UPPER MICHIGAN ENERGY RESOURCES

Upper Michigan Energy
Resources Corporation
231 W. Michigan St.
Milwaukee, WI 53203

UNITED PARCEL SERVICE

May 2, 2019

Mr. Joseph Scanlan
Michigan Department of Environment, Great Lakes, and Energy
Air Quality Division
1504 West Washington Street
Marquette, MI 49855

Subject: **A.J. Mihm Generating Station**
Pelkie, Michigan
Permit to Install 34-17 and 40 CFR Part 63 Subpart ZZZZ
EURICE1, EURICE2, and EURICE3 Compliance Emissions
Test Report Submittal

Dear Mr. Scanlan:

Upper Michigan Energy Resources Corporation (UMERC) respectfully submits the results of reciprocating internal combustion engine (RICE) Maximum Achievable Control Technology (MACT) initial compliance testing conducted at the A.J. Mihm Generating Station units EURICE1, EURICE2, and EURICE3 during the period March 14-16, 2019.

The results demonstrate compliance with the conditions of Permit To Install 34-17 and 40 CFR Part 63 Subpart ZZZZ. A summary of results by emission unit is presented below.

Source	Pollutant	Test Result	RICE MACT Emission Limit
EURICE1	Formaldehyde	0.3 ppmvd @ 15% O2	14 ppmvd @ 15% O2
EURICE2	Formaldehyde	0.4 ppmvd @ 15% O2	14 ppmvd @ 15% O2
EURICE3	Formaldehyde	0.4 ppmvd @ 15% O2	14 ppmvd @ 15% O2

Enclosed please find the following Mostardi Platt test report:

- *Semiannual RICE MACT Compliance Emissions Test Report, Upper Michigan Resource Corporation, A.J. Mihm Generating Station, EURICE1, EURICE2, EURICE3, Pelkie, Michigan, Project No. M190803D, March 14 through March 16, 2019.*

If you have any questions or need additional information, please contact me at (414) 221-2389 or laura.jarmuz@wecenergygroup.com.

Sincerely,

Laura M Jarmuz

Laura Jarmuz
Senior Engineer

cc: Karen Kajiya-Mills, Technical Programs Unit, EGLE, Air Quality Division
Ed Nam, Director Air and Radiation, US EPA Region V
Ed Lancaster, District Supervisor, EGLE, Air Quality Division—w/o enclosure
Scott Johnson, UMERC—electronic w/o enclosure
Justin Kowalski, UMERC—electronic w/o enclosure

Enclosure:

1. Mostardi Platt Project No. M190803D Report

mostardi platt

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MAY 06 2019
AIR QUALITY DIVISION

Semiannual RICE MACT Compliance Emissions Test Report

Upper Michigan Resources Corporation
A.J. Mihm Generating Station
Permit No. 34-17
EURICE1, EURICE2, EURICE3 Outlet Ducts
Pelkie, Michigan
March 14 through March 16, 2019

Report Submittal Date
April 26, 2019

Project No. M190803D

888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a formaldehyde emissions test program for Upper Michigan Energy Resources Corporation (UMERC) on March 14 through March 16, 2019 at A. J. Mihm Generating Station on the Reciprocating Internal Combustion Engine (EURICE) 1, EURICE2, and EURICE3 Outlet Ducts in Pelkie, Michigan. The purpose of the test program was to meet the initial compliance demonstration requirements for emission rates in accordance with Permit to Install 34-17 and the RICE MACT 40 CFR Part 63 Subpart ZZZZ. This report summarizes the results of the test program and test methods used.

The test locations, test dates, and test parameters are summarized below.

TEST INFORMATION		
Test Locations	**Test Dates**	**Test Parameters**
EURICE1	March 14, 2019	Formaldehyde (CH_2O), Moisture (H_2O), and Oxygen (O_2)
EURICE2	March 15, 2019	(CH_2O), (H_2O), and (O_2)
EURICE3	March 16, 2019	(CH_2O), (H_2O), and (O_2)

A.J. Mihm Generating Station electric generation facility includes three (3) Wärtsilä W18V50SG natural gas-fired, four stroke, lean burn, spark ignition reciprocating internal combustion engines (RICE) coupled to 18,817 kW electric generators, a 1,000 kW natural gas-fired emergency generator, and one natural gas-fired natural gas conditioning heater. The RICE electric generating unit engines utilize pipeline quality natural gas and are equipped with selective catalytic reduction (SCR) for nitrogen oxides (NOx) control and oxidation catalyst systems for carbon monoxide (CO), volatile organic compound (VOC), and organic hazardous air pollutant (HAP) control. Each RICE electric generating unit exhausts into an individual stack.

Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS				
Test Location	**Date**	**Test Parameter**	**Emission Limit**	**Emission Rate**
EURICE1	3/14/2019	Formaldehyde	14 ppmvd @ 15% O_2	0.3 ppmvd @ 15% O_2
EURICE2	3/15/2019			0.4 ppmvd @ 15% O_2
EURICE3	3/16/2019			0.4 ppmvd @ 15% O_2

Operating Data as provided by the plant is included in Appendix A.

The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Coordinator	WEC Energy Group, Inc 231 W. Michigan Street Milwaukee, Wisconsin 53203	Ms. Laura Jarmuz Senior Engineer 414-221-2389 Laura.jarmuz@wecenergygroup.com
Test Facility	Upper Michigan Energy Resources Corporation A.J. Mihm Generating Station 16017 Sarya Road Pelkie, Michigan 49958	
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. John S Nestor Project Manager (630) 993-2100 (phone) jnestor@mp-mail.com

The test crew consisted Messrs. J. Nestor, M. Peterson, N. Colangelo, J. Gross, J. Carlson, K. Krofel and R. Sollars of Mostardi Platt.

2.0 TEST METHODOLOGY

Emission testing was conducted following the methods specified in 40CFR60, Appendix A and 40CFR63, Appendix A. Schematics of the test section diagrams and sampling trains used are included in Appendix B and C, respectively. Calculation nomenclature and example calculations are included in Appendix D. Reference method test data can be found in Appendix E.

The following methodology was used during the test program:

Method 3A Oxygen (O_2) Determination

Oxygen (O_2) concentrations were measured to determine emission rates in ppmvd corrected to 15% O_2 in accordance with Method 3A. An ECOM analyzer was used to determine stack gas oxygen. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix F and copies of gas cylinder certifications are included in Appendix G.

Method 320 Formaldehyde (CH_2O) and Moisture (H_2O) Determination

FTIR data was collected using an MKS MultiGas 2030 FTIR spectrometer.

The FTIR was equipped with a temperature-controlled, 5.11 meter multi-pass gas cell maintained at 191°C. Gas flows and sampling system pressures were monitored using a rotameter and pressure transducer. All data was collected at 0.5 cm^{-1} resolution. Each spectrum was derived from the coaddition of 62 scans, with a new data point generated approximately every one minute. Analyzer data for each run is present is Appendix E.

SAMPLING SYSTEM PARAMETERS				
MKS Serial #	**Sampling Line**	**Probe Assembly**	**Particulate Filter Media**	**Operating Temperatures**
019088128	100' 3/8" dia., heated Teflon	Heated 3', 3/8" dia. SS	0.01µ heated borosilicate glass fiber	191°C

QA/QC procedures followed US EPA Method 320. See below for QA/QC procedure details and list of calibration gas standards. All calibration gases were introduced to the analyzer and the sampling system using an instrument grade stainless steel rotameter. All QA/QC procedures were within the acceptance criteria allowance of the applicable EPA methodology. See Appendix F for FTIR QA/QC Data.

FTIR QA/QC PROCEDURES						
QA/QC Specification	**Purpose**	**Calibration Gas Analyte**	**Delivery**	**Frequency**	**Acceptance Criteria**	**Result**
M320: Zero	Verify that the FTIR is free of contaminants & zero the FTIR	Nitrogen (zero)	Direct to FTIR	pre/post test	< MDL or Noise	**Pass**
M320: Calibration Transfer Standard (CTS) Direct	Verify FTIR stability, confirm optical path length	Ethylene	Direct to FTIR	pretest	+/- 5% cert. value	**Pass**
M320: Analyte Direct	Verify FTIR calibration	Acetaldehyde, Methanol, SF6	Direct to FTIR	pretest	+/- 5% cert. value	**Pass**
M320: CTS Response	Verify system stability, recovery, response time	Ethylene	Sampling System	Daily, pre/post test	+/- 5% of Direct Measurement	**Pass**
M320: Zero Response	Verify system is free of contaminants, system bias	Nitrogen (zero)	Sampling System	pretest	Bias correct data	**Pass**
M320: Analyte Spike	Verify system ability to deliver and quantify analyte of interest in the presence of other effluent gases	Acetaldehyde, Methanol, SF6	Dynamic Addition to Sampling System, 1:10 effluent	Throughout testing – daily	+/- 30% theoretical recovery	**Pass**

Note: The determined concentrations from direct analyses were used in all system/spike recovery calculations.

CALIBRATION GAS STANDARDS				
Components	**Concentration (ppm)**	**Vendor**	**Cylinder #**	**Standard Type**
Ethylene	100.0	Airgas	CC111625	Primary +/- 1%
Acetaldehyde/ Methanol/SF6	194.4/195.3/ 4.820	Airgas	CC475635	Certified Standard-Spec +/- 5%
Nitrogen	Zero Gas	Airgas	N/A	UHP Grade

Analyte Spiking
Acetaldehyde and methanol spiking was performed prior to testing to verify the ability of the sampling system to quantitatively deliver a sample containing acetaldehyde and methanol from the base of the probe to the FTIR. Analyte spiking assures the ability of the FTIR sampling system to recover volatile organics in the presence of effluent gas.

As part of the spiking procedure, samples were measured to determine native acetaldehyde and methanol concentrations to be used in the spike recovery calculations. The analyte spiking gases contained a low concentration of sulfur hexafluoride (SF_6). The determined SF_6 concentration in the spiked sample was used to calculate the dilution factor of the spike and thus used to calculate the concentration of the spiked Acetaldehyde and methanol. The spike target dilution ratio was 1:10 or less.

The following equation illustrates the percent recovery calculation.

$$DF = \frac{SF6(spk)}{SF6(direct)} \quad \text{(Sec. 9.2.3 (3) USEPA Method 320)}$$

$$CS = DF * Spike(dir) + Unspike(1 - DF) \quad \text{(Sec. 9.2.3 (4) USEPA Method 320)}$$

DF = Dilution factor of the spike gas
$SF_{6(dir)}$ = SF_6 concentration measured directly in undiluted spike gas
$SF_{6(spk)}$ = Diluted SF_6 concentration measured in a spiked sample
$Spike_{dir}$ = Concentration of the analyte in the spike standard measure by the FTIR directly
CS = Expected concentration of the spiked samples
Unspike = Native concentration of analytes in unspiked samples

Post Collection Data Validation
As part of the data validation procedure, reference spectra are manually fit to that of the sample spectra and a concentration is determined. The reference spectra are scaled to match the peak amplitude of the sample, thus providing a scale factor. The scale factor multiplied by the reference spectra concentration is used to determine the concentration value for the sample spectra. Sample pressure and temperature corrections are then applied to compute the final sample concentration. The manually calculated results are then compared with the software-generated results. The data is then validated if the two concentrations are within ± 20% agreement. If there is a difference greater than ± 20% the spectra are reviewed for possible spectra interferences or any other possible causes leading to incorrectly quantified data.

Detection Limit

The detection limit of each analyte was calculated following Annex A2 of ASTM D6348-12 procedure using spectra that contained similar amounts of moisture and carbon dioxide.

Analyte	Detection Limit (ppmv wet)	Detection Limit (%v)
Formaldehyde	**0.2**	-
Moisture	-	**0.1**

QA/QC data are found in Appendix F. Copies of gas cylinder certifications are found in Appendix G. All concentration data were recorded on a wet, volume basis. The sample and data collection followed the procedures outlined in Method 320.

3.0 TEST RESULT SUMMARIES

RICE MACT Compliance Emission Summary Upper Michigan Resource Generation Company A.J. Mihm Generating Station EURICE1 Outlet Duct						
Run Number	Date	Time	Formaldehyde (ppmv wet)	H2O (%v)	O2 (%v Dry)	Formaldehyde (ppmv dry @ 15% O_2)
2	3/14/2019	11:55-12:54	0.4	10.2	11.1	0.3
3	3/14/2019	15:00-15:59	0.4	10.2	11.2	0.3
4	3/14/2019	17:30-18:29	0.6	10.2	11.0	0.4
Average			0.5	10.2	11.1	0.3

RICE MACT Compliance Emission Summary Upper Michigan Resource Generation Company A.J. Mihm Generating Station EURICE2 Outlet Duct						
Run Number	Date	Time	Formaldehyde (ppmv wet)	H2O (%v)	O2 (%v Dry)	Formaldehyde (ppmv dry @ 15% O_2)
1	3/15/2019	8:10-9:09	0.5	9.8	11.4	0.3
2	3/15/2019	10:52-11:51	0.6	9.7	11.5	0.4
3	3/15/2019	13:33-14:32	0.6	9.7	11.4	0.4
Average			0.6	9.7	11.4	0.4

RICE MACT Compliance Emission Summary Upper Michigan Resource Generation Company A.J. Mihm Generating Station EURICE3 Outlet Duct						
Run Number	Date	Time	Formaldehyde (ppmv wet)	H2O (%v)	O2 (%v Dry)	Formaldehyde (ppmv dry @ 15% O_2)
1	3/16/2019	9:19-10:18	0.5	9.6	11.4	0.3
2	3/16/2019	12:08-13:07	0.7	9.5	11.5	0.5
3	3/16/2019	14:33-15:32	0.7	9.4	11.5	0.5
Average			0.6	9.5	11.5	0.4

4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Upper Michigan Energy Resources Corporation. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

CERTIFICATION

As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT

John Nestor

Project Manager

John S. Nestor

Scott W. Banach

Quality Assurance

Scott W. Banach

APPENDICES

Appendix A – Plant Operating Data

A.J. Mihm Generating Station
RICE MACT Compliance Emissions Testing
Summary of Operating Data

EURICE1					
3/14/2019					
Method 3A and 320					
Start Time	*821*	*1155*	*1500*	*1730*	
End Time	*920*	*1254*	*1559*	*1829*	
	Run 1*	**Run 2**	**Run 3**	**Run 4**	**Average**
Engine (kW)	18,912	18,832	18,911	18,910	**18,884**
Engine natural gas use (pound/hour)	6,528	6,537	6,553	6,488	**6,526**
SCR/Oxidation catalyst inlet temperature) (deg F)	729	730	729	731	**730**
Pressure drop across the oxidation catalyst (PSI)	0.10	0.10	0.10	0.10	**0.10**

*Run 1 was excluded from the test program due to an equipment malfunction on a TPM train during a concurrent test run

EURICE2				
3/15/2019				
Method 3A and 320				
Start Time	*810*	*1052*	*1333*	
End Time	*909*	*1151*	*1432*	
	Run 1	**Run 2**	**Run 3**	**Average**
Engine (kW)	18,867	18,851	18,860	**18,859**
Engine natural gas use (pound/hour)	6,597	6,538	6,540	**6,558**
SCR/Oxidation catalyst inlet temperature) (deg F)	724	724	725	**725**
Pressure drop across the oxidation catalyst (PSI)	0.10	0.10	0.10	**0.10**

EURICE3				
3/16/2019				
Method 3A and 320				
Start Time	*919*	*1208*	*1433*	
End Time	*1018*	*1307*	*1532*	
	Run 1	**Run 2**	**Run 3**	**Average**
Engine (kW)	18,847	18,849	18,848	**18,848**
Engine natural gas use (pound/hour)	6,518	6,570	6,585	**6,558**
SCR/Oxidation catalyst inlet temperature) (deg F)	726	722	720	**722**
Pressure drop across the oxidation catalyst (PSI)	0.14	0.11	0.12	**0.12**

Upper Michigan Energy Resources Corporation Mihm Generating Station Temperature and Pressure Data				
Unit	Date	Barometric Pressure, Inches Hg	Ambient Temperature, ° F	Relative Humidity, %
EURICE1	03/14/19	29.30	40	88.93
EURICE2	03/15/19	29.19	28	71.57
EURICE3	03/16/19	29.69	21	67.72

EURICE1
SCR/Oxidation Catalyst Inlet Temperature

Start Time	End Time	Value/Average (Deg F)
03-14-2019 08:20 EDT	03-14-2019 08:25 EDT	730
03-14-2019 08:25 EDT	03-14-2019 08:30 EDT	730
03-14-2019 08:30 EDT	03-14-2019 08:35 EDT	730
03-14-2019 08:35 EDT	03-14-2019 08:40 EDT	730
03-14-2019 08:40 EDT	03-14-2019 08:45 EDT	730
03-14-2019 08:45 EDT	03-14-2019 08:50 EDT	729
03-14-2019 08:50 EDT	03-14-2019 08:55 EDT	729
03-14-2019 08:55 EDT	03-14-2019 09:00 EDT	729
03-14-2019 09:00 EDT	03-14-2019 09:05 EDT	729
03-14-2019 09:05 EDT	03-14-2019 09:10 EDT	729
03-14-2019 09:10 EDT	03-14-2019 09:15 EDT	729
03-14-2019 09:15 EDT	03-14-2019 09:20 EDT	729
03-14-2019 09:20 EDT	03-14-2019 09:25 EDT	729
03-14-2019 09:25 EDT	03-14-2019 09:30 EDT	729
03-14-2019 09:30 EDT	03-14-2019 09:35 EDT	729
03-14-2019 09:35 EDT	03-14-2019 09:40 EDT	729
03-14-2019 09:40 EDT	03-14-2019 09:45 EDT	729
03-14-2019 09:45 EDT	03-14-2019 09:50 EDT	729
03-14-2019 09:50 EDT	03-14-2019 09:55 EDT	729
03-14-2019 09:55 EDT	03-14-2019 10:00 EDT	729
03-14-2019 10:00 EDT	03-14-2019 10:05 EDT	729
03-14-2019 10:05 EDT	03-14-2019 10:10 EDT	729
03-14-2019 10:10 EDT	03-14-2019 10:15 EDT	729
03-14-2019 10:15 EDT	03-14-2019 10:20 EDT	729
03-14-2019 10:20 EDT	03-14-2019 10:25 EDT	729
03-14-2019 10:25 EDT	03-14-2019 10:30 EDT	729
03-14-2019 10:30 EDT	03-14-2019 10:35 EDT	729
03-14-2019 10:35 EDT	03-14-2019 10:40 EDT	729
03-14-2019 10:40 EDT	03-14-2019 10:45 EDT	729
03-14-2019 10:45 EDT	03-14-2019 10:50 EDT	729
03-14-2019 10:50 EDT	03-14-2019 10:55 EDT	729
03-14-2019 10:55 EDT	03-14-2019 11:00 EDT	729
03-14-2019 11:00 EDT	03-14-2019 11:05 EDT	729
03-14-2019 11:05 EDT	03-14-2019 11:10 EDT	729
03-14-2019 11:10 EDT	03-14-2019 11:15 EDT	729
03-14-2019 11:15 EDT	03-14-2019 11:20 EDT	729
03-14-2019 11:20 EDT	03-14-2019 11:25 EDT	729
03-14-2019 11:25 EDT	03-14-2019 11:30 EDT	729
03-14-2019 11:30 EDT	03-14-2019 11:35 EDT	729
03-14-2019 11:35 EDT	03-14-2019 11:40 EDT	729
03-14-2019 11:40 EDT	03-14-2019 11:45 EDT	729
03-14-2019 11:45 EDT	03-14-2019 11:50 EDT	729
03-14-2019 11:50 EDT	03-14-2019 11:55 EDT	729
03-14-2019 11:55 EDT	03-14-2019 12:00 EDT	729
03-14-2019 12:00 EDT	03-14-2019 12:05 EDT	729
03-14-2019 12:05 EDT	03-14-2019 12:10 EDT	729
03-14-2019 12:10 EDT	03-14-2019 12:15 EDT	729

EURICE1
SCR/Oxidation Catalyst Inlet Temperature

Start Time	End Time	Value/Average (Deg F)
03-14-2019 12:15 EDT	03-14-2019 12:20 EDT	729
03-14-2019 12:20 EDT	03-14-2019 12:25 EDT	729
03-14-2019 12:25 EDT	03-14-2019 12:30 EDT	729
03-14-2019 12:30 EDT	03-14-2019 12:35 EDT	729
03-14-2019 12:35 EDT	03-14-2019 12:40 EDT	729
03-14-2019 12:40 EDT	03-14-2019 12:45 EDT	731
03-14-2019 12:45 EDT	03-14-2019 12:50 EDT	730
03-14-2019 12:50 EDT	03-14-2019 12:55 EDT	730
03-14-2019 12:55 EDT	03-14-2019 13:00 EDT	730
03-14-2019 13:00 EDT	03-14-2019 13:05 EDT	730
03-14-2019 13:05 EDT	03-14-2019 13:10 EDT	731
03-14-2019 13:10 EDT	03-14-2019 13:15 EDT	732
03-14-2019 13:15 EDT	03-14-2019 13:20 EDT	730
03-14-2019 13:20 EDT	03-14-2019 13:25 EDT	730
03-14-2019 13:25 EDT	03-14-2019 13:30 EDT	730
03-14-2019 13:30 EDT	03-14-2019 13:35 EDT	730
03-14-2019 13:35 EDT	03-14-2019 13:40 EDT	730
03-14-2019 13:40 EDT	03-14-2019 13:45 EDT	731
03-14-2019 13:45 EDT	03-14-2019 13:50 EDT	731
03-14-2019 13:50 EDT	03-14-2019 13:55 EDT	730
03-14-2019 13:55 EDT	03-14-2019 14:00 EDT	729
03-14-2019 14:00 EDT	03-14-2019 14:05 EDT	729
03-14-2019 14:05 EDT	03-14-2019 14:10 EDT	729
03-14-2019 14:10 EDT	03-14-2019 14:15 EDT	729
03-14-2019 14:15 EDT	03-14-2019 14:20 EDT	729
03-14-2019 14:20 EDT	03-14-2019 14:25 EDT	729
03-14-2019 14:25 EDT	03-14-2019 14:30 EDT	729
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03-14-2019 14:50 EDT	03-14-2019 14:55 EDT	729
03-14-2019 14:55 EDT	03-14-2019 15:00 EDT	730
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03-14-2019 15:15 EDT	03-14-2019 15:20 EDT	729
03-14-2019 15:20 EDT	03-14-2019 15:25 EDT	729
03-14-2019 15:25 EDT	03-14-2019 15:30 EDT	729
03-14-2019 15:30 EDT	03-14-2019 15:35 EDT	729
03-14-2019 15:35 EDT	03-14-2019 15:40 EDT	729
03-14-2019 15:40 EDT	03-14-2019 15:45 EDT	729
03-14-2019 15:45 EDT	03-14-2019 15:50 EDT	729
03-14-2019 15:50 EDT	03-14-2019 15:55 EDT	729
03-14-2019 15:55 EDT	03-14-2019 16:00 EDT	729
03-14-2019 16:00 EDT	03-14-2019 16:05 EDT	729
03-14-2019 16:05 EDT	03-14-2019 16:10 EDT	729

EURICE1
SCR/Oxidation Catalyst Inlet Temperature

Start Time	End Time	Value/Average (Deg F)
03-14-2019 16:10 EDT	03-14-2019 16:15 EDT	729
03-14-2019 16:15 EDT	03-14-2019 16:20 EDT	729
03-14-2019 16:20 EDT	03-14-2019 16:25 EDT	729
03-14-2019 16:25 EDT	03-14-2019 16:30 EDT	729
03-14-2019 16:30 EDT	03-14-2019 16:35 EDT	730
03-14-2019 16:35 EDT	03-14-2019 16:40 EDT	730
03-14-2019 16:40 EDT	03-14-2019 16:45 EDT	730
03-14-2019 16:45 EDT	03-14-2019 16:50 EDT	730
03-14-2019 16:50 EDT	03-14-2019 16:55 EDT	730
03-14-2019 16:55 EDT	03-14-2019 17:00 EDT	730
03-14-2019 17:00 EDT	03-14-2019 17:05 EDT	730
03-14-2019 17:05 EDT	03-14-2019 17:10 EDT	730
03-14-2019 17:10 EDT	03-14-2019 17:15 EDT	730
03-14-2019 17:15 EDT	03-14-2019 17:20 EDT	730
03-14-2019 17:20 EDT	03-14-2019 17:25 EDT	730
03-14-2019 17:25 EDT	03-14-2019 17:30 EDT	730
03-14-2019 17:30 EDT	03-14-2019 17:35 EDT	730
03-14-2019 17:35 EDT	03-14-2019 17:40 EDT	730
03-14-2019 17:40 EDT	03-14-2019 17:45 EDT	730
03-14-2019 17:45 EDT	03-14-2019 17:50 EDT	730
03-14-2019 17:50 EDT	03-14-2019 17:55 EDT	730
03-14-2019 17:55 EDT	03-14-2019 18:00 EDT	730
03-14-2019 18:00 EDT	03-14-2019 18:05 EDT	730
03-14-2019 18:05 EDT	03-14-2019 18:10 EDT	731
03-14-2019 18:10 EDT	03-14-2019 18:15 EDT	731
03-14-2019 18:15 EDT	03-14-2019 18:20 EDT	730
03-14-2019 18:20 EDT	03-14-2019 18:25 EDT	730
03-14-2019 18:25 EDT	03-14-2019 18:30 EDT	730
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03-14-2019 18:35 EDT	03-14-2019 18:40 EDT	731
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03-14-2019 18:45 EDT	03-14-2019 18:50 EDT	731
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03-14-2019 18:55 EDT	03-14-2019 19:00 EDT	730
03-14-2019 19:00 EDT	03-14-2019 19:05 EDT	732
03-14-2019 19:05 EDT	03-14-2019 19:10 EDT	732
03-14-2019 19:10 EDT	03-14-2019 19:15 EDT	732
03-14-2019 19:15 EDT	03-14-2019 19:20 EDT	732
03-14-2019 19:20 EDT	03-14-2019 19:25 EDT	732
03-14-2019 19:25 EDT	03-14-2019 19:30 EDT	732
03-14-2019 19:30 EDT	03-14-2019 19:35 EDT	732
03-14-2019 19:35 EDT	03-14-2019 19:40 EDT	732

EURICE2
SCR/Oxidation Catalyst Inlet Temperature

Start Time	End Time	Value/Average (Deg F)
03-15-2019 08:10 EDT	03-15-2019 08:15 EDT	723
03-15-2019 08:15 EDT	03-15-2019 08:20 EDT	723
03-15-2019 08:20 EDT	03-15-2019 08:25 EDT	723
03-15-2019 08:25 EDT	03-15-2019 08:30 EDT	724
03-15-2019 08:30 EDT	03-15-2019 08:35 EDT	725
03-15-2019 08:35 EDT	03-15-2019 08:40 EDT	725
03-15-2019 08:40 EDT	03-15-2019 08:45 EDT	725
03-15-2019 08:45 EDT	03-15-2019 08:50 EDT	725
03-15-2019 08:50 EDT	03-15-2019 08:55 EDT	725
03-15-2019 08:55 EDT	03-15-2019 09:00 EDT	725
03-15-2019 09:00 EDT	03-15-2019 09:05 EDT	725
03-15-2019 09:05 EDT	03-15-2019 09:10 EDT	725
03-15-2019 09:10 EDT	03-15-2019 09:15 EDT	725
03-15-2019 09:15 EDT	03-15-2019 09:20 EDT	725
03-15-2019 09:20 EDT	03-15-2019 09:25 EDT	725
03-15-2019 09:25 EDT	03-15-2019 09:30 EDT	725
03-15-2019 09:30 EDT	03-15-2019 09:35 EDT	725
03-15-2019 09:35 EDT	03-15-2019 09:40 EDT	724
03-15-2019 09:40 EDT	03-15-2019 09:45 EDT	723
03-15-2019 09:45 EDT	03-15-2019 09:50 EDT	723
03-15-2019 09:50 EDT	03-15-2019 09:55 EDT	724
03-15-2019 09:55 EDT	03-15-2019 10:00 EDT	725
03-15-2019 10:00 EDT	03-15-2019 10:05 EDT	725
03-15-2019 10:05 EDT	03-15-2019 10:10 EDT	725
03-15-2019 10:10 EDT	03-15-2019 10:15 EDT	725
03-15-2019 10:15 EDT	03-15-2019 10:20 EDT	725
03-15-2019 10:20 EDT	03-15-2019 10:25 EDT	725
03-15-2019 10:25 EDT	03-15-2019 10:30 EDT	725
03-15-2019 10:30 EDT	03-15-2019 10:35 EDT	725
03-15-2019 10:35 EDT	03-15-2019 10:40 EDT	725
03-15-2019 10:40 EDT	03-15-2019 10:45 EDT	725
03-15-2019 10:45 EDT	03-15-2019 10:50 EDT	725
03-15-2019 10:50 EDT	03-15-2019 10:55 EDT	725
03-15-2019 10:55 EDT	03-15-2019 11:00 EDT	725
03-15-2019 11:00 EDT	03-15-2019 11:05 EDT	725
03-15-2019 11:05 EDT	03-15-2019 11:10 EDT	725
03-15-2019 11:10 EDT	03-15-2019 11:15 EDT	724
03-15-2019 11:15 EDT	03-15-2019 11:20 EDT	724
03-15-2019 11:20 EDT	03-15-2019 11:25 EDT	725
03-15-2019 11:25 EDT	03-15-2019 11:30 EDT	725
03-15-2019 11:30 EDT	03-15-2019 11:35 EDT	725
03-15-2019 11:35 EDT	03-15-2019 11:40 EDT	724
03-15-2019 11:40 EDT	03-15-2019 11:45 EDT	723
03-15-2019 11:45 EDT	03-15-2019 11:50 EDT	723
03-15-2019 11:50 EDT	03-15-2019 11:55 EDT	723
03-15-2019 11:55 EDT	03-15-2019 12:00 EDT	723
03-15-2019 12:00 EDT	03-15-2019 12:05 EDT	723

EURICE2
SCR/Oxidation Catalyst Inlet Temperature

Start Time	End Time	Value/Average (Deg F)
03-15-2019 12:05 EDT	03-15-2019 12:10 EDT	723
03-15-2019 12:10 EDT	03-15-2019 12:15 EDT	724
03-15-2019 12:15 EDT	03-15-2019 12:20 EDT	725
03-15-2019 12:20 EDT	03-15-2019 12:25 EDT	725
03-15-2019 12:25 EDT	03-15-2019 12:30 EDT	727
03-15-2019 12:30 EDT	03-15-2019 12:35 EDT	726
03-15-2019 12:35 EDT	03-15-2019 12:40 EDT	725
03-15-2019 12:40 EDT	03-15-2019 12:45 EDT	725
03-15-2019 12:45 EDT	03-15-2019 12:50 EDT	725
03-15-2019 12:50 EDT	03-15-2019 12:55 EDT	725
03-15-2019 12:55 EDT	03-15-2019 13:00 EDT	725
03-15-2019 13:00 EDT	03-15-2019 13:05 EDT	724
03-15-2019 13:05 EDT	03-15-2019 13:10 EDT	723
03-15-2019 13:10 EDT	03-15-2019 13:15 EDT	725
03-15-2019 13:15 EDT	03-15-2019 13:20 EDT	724
03-15-2019 13:20 EDT	03-15-2019 13:25 EDT	725
03-15-2019 13:25 EDT	03-15-2019 13:30 EDT	725
03-15-2019 13:30 EDT	03-15-2019 13:35 EDT	725
03-15-2019 13:35 EDT	03-15-2019 13:40 EDT	725
03-15-2019 13:40 EDT	03-15-2019 13:45 EDT	724
03-15-2019 13:45 EDT	03-15-2019 13:50 EDT	723
03-15-2019 13:50 EDT	03-15-2019 13:55 EDT	723
03-15-2019 13:55 EDT	03-15-2019 14:00 EDT	723
03-15-2019 14:00 EDT	03-15-2019 14:05 EDT	724
03-15-2019 14:05 EDT	03-15-2019 14:10 EDT	725
03-15-2019 14:10 EDT	03-15-2019 14:15 EDT	725
03-15-2019 14:15 EDT	03-15-2019 14:20 EDT	725
03-15-2019 14:20 EDT	03-15-2019 14:25 EDT	725
03-15-2019 14:25 EDT	03-15-2019 14:30 EDT	725
03-15-2019 14:30 EDT	03-15-2019 14:35 EDT	725
03-15-2019 14:35 EDT	03-15-2019 14:40 EDT	725
03-15-2019 14:40 EDT	03-15-2019 14:45 EDT	725
03-15-2019 14:45 EDT	03-15-2019 14:50 EDT	725
03-15-2019 14:50 EDT	03-15-2019 14:55 EDT	725
03-15-2019 14:55 EDT	03-15-2019 15:00 EDT	725
03-15-2019 15:00 EDT	03-15-2019 15:05 EDT	725
03-15-2019 15:05 EDT	03-15-2019 15:10 EDT	725
03-15-2019 15:10 EDT	03-15-2019 15:15 EDT	725
03-15-2019 15:15 EDT	03-15-2019 15:20 EDT	725
03-15-2019 15:20 EDT	03-15-2019 15:25 EDT	725
03-15-2019 15:25 EDT	03-15-2019 15:30 EDT	725
03-15-2019 15:30 EDT	03-15-2019 15:35 EDT	725
03-15-2019 15:35 EDT	03-15-2019 15:40 EDT	725

EURICE3
SCR/Oxidation Catalyst Inlet Temperature

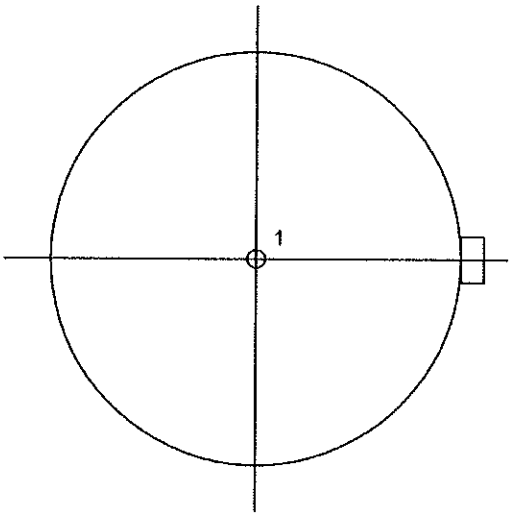
Start Time	End Time	Value/Average (Deg F)
03-16-2019 09:15 EDT	03-16-2019 09:20 EDT	727
03-16-2019 09:20 EDT	03-16-2019 09:25 EDT	727
03-16-2019 09:25 EDT	03-16-2019 09:30 EDT	727
03-16-2019 09:30 EDT	03-16-2019 09:35 EDT	727
03-16-2019 09:35 EDT	03-16-2019 09:40 EDT	727
03-16-2019 09:40 EDT	03-16-2019 09:45 EDT	727
03-16-2019 09:45 EDT	03-16-2019 09:50 EDT	727
03-16-2019 09:50 EDT	03-16-2019 09:55 EDT	727
03-16-2019 09:55 EDT	03-16-2019 10:00 EDT	728
03-16-2019 10:00 EDT	03-16-2019 10:05 EDT	727
03-16-2019 10:05 EDT	03-16-2019 10:10 EDT	727
03-16-2019 10:10 EDT	03-16-2019 10:15 EDT	729
03-16-2019 10:15 EDT	03-16-2019 10:20 EDT	729
03-16-2019 10:20 EDT	03-16-2019 10:25 EDT	729
03-16-2019 10:25 EDT	03-16-2019 10:30 EDT	728
03-16-2019 10:30 EDT	03-16-2019 10:35 EDT	726
03-16-2019 10:35 EDT	03-16-2019 10:40 EDT	724
03-16-2019 10:40 EDT	03-16-2019 10:45 EDT	723
03-16-2019 10:45 EDT	03-16-2019 10:50 EDT	723
03-16-2019 10:50 EDT	03-16-2019 10:55 EDT	723
03-16-2019 10:55 EDT	03-16-2019 11:00 EDT	723
03-16-2019 11:00 EDT	03-16-2019 11:05 EDT	723
03-16-2019 11:05 EDT	03-16-2019 11:10 EDT	723
03-16-2019 11:10 EDT	03-16-2019 11:15 EDT	722
03-16-2019 11:15 EDT	03-16-2019 11:20 EDT	722
03-16-2019 11:20 EDT	03-16-2019 11:25 EDT	722
03-16-2019 11:25 EDT	03-16-2019 11:30 EDT	721
03-16-2019 11:30 EDT	03-16-2019 11:35 EDT	722
03-16-2019 11:35 EDT	03-16-2019 11:40 EDT	723
03-16-2019 11:40 EDT	03-16-2019 11:45 EDT	722
03-16-2019 11:45 EDT	03-16-2019 11:50 EDT	721
03-16-2019 11:50 EDT	03-16-2019 11:55 EDT	721
03-16-2019 11:55 EDT	03-16-2019 12:00 EDT	721
03-16-2019 12:00 EDT	03-16-2019 12:05 EDT	721
03-16-2019 12:05 EDT	03-16-2019 12:10 EDT	721
03-16-2019 12:10 EDT	03-16-2019 12:15 EDT	721
03-16-2019 12:15 EDT	03-16-2019 12:20 EDT	721
03-16-2019 12:20 EDT	03-16-2019 12:25 EDT	721
03-16-2019 12:25 EDT	03-16-2019 12:30 EDT	721
03-16-2019 12:30 EDT	03-16-2019 12:35 EDT	721
03-16-2019 12:35 EDT	03-16-2019 12:40 EDT	721
03-16-2019 12:40 EDT	03-16-2019 12:45 EDT	722
03-16-2019 12:45 EDT	03-16-2019 12:50 EDT	723
03-16-2019 12:50 EDT	03-16-2019 12:55 EDT	723
03-16-2019 12:55 EDT	03-16-2019 13:00 EDT	723
03-16-2019 13:00 EDT	03-16-2019 13:05 EDT	723

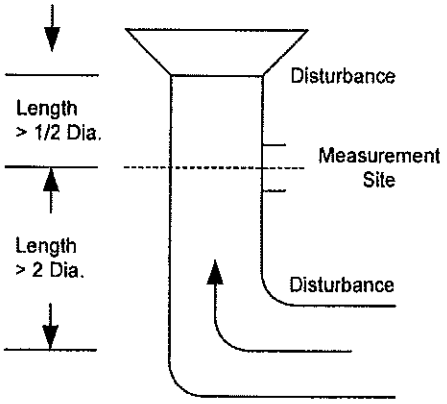
EURICE3
SCR/Oxidation Catalyst Inlet Temperature

Start Time	End Time	Value/Average (Deg F)
03-16-2019 13:05 EDT	03-16-2019 13:10 EDT	723
03-16-2019 13:10 EDT	03-16-2019 13:15 EDT	721
03-16-2019 13:15 EDT	03-16-2019 13:20 EDT	721
03-16-2019 13:20 EDT	03-16-2019 13:25 EDT	721
03-16-2019 13:25 EDT	03-16-2019 13:30 EDT	721
03-16-2019 13:30 EDT	03-16-2019 13:35 EDT	721
03-16-2019 13:35 EDT	03-16-2019 13:40 EDT	721
03-16-2019 13:40 EDT	03-16-2019 13:45 EDT	721
03-16-2019 13:45 EDT	03-16-2019 13:50 EDT	721
03-16-2019 13:50 EDT	03-16-2019 13:55 EDT	721
03-16-2019 13:55 EDT	03-16-2019 14:00 EDT	721
03-16-2019 14:00 EDT	03-16-2019 14:05 EDT	721
03-16-2019 14:05 EDT	03-16-2019 14:10 EDT	721
03-16-2019 14:10 EDT	03-16-2019 14:15 EDT	721
03-16-2019 14:15 EDT	03-16-2019 14:20 EDT	721
03-16-2019 14:20 EDT	03-16-2019 14:25 EDT	720
03-16-2019 14:25 EDT	03-16-2019 14:30 EDT	720
03-16-2019 14:30 EDT	03-16-2019 14:35 EDT	720
03-16-2019 14:35 EDT	03-16-2019 14:40 EDT	720
03-16-2019 14:40 EDT	03-16-2019 14:45 EDT	720
03-16-2019 14:45 EDT	03-16-2019 14:50 EDT	720
03-16-2019 14:50 EDT	03-16-2019 14:55 EDT	720
03-16-2019 14:55 EDT	03-16-2019 15:00 EDT	720
03-16-2019 15:00 EDT	03-16-2019 15:05 EDT	720
03-16-2019 15:05 EDT	03-16-2019 15:10 EDT	720
03-16-2019 15:10 EDT	03-16-2019 15:15 EDT	720
03-16-2019 15:15 EDT	03-16-2019 15:20 EDT	720
03-16-2019 15:20 EDT	03-16-2019 15:25 EDT	720
03-16-2019 15:25 EDT	03-16-2019 15:30 EDT	720
03-16-2019 15:30 EDT	03-16-2019 15:35 EDT	720
03-16-2019 15:35 EDT	03-16-2019 15:40 EDT	720
03-16-2019 15:40 EDT	03-16-2019 15:45 EDT	720
03-16-2019 15:45 EDT	03-16-2019 15:50 EDT	721
03-16-2019 15:50 EDT	03-16-2019 15:55 EDT	721
03-16-2019 15:55 EDT	03-16-2019 16:00 EDT	721
03-16-2019 16:00 EDT	03-16-2019 16:05 EDT	721
03-16-2019 16:05 EDT	03-16-2019 16:10 EDT	721
03-16-2019 16:10 EDT	03-16-2019 16:15 EDT	721
03-16-2019 16:15 EDT	03-16-2019 16:20 EDT	720
03-16-2019 16:20 EDT	03-16-2019 16:25 EDT	720
03-16-2019 16:25 EDT	03-16-2019 16:30 EDT	720
03-16-2019 16:30 EDT	03-16-2019 16:35 EDT	720

Appendix B - Test Section Diagram

GASEOUS TRAVERSE FOR ROUND DUCTS





Job: Upper Michigan Energy Resources Corporation
A.J. Mihm Generating Station

Date: March 14 through March 16, 2019

Test Location: EURICE1, EURICE2, EURICE3 Outlet Duct (Each identical)

Duct Diameter: 5.29 Feet

Duct Area: 21.979 Square Feet

No. Points Across Diameter: 1

No. of Ports: 1

Port Length: 8.0 Inches

Appendix C - Sample Train Diagram

USEPA Methods 3A and 320 – Sample Train Diagram