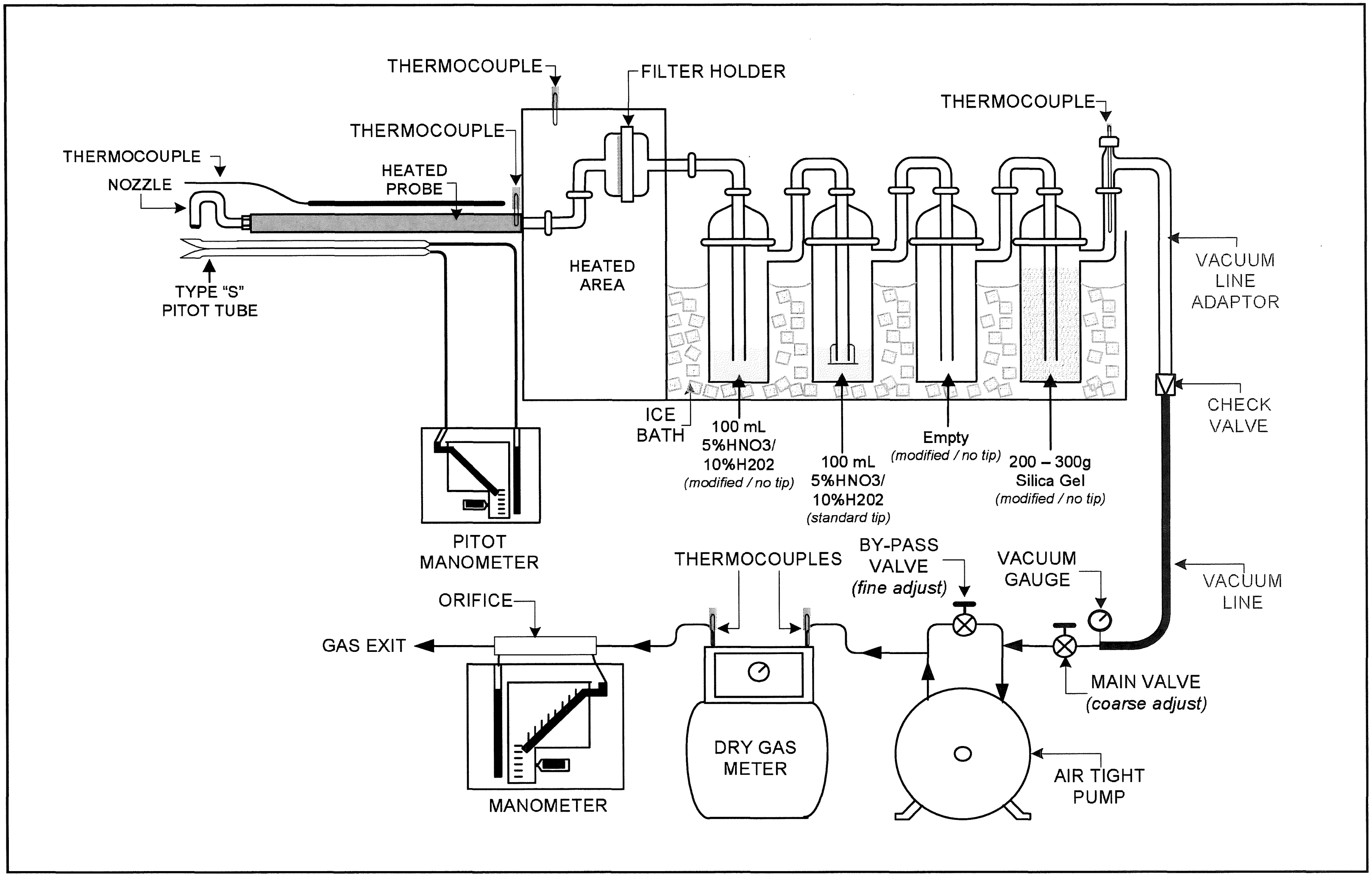


FIGURE 4.2
US EPA METHOD 29 SAMPLING TRAIN SCHEMATIC



5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA AUDITS

Tables 5.1 to 5.4.2 illustrate the QA audits that were performed during this test.

All meter boxes and sampling trains used during sampling performed within the requirements of their respective methods as is shown in Tables 5.1 and 5.2. All post-test leak checks were well below the applicable limit. Minimum metered volumes and percent isokinetics were also met where applicable.

Table 5.3 displays the US EPA Method 3 Fyrite Audits which were performed during this test in accordance with US EPA Method 3, Section 10.1 requirements. As shown, all Fyrite analyzer results were within ±0.5% of the respective Audit Gas concentrations.

Table 5.4.1 displays the laboratory QA results for US EPA Method 29, and Table 5.4.2 displays the results of the US EPA Method 29 Audit Sample analysis. All the spike recoveries were within the US EPA Method 29 limits. The US EPA Method 29 audit samples were within the acceptable ranges established for the ERA Stationary Source Audit Sample (SSAS) Program. The ERA SSAS report is located in Appendix B.3.

5.2 QA/QC PROBLEMS

No QA/QC problems occurred during this test event.

5.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is presented in the report appendices.

TABLE 5.1
US EPA METHOD 5/202 SAMPLING TRAIN AUDIT RESULTS

Parameter	Run 1	Run 2	Run 3
Sampling Location	**EUBOFDESULF EXHAUST STACK**		
Post-Test Leak Rate Observed (cfm)	0.000	0.000	0.000
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	68.797	65.709	72.818
Recommended Volume of Dry Gas Collected (dscf)	21.000	21.000	21.000
Acceptable	Yes	Yes	Yes
Percent of Isokinetic Sampling Rate (%)	100.2	99.1	99.6
Applicable Method Allowable Isokinetic Sampling Rate (%)	100 ± 10	100 ± 10	100 ± 10
Acceptable	Yes	Yes	Yes

US EPA METHOD 29 SAMPLING TRAIN AUDIT RESULTS

Parameter	Run 1	Run 2	Run 3
Sampling Location	**EUBOFDESULF EXHAUST STACK**		
Post-Test Leak Rate Observed (cfm)	0.000	0.000	0.000
Applicable Method Allowable Leak Rate (cfm)	0.020	0.020	0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	63.199	73.452	70.212
Recommended Volume of Dry Gas Collected (dscf)	44.143	44.143	44.143
Acceptable	Yes	Yes	Yes
Percent of Isokinetic Sampling Rate (%)	99.1	99.3	99.4
Applicable Method Allowable Isokinetic Sampling Rate (%)	100 ± 10	100 ± 10	100 ± 10
Acceptable	Yes	Yes	Yes

TABLE 5.2
DRY GAS METER AUDIT RESULTS

Sampling Location / Sampling Train	Pre-Test Dry Gas Meter Calibration Factor (Y)	Average Post-Test Dry Gas Meter Calibration Check Value (Yqa)	Post Test Dry Gas Meter Calibration Check Value Difference From Pre-Test Calibration Factor (%)	Applicable Method Allowable Difference (%)	Acceptable
EUBOFDESULF Baghouse Exhaust Stack (US EPA Method 5/202)	1.0090	1.0058	0.32%	5.00%	Yes
EUBOFDESULF Baghouse Exhaust Stack (US EPA Method 29)	1.0090	1.0121	-0.31%	5.00%	Yes

TABLE 5.3
US EPA METHOD 3 FYRITE AUDIT

Audit Date	**August 30, 2019**	
Audit Gas	**$\%CO_2$**	**$\%O_2$**
Audit Gas Concentration (%)	**10.0**	**10.0**
Fyrite Response 1 (%)	10.0	10.0
Fyrite Response 2 (%)	10.0	10.0
Fyrite Response 3 (%)	10.0	10.0
Average (%)	10.0	10.0
Average Within ±0.5%	Yes	Yes

Audit Gas Cylinder Number: EB0024944

TABLE 5.4.1
US EPA METHOD 29 LABORATORY QA

	Pb	**Mn**
Front-Half Spike Recovery (%)	100	99
Acceptable per US EPA Method 29 (Expected Range 70%-130%)	YES	YES
Back-Half Spike Recovery (%)	100	103
Acceptable per US EPA Method 29 (Expected Range 70%-130%)	YES	YES
Front-Half Duplicate , %RPD	1.0	3.9
Acceptable per US EPA Method 29 (Expected Difference Within 20%)	YES	YES
Back-Half Duplicate, %RPD	0.13	0.27
Acceptable per US EPA Method 29 (Expected Difference Within 20%)	YES	YES

TABLE 5.4.2
US EPA METHOD 29 AUDIT RESULTS

	Pb	**Mn**
Audit Sample I.D.	**07159P-1425**	
Reported Mass (µg)	**53.6**	**64.5**
Expected Range 70%-130%	*44.2 - 66.4*	*51.5 - 77.3*
Acceptable per US EPA Method 29	Yes	Yes
Audit Sample I.D.	**07159P-1426**	
Reported Mass (µg)	**2.88**	**2.37**
Expected Range 70%-130%	*2.07 - 3.45*	*1.70 - 2.82*
Acceptable per US EPA Method 29	Yes	Yes