DTE

COMPLIANCE TEST REPORT

for

RELATIVE RESPONSE AUDIT (RRA)

PARTICULATE MATTER CONTINUOUS EMISSIONS MONITORING SYSTEM (PM CEMS)

UNIT 1 – Stack

Belle River Power Plant
China Twp., Michigan

March 10, 2020

Prepared By
Environmental Management & Resources
Environmental Field Services Group
DTE Corporate Services, LLC
7940 Livernois G-4S
Detroit, MI 48210

DTE

CONTENTS

RESULTS TABLE

FIGURES

APPENDICES

DTE

EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EMR) Field Services Group performed a Relative Response Audit (RRA) on the Particulate Matter Continuous Emissions Monitoring System (PM CEMS). The RRA was performed on the Unit 1 exhaust stack located at the Belle River Power Plant, in China Twp, Michigan. The testing is required by 40 CFR Part 63, Subpart UUUUU. Testing was performed in accordance with Procedure 2 of 40 CFR Part 60, Appendix F. The testing was conducted on March 10, 2020.

A summary of the emission test results is shown below. Criterion for acceptable RRA results are located in Procedure 2 Sec 10.4(6)(i-ii):

Relative Response Audit
Unit 1 Stack
Belle River Power Plant
March 10, 2020

	PM CEMS (mg/acm)[1]	RM PM (mg/acm)[1]	PM CEMS (correlation)	Correlation (-25% Emission Limit)	Correlation (+25% Emission Limit)
Run 1	5.1	2.0	3.4	-1.12	7.97
Run 2	6.0	2.5	3.7	-0.89	8.31
Run 3	5.4	2.0	3.5	-1.12	8.08
PM CEMS < Greatest PM CEMS Response on correlation regression line				***≤56.3 mg/acm***	***Pass***
2 of 3 PM CEMS and RM w/in 25% of numerical emission limit on correlation regression line					***Pass***

[1]mg/acm @ stack conditions

DTE

1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EMR) Field Services Group performed a Relative Response Audit (RRA) on the Particulate Matter Continuous Emissions Monitoring System (PM CEMS). The RRA was performed on the Unit 1 exhaust stack located at the Belle River Power Plant, in China Twp, Michigan. The testing is required by 40 CFR Part 63, Subpart UUUUU. Testing was performed in accordance with Procedure 2 of 40 CFR Part 60, Appendix F. The testing was conducted on March 10, 2020.

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1-5 (MATS Modified). Criterion for acceptable RRA results are located in Part 60, Appendix F Procedure 2 Sec 10.4(6)(i-ii).

The fieldwork was performed in accordance with EPA Reference Methods and EMR's Intent to Test.[1] The following EMR Field Services personnel participated in the testing program: Mr. Mark Grigereit, Principal Engineer, Mr. Thom Snyder, Environmental Specialist, and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Grigereit was the project leader. Coordination with the facility was performed by Ms. Alexis Thomas, Associate Environmental Engineer. Mr. Mark Dziadosz and Mr. Elmouchi with the Air Quality Division of the Michigan Department of Environment, Great Lakes, & Energy (EGLE) received the test plan and were notified of the emissions testing.

2.0 SOURCE DESCRIPTION

The Belle River Power Plant (BRPP) located at 4505 King Road in China Township, Michigan, employs the use of two (2) Babcock and Wilcox coal-fired boilers (Units 1 & 2) each capable of producing 4,550,000 pounds per hour of steam. Each Unit has a Siemens Power Corporation turbine generator with a nominally rated capability of 635 (Unit 1) and 645 (Unit 2) megawatts (MW).

[1] EGLE, Test Plan, Submitted November 5, 2020. (Attached-Appendix A)

DTE

Belle River Power Plant utilizes Sick AG Maihak SP100 dust measuring systems. The analyzers utilize a measuring technique based off scattered light principal. The SP100 model is specific for low to medium dust collections. The following unit was audited:

Unit	Analyzer	Manufacturer/ Model	Analyzer Range	Serial Number
Unit 1	PM	Sick/ Maihak SP100	200 mg/acm	15318411

3.0 SAMPLING AND ANALYTICAL PROCEDURES

DTE Energy obtained emissions measurements in accordance with procedures specified in the USEPA *Standards of Performance for New Stationary Sources*. The sampling and analytical methods used in the testing program are indicated in the table below

Sampling Method	Parameter	Analysis
USEPA Methods 1-2	Exhaust Gas Flow Rates	Field data analysis and reduction
USEPA Method 3A	O_2 & CO_2	Instrumental Analyzer Method
USEPA Method 4	Moisture Content	Field data analysis and reduction
USEPA Method 5 - MATS Modified	Particulate Matter	Gravimetric Analysis

3.1 STACK GAS VELOCITY AND FLOWRATES (USEPA Methods 1-2)

3.1.1 *Sampling Method*

Stack gas velocity traverses were conducted in accordance with the procedures outlined in USEPA Method 1, "Sample and Velocity Traverses for Stationary Sources," and Method 2, "Determination of Stack Gas Velocity and Volumetric Flowrate." Four (4) sampling ports were utilized on each unit's exhaust stack, sampling at three (3) points per port for a total of twelve (12) points. Velocity traverses were conducted

simultaneously with the particulate sampling. See Figure 1 for a diagram of the traverse/sampling points used.

Cyclonic flow checks were performed on each stack during the initial flow monitor certification RATAs. Testing at the sampling location demonstrated that no cyclonic flow was present at either location. No changes to the stacks have occurred since the cyclonic flow checks were performed. Additionally, verifications of null angle at 0° were observed while performing static pressure checks on each unit.

3.1.2 *Method 2 Sampling Equipment*

The EPA Method 2 sampling equipment consisted of a 0-10" incline manometer, S-type Pitot tube (C_p = 0.84) and a Type-K calibrated thermocouple.

3.2 OXYGEN & CARBON DIOXIDE (USEPA Method 3A)

3.2.1 *Sampling Method*

Oxygen (O_2) and carbon dioxide (CO_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The analyzers utilize paramagnetic sensors.

3.2.2 *O_2/CO_2 Sampling Train*

The EPA Method 3A sampling system consisted of the following:

(1) PTFE sampling line (collecting gas sample from the meter rig exhaust)
(2) Universal® gas conditioner with particulate filter
(3) PTFE connecting line
(4) Servomax 1400 O_2/CO_2 gas analyzer
(5) Appropriate USEPA Protocol 1 calibration gases
(6) Data Acquisition System

3.2.3 *Sampling Train Calibration*

The O_2 and CO_2 analyzers were calibrated according to procedures outlined in USEPA Methods 3A. Zero, span, and mid-range calibration gases were introduced directly into the analyzer to verify the instruments linearity, prior to sampling, and again at the completion of each test run.

3.3 MOISTURE DETERMINATION (USEPA Method 4)

3.3.1 *Sampling Method*

Determination of the moisture content of the exhaust gas was performed using USEPA Method 4, "Determination of Moisture Content in Stack Gases". The

moisture was collected in the Method 5 glass impingers, and the percentage of water was then derived from calculations outlined in USEPA Method 4.

3.4 PARTICULATE MATTER (USEPA Method 5 - MATS Modified)

3.4.1 *Filterable Particulate Sampling Method*

USEPA Method 5 - MATS Modified, "Determination of Particulate Emissions from Stationary Sources" was used to measure the filterable (front-half) particulate emissions (see Figure 2 for a schematic of the sampling train). Triplicate, 60-minute test runs were conducted.

The Method 5 - MATS Modified modular isokinetic stack sampling system consisted of the following:

(1) PTFE coated stainless-steel button-hook nozzle
(2) Heated glass-lined probe
(3) Heated 3" glass filter holder with a quartz filter (Maintained at a temperature of 320 ± 25 °F)
(4) Set of impingers for the collection of condensate for moisture determination
(5) Length of sample line
(6) Environmental Supply® control case equipped with a pump, dry gas meter, and calibrated orifice.

The quartz filters used in the sampling were initially baked for 3 hours at 320 °F, desiccated for 24 hours and weighed to a constant weight as described in Method 5 - MATS Modified to obtain the initial tare weight.

After completion of the final leak test for each test run, the filter was recovered, and the probe, nozzle and the front half of the filter holder assembly were brushed and rinsed with acetone. The acetone rinses were collected in a pre-cleaned sample container. The container was labeled with the test number, test location, test date, and the level of liquid marked on the outside of the container. Immediately after recovery, the sample containers were placed in a cooler for storage.

At the laboratory the acetone rinses were transferred to clean pre-weighed PTFE beaker liners and evaporated to dryness at ambient temperature and pressure. The beaker liners and filters were desiccated for 24 hours and weighed to a constant weight (within 0.5 mg). The data sheets containing the initial and final weights on the filters and beakers can be found in Appendix C.

Collected field blanks consisted of a blank filter and acetone solution blank. The acetone blank was collected from the rinse bottle used in sample recovery. The blank filter and acetone were collected and analyzed following the same procedures used to recover and analyze the field samples. Field data sheets for the Method 5 - MATS Modified sampling can be found in Appendix B.

3.4.2 *Quality Control and Assurance*

All sampling and analytical equipment was calibrated according to the guidelines referenced in EPA Method 5 - MATS Modified. All Method 1-5 calibration data is in Appendix D.

3.4.3 *Data Reduction*

The filterable PM emissions data collected during the testing were calculated and reported as mg/acm @ stack conditions.

4.0 OPERATING PARAMETERS

The test program included the collection of PM CEMs emission data and Load during each PM emissions test. Data collected during the testing is presented in Appendix E.

5.0 DISCUSSION OF RESULTS

Table 1 presents the Unit 1 Reference Method particulate emission testing results (RM PM), particulate matter continuous emissions monitoring system (PM CEMS) results, PM CEMS correlation (expected point on the correlation regression line) value, and ±25% of the emission limit along the correlation regression line). Particulate emissions are presented in milligram per actual cubic meter calculated at stack conditions (mg/acm).

In order to pass an RRA, both of the following criteria must be met: Procedure 2 10.4(6)(i-ii).

i) For all three data points, the PM CEMS response value can be no greater that the greatest PM CEMS response value used to develop the correlation curve.

ii) At least two of the three sets of PM CEMS and Reference Method measurements must fall within the same specified area on a graph of the correlation regression line as required for the RCA and described in paragraph (5)(iii). "The specific area on the graph of the correlation regression line is defined by two lines parallel to the correlation regression line, offset at ±25% of the numerical emission limit value from the correlation regression line.

Both requirements were successfully met. Testing results are in Table 1 "Unit 1 PM CEMS RRA Results" and Table 2 "Unit 1 PM CEMS RRA – Summary Graph)."

The auxiliary test data presented in the results table for each test includes the unit load in gross megawatts (GMW), stack temperature in degrees Fahrenheit (°F), stack gas moisture in percent (%), stack gas velocity in feet per minute (ft/min), and stack gas flow rate in actual cubic feet per minute (acfm), standard cubic feet per minute (scfm) and dry standard cubic feet per minute (dscfm).

DTE

6.0 CERTIFICATION STATEMENT

"I certify that I believe the information provided in this document is true, accurate, and complete. Results of testing are based on the good faith application of sound professional judgment, using techniques, factors, or standards approved by the Local, State, or Federal Governing body, or generally accepted in the trade."

Mark Grigereit, QSTI

This report prepared by:

Mr. Mark Grigereit, QSTI
Principal Engineer, Field Services Group
Environmental Management and Resources
DTE Energy

DTE

RESULTS TABLES

DTE

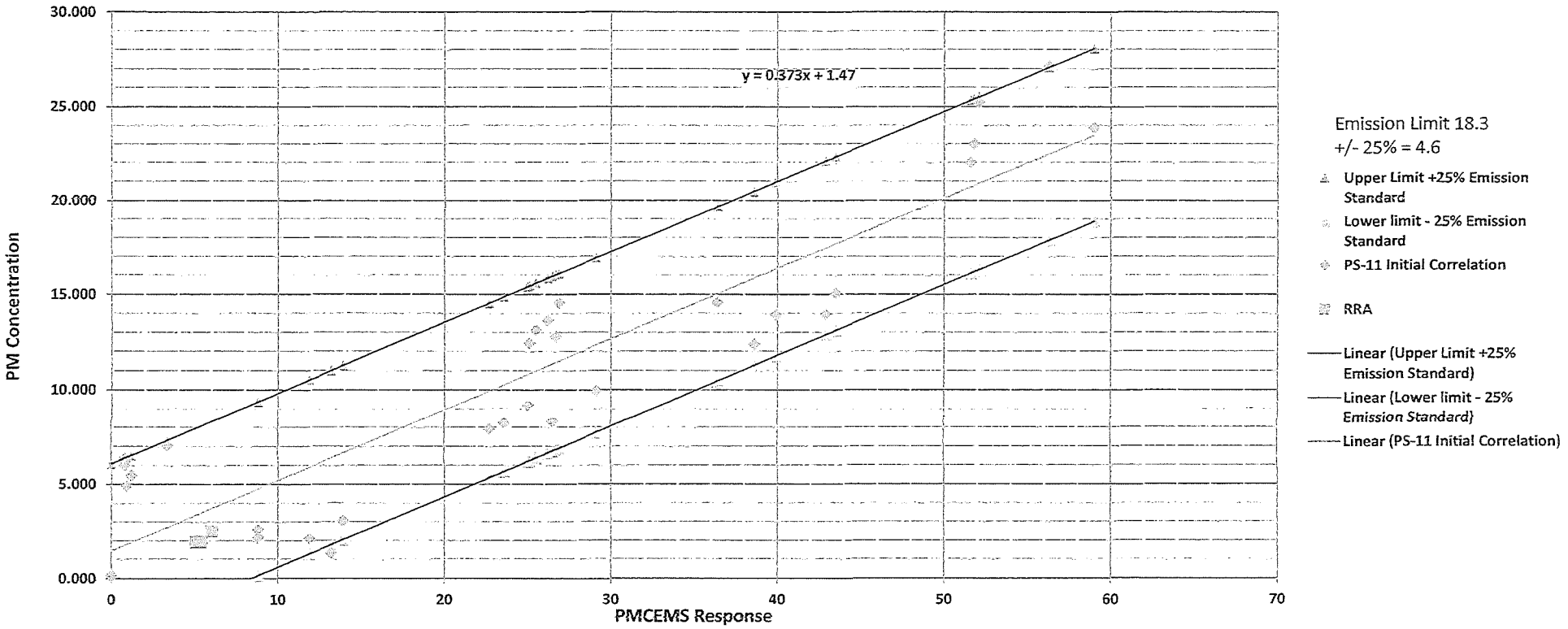
TABLE NO. 1
PARTICULATE MATTER CONTINUOUS EMISSIONS MONITORING SYSTEM
RELATIVE RESPONSE AUDIT RESULTS
Belle River Power Plant - Unit 1 Stack
March 10, 2020

Test	Test Time	Unit Load (GMW)	Stack Temperature (°F)	Stack Moisture (%)	Stack Velocity (ft/min)	Exhaust Gas Flowrates (ACFM)	Exhaust Gas Flowrates (SCFM)	Exhaust Gas Flowrates (DSCFM)	PM CEMS (mg/acm[1])	RM PM (mg/acm[1])	PM CEMS (correlation)	Correlation (-25% Emission limit[2])	Correlation (+25% Emission limit[2])
RRA-1	6:42-7:48	554.8	274.1	10.9	5,216	2,663,980	1,856,681	1,654,838	5.1	2.0	3.4	-1.23	7.97
RRA-2	8:15-9:20	554.9	277.9	11.3	5,236	2,674,191	1,854,116	1,644,618	6.0	2.5	3.7	-0.89	8.31
RRA-3	9:43-10:47	555.0	276.8	11.2	5,245	2,678,644	1,859,934	1,650,764	5.4	2.0	3.5	-1.12	8.08

(1) concentration @ stack conditions

(2) ±25% emission limit (4.6 mg/acm)

TABLE No. 2
BELLE RIVER POWER PLANT
UNIT 1
PM CEMS RRA
SUMMARY GRAPH
March 10, 2020

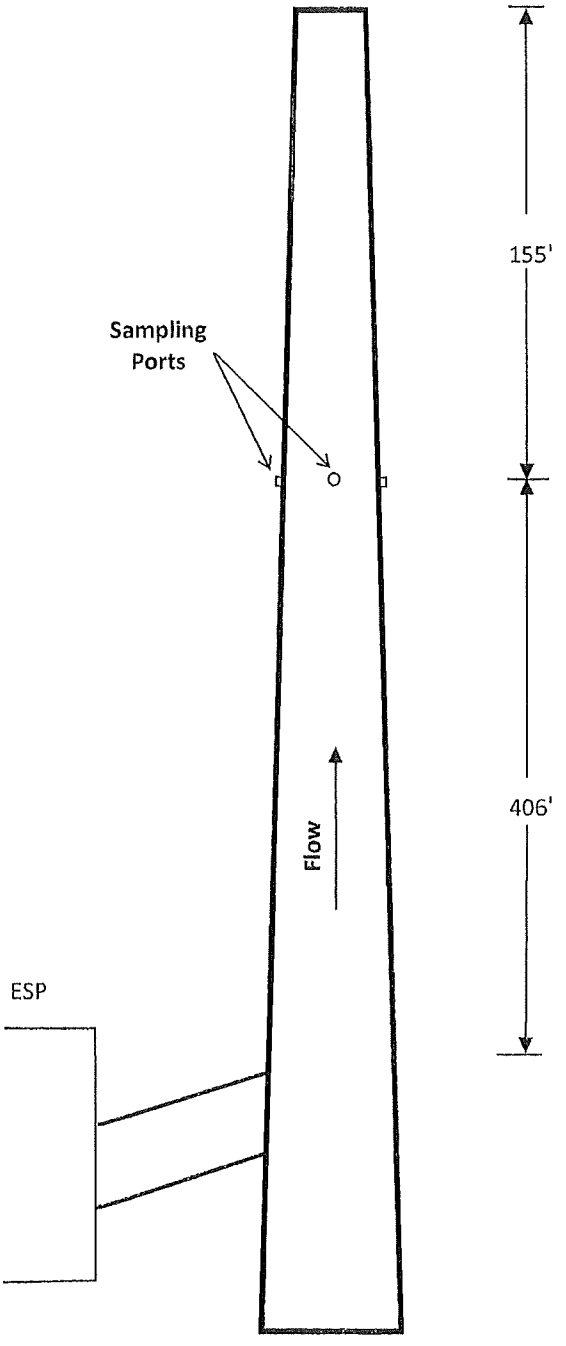


DTE

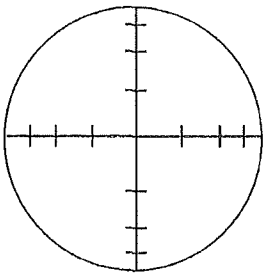
FIGURES

DTE

Figure 1 – Sampling Location
Belle River Power Plant – Units 1-2
March 10, 2020



Stack Diameter 25'-6"

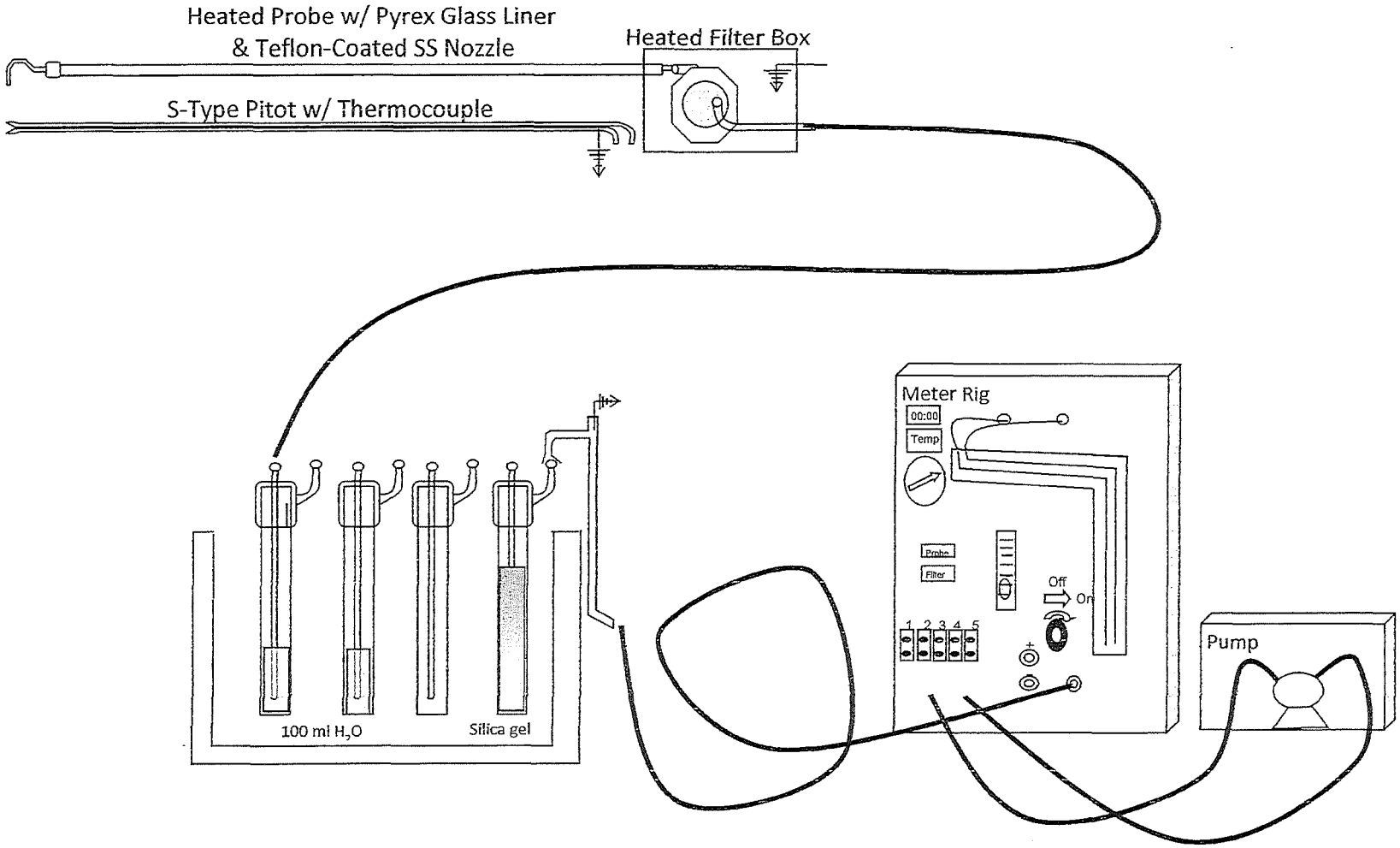


Sample Points

Points	Distance From Inner Wall
1	13.6
2	44.7
3	90.6

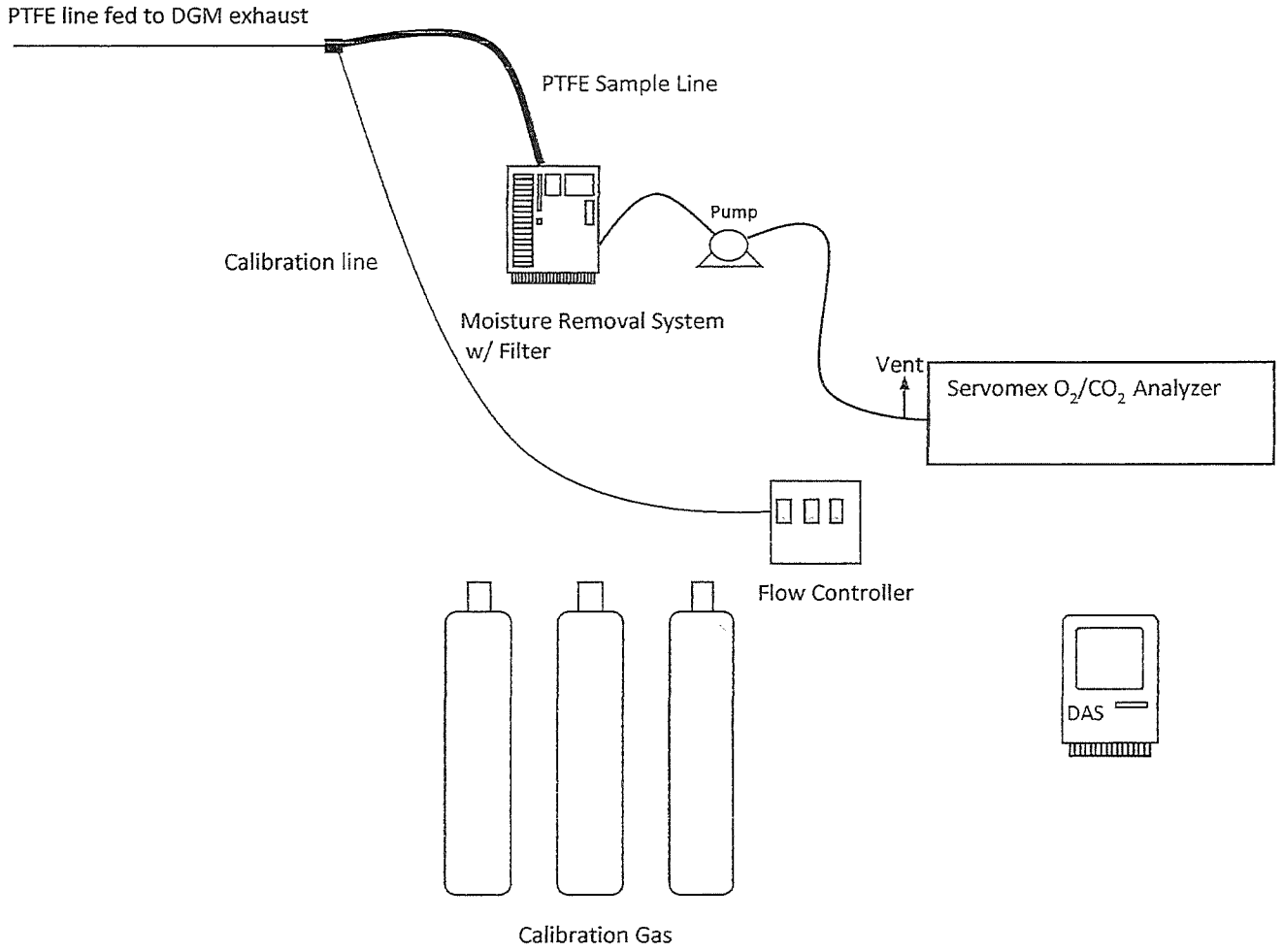
DTE

Figure 2 – Method 5 (MATS Modified)
Belle River Power Plant – Units 1-2
March 10, 2020



DTE

Figure 3 – Method 3A
Belle River Power Plant – Units 1-2
March 10, 2020



DTE

APPENDIX A

EGLE TEST PLAN