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EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EM&R) Field Services Group performed emissions testing at the DTE-Gas, Belle River Mills Compressor Station, located in China, Michigan. The fieldwork, performed on March 26, 2019 was conducted to satisfy requirements of the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-B6478-2016 and 40 CFR Part 60 Subpart KKKK. Testing was performed for oxides of nitrogen (NO_x) to determine emissions from EUTURBINEC50 and EUTURBINET70 while operating within 25% of peak load (hp).

The results of the emissions testing are highlighted below:

NO_X Emissions Test Results
Belle River Mills Compressor Station
March 26, 2019

Emission Unit	Turbine Load (% of rated hp)	NO_x Concentration (ppm @ 15% O_2)	Permit Limit[1]
EUTURBINEC50	91.3%	13.5	25.0
EUTURBINEC70	89.3%	9.9	25.0

[1] Average Oxides of Nitrogen Emissions Concentration (ppm) corrected to 15% O_2

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1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EM&R) Field Services Group performed emissions testing at the DTE-Gas, Belle River Mills Compressor Station, located in China, Michigan. The fieldwork, performed on March 26, 2019, was conducted to satisfy requirements of the Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-B6478-2016 and 40 CFR Part 60 Subpart KKKK. Testing was performed for oxides of nitrogen (NO_x) to determine emissions from EUTURBINEC50 and EUTURBINET70 while operating within 25% of peak load (hp).

Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 3A & 7E. The fieldwork was performed in accordance with EPA Reference Methods and EM&R's Intent to Test[1], Test Plan Submittal. The following DTE personnel participated in the testing program: Mark Grigereit, Principal Engineer, Jason Logan, Environmental Specialist, and Thomas Snyder, Environmental Specialist. Mr. Grigereit was the project leader. Mr. Mark Dziadosz and Mr. Joe Forth from the MDEQ-AQD observed the testing.

2.0 SOURCE DESCRIPTION

The Belle River Mills Compressor Station located at 5440 Puttygut Road, China, Michigan, employs the use of three natural gas-fired compressor turbines rated at 6,130 horsepower (EUTURBINEC50), 10,915 horsepower (EUTURBINET70), and 15,900 horsepower (EUTURBINE1). Each unit is equipped with a low NO_x combustor for NO_x control. The turbines generate line pressure assisting with the transmission of natural gas into and out of the gas storage field as well as to and from the pipeline transmission system in SE Michigan. Testing for NO_x emissions was performed on EUTURBINEC50 and EUTURBINEC70 while the turbine operated in the $LoNO_x$ mode within 25% of peak load (rated horsepower).

The turbines exhaust directly to the atmosphere through a vertical, rectangular exhaust duct.

A schematic representation of the turbines exhaust and sampling locations are presented in Figures 1 and 2. Due to frost laws (seasonal weight restrictions), a manlift was not available for use for this testing. An alternative sampling location was allowed by the MDEQ-AQD for one-time use.

[1] MDEQ, Test Plan, Submitted February 28, 2019. (Attached-Appendix A)

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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 Method 3A	Oxygen	Instrumental Analyzer Method
USEPA Method 7E	Oxides of Nitrogen	Instrumental Analyzer Method

3.1 OXYGEN AND OXIDES OF NITROGEN (USEPA METHODS 3A AND 7E)

3.1.1 Sampling Method

Oxygen (O_2) emissions were evaluated using USEPA Method 3A, "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, and Dry Molecular Weight (Instrumental Analyzer Method)". The O_2 analyzer utilizes a paramagnetic sensor.

Oxides of Nitrogen (NO_x) emissions were evaluated using USEPA Method 7E, "Determination of Oxides of Nitrogen Emissions from Stationary Sources". The NO_x analyzer utilizes a chemiluminescent detector.

3.1.2 O_2 and NO_x Sampling Train

The EPA Methods 3A and 7E sampling system (Figure 2) consisted of the following components:

(1) Stainless steel sampling probe with cintered filter.
(2) Heated Teflon™ sampling line.
(3) MAK® gas conditioner with particulate filter.
(4) Flexible unheated Teflon™ sampling line.
(5) Servomex 1400 O_2/CO_2 gas analyzer and TECO 42i NO_x gas analyzer.
(6) Appropriate USEPA Protocol 1 Calibration Gases
(7) Data Acquisition System.

Refer to Figure 2 for a schematic of the O_2 and NO_x sampling train.

3.1.3 Sampling Train Calibration

The O_2 / NO_X instruments were calibrated according to procedures outlined in USEPA Methods 3A & 7E. Zero, span, and mid-range calibration gases were introduced directly into the NO_X and O_2 analyzers to determine the instruments linearity. A zero and mid-range span gas was then introduced through the entire sampling system to determine sampling system bias for each analyzer. Additional system calibrations were performed at the completion of each test.

3.1.4 Sampling Duration & Frequency

Emissions testing consisted of triplicate 24-minute samples on the exhaust of EUTURBINEC50 and EUTURBINET70. Sampling was performed simultaneously for O_2 & NO_x. Each test consisted of sampling at three points on a line passing through the centroid located at 16.7%, 50%, and 83.3% of the stack diameter. Each point was sampled for 8 minutes. Data was recorded at 10-second intervals.

3.1.5 Quality Control and Assurance (O_2 and NOX)

All sampling and analytical equipment was calibrated according to the guidelines referenced in Methods 3A and 7E. Calibration gases were EPA Protocol 1 gases. Calibration gas concentrations were within the acceptable ranges specified in Method 7E. Methods 3A references Method 7E for calibration standards. Calibration gas certification sheets are located in Appendix B.

DTE performed converter efficiency testing by directly challenging the NO_x analyzer with a nitrogen dioxide (NO_2) calibration gas of 15.6 ppm. Results from the converter efficiency test demonstrated that the analyzer met the requirements of Method 7E (Greater than 90%).

$$Eff_{NO2} = \frac{C_{Dir}}{C_v} = \frac{14.34}{15.6} = 91.9\%$$

Calibration gas certification sheets are located in Appendix C.

3.1.6 Data Reduction

The O_2 and NO_x emission readings were recorded at 10-second intervals and averaged to 1-minute increments. NOx emissions were reported in parts per million corrected to 15% O_2 (ppm @ 15% O_2) as required by the MDEQ ROP.

The emissions data collected can be found in Appendix B.

4.0 OPERATING PARAMETERS

The test program included the collection of turbine operating data during each test run. Parameters recorded included load (horsepower), gross dry BTU, fuel feed rate, air inlet pressure, and air inlet temperature.

Operational data and results of the fuel analysis can be found in Appendix E.

5.0 RESULTS

The results of the NOx emission testing conducted on EUTURBINEC50 and EUTURBINET70 are presented in Table Nos. 1 and 2, respectively. The NOx emissions are presented in parts per million (ppm) and parts per million at 15% oxygen (ppmvd @ 15% O_2) and process data presented in unit load (%).

Testing of EUTURBINEC50 and EUTURBINET70 demonstrated compliance with permitted emission rates at 91.3% and 89.3% load, respectively.

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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."

Jason Logan, QSTI

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RESULTS TABLE

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TABLE NO. 1
NITROGEN OXIDE (NOx) EMISSION TESTING RESULTS
Belle River Mills Compressor Station
EUTURBINEC50
March 26, 2019

Test	Time	Load (% of rated hp)	Oxygen [1] (%)	NO_x Emissions [1] (ppm)	NO_x Emissions [1] (ppm @ 15% O_2)
Test-1	9:00-9:24	91.1%	15.6	12.2	13.7
Test-2	9:33-9:57	92.1%	15.7	12.1	13.6
Test-3	10:08-10:32	90.5%	15.7	11.8	13.3
	Avg:	*91.3%*	*15.7*	*12.1*	*13.5*

(1) Corrected for analyzer drift per USEPA method 7E

NOx Permit Limits:

25.0 ppm corrected to 15% O2

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TABLE NO. 2
NITROGEN OXIDE (NOx) EMISSION TESTING RESULTS
Belle River Mills Compressor Station
EUTURBINET70
March 26, 2019

Test	Time	Load (% of rated hP)	Oxygen [1] (%)	NO_x Emissions [1] (ppm)	NO_x Emissions [1] (ppm @ 15% O_2)
Test-4	10:50-11:14	89.3%	15.3	9.1	9.7
Test-5	11:23-11:47	89.4%	15.3	9.3	9.9
Test-6	11:57-12:21	89.2%	15.3	9.5	10.1
	Avg:	*89.3%*	*15.3*	*9.3*	*9.9*

(1) Corrected for analyzer drift per USEPA method 7E

NOx Permit Limits:

25.0 ppm corrected to 15% O2

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FIGURES

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Figure 1 – Sampling Location
Belle River Mills Compressor Station - EUTURBINEC50
March 26, 2019

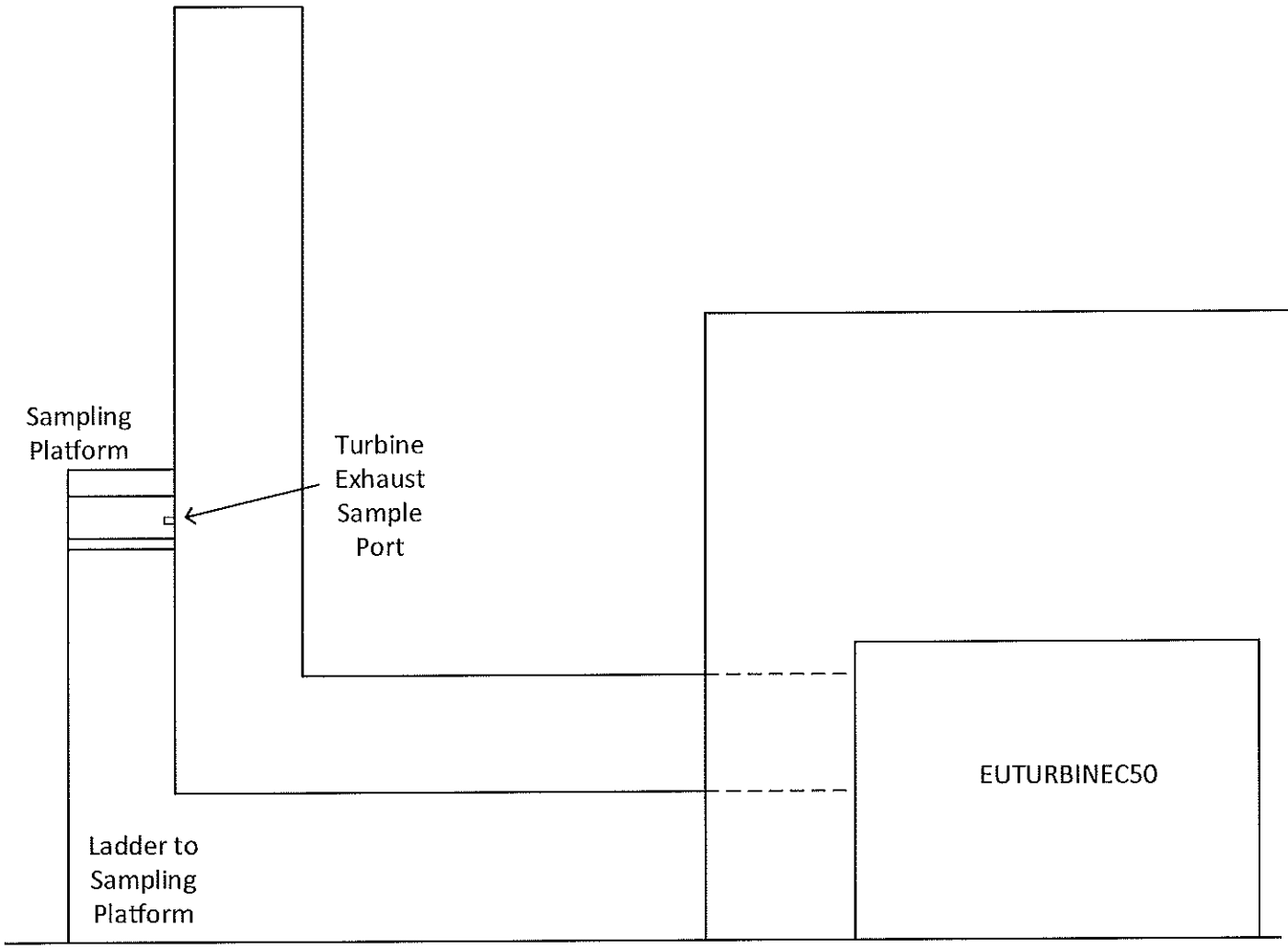

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Figure 2 – Sampling Location
Belle River Mills Compressor Station - EUTURBINET70
March 26, 2019

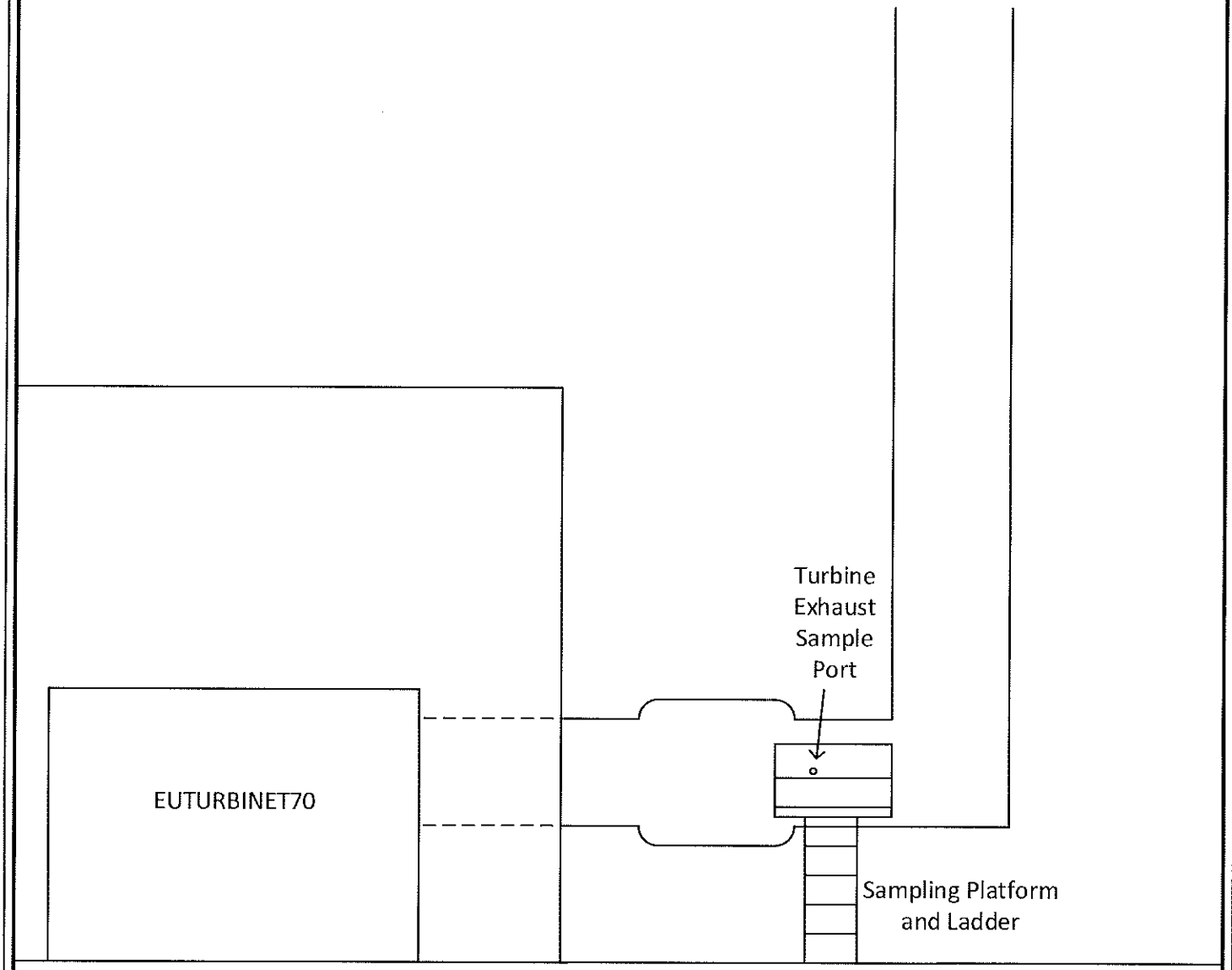

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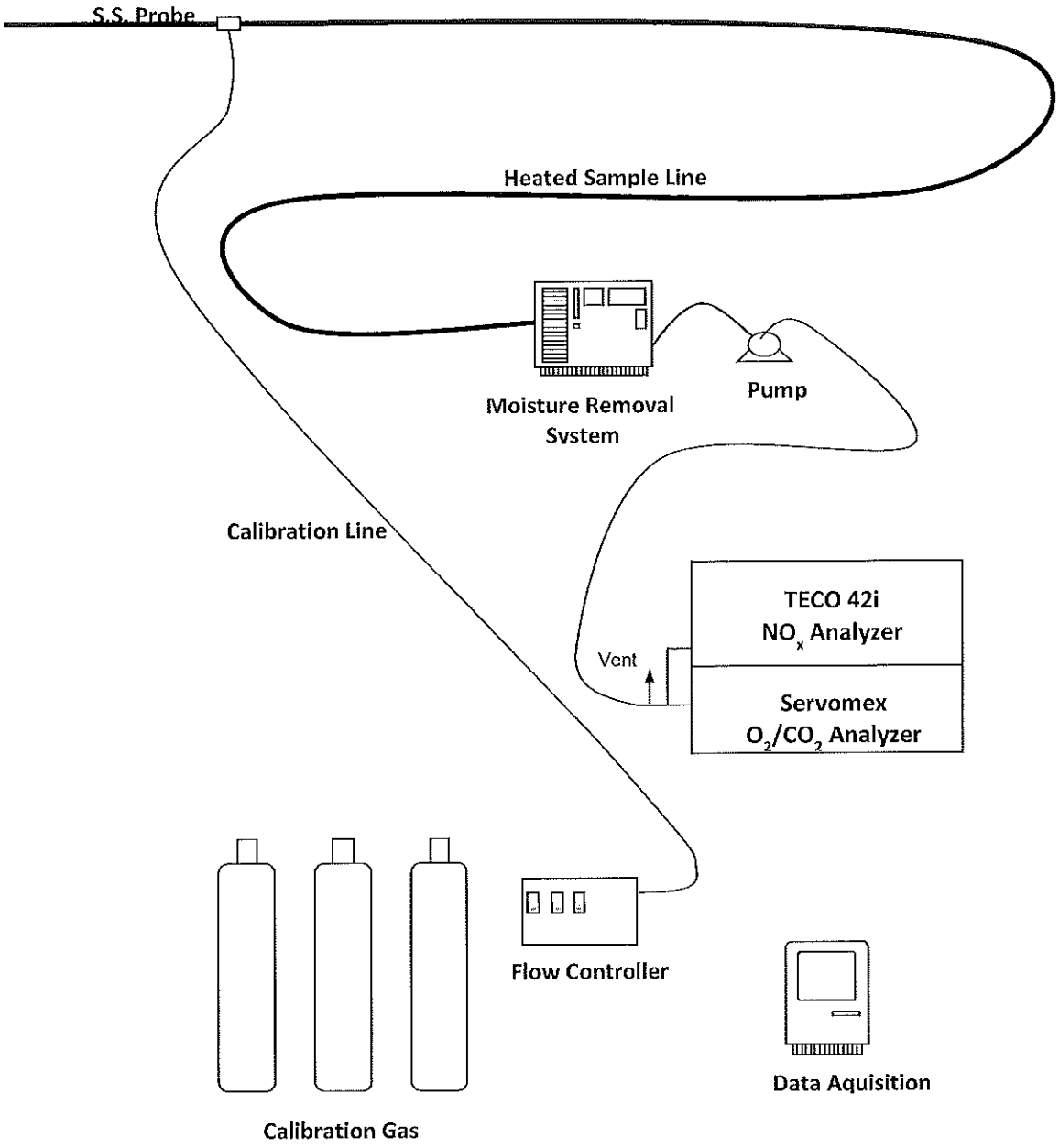
Figure 3 – EPA Methods 3A & 7E
Belle River Compressor Station – Turbines C50 & T70
March 26, 2019



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APPENDIX A

MDEQ TEST PLAN