

**Consumers Energy Company
J.C. Weadock Generating Plant
Essexville, Michigan**

**Units #7 & #8
Particulate Emission Test**

**Testing Conducted On:
November 3-4, 2014**

**Testing Conducted By:
Mr. Brian Miska & Mr. Gregg Koteskey
Consumers Energy Company
Engineering Services Department
Regulatory Compliance Testing Section**





MICHIGAN DEPARTMENT OF ENVIRONMENTAL AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name Consumers Energy J.C. Weadock Unit 7&8 Plant County Bay
Source Address 2680 N. Weadock Highway City Essexville
AQD Source ID (SRN) B2840 ROP No. MI-ROP-B2840-2009a ROP Section No. 3

Please check the appropriate box(es):

Annual Compliance Certification (Pursuant to Rule 213(4)(c))
Reporting period (provide inclusive dates): From To
1. During the entire reporting period, this source was in compliance with ALL terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.
2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, EXCEPT for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))
Reporting period (provide inclusive dates): From To
1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.
2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, EXCEPT for the deviations identified on the enclosed deviation report(s).

Other Report Certification
Reporting period (provide inclusive dates): From To
Additional monitoring reports or other applicable documents required by the ROP are attached as described:
2014 Particulate Emission Test Results Submittal

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

David T. Walter Site Production Manager I (989) 891-3158
Name of Responsible Official (print or type) Title Phone Number

Signature of Responsible Official Date 11.24.14

* Photocopy this form as needed.

RECEIVED

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AIR QUALITY DIV.

INTRODUCTION

This report summarizes the results of the emission testing for particulate matter (PM), conducted on November 3-4, 2014, on Units 7 & 8 at Consumers Energy Company's J.C. Weadock Generating Plant, located in Essexville, Michigan. The Purpose of the emission testing was to demonstrate compliance with the PM emission limit for EUWEADOCK7-S3 and EUWEADOCK8-S3, as identified in the facility's current renewable operating permit (ROP) No. MI-ROP-B2840-2009a. The stack test was conducted in accordance with the ROP and a stack test protocol acceptance letter dated October 10, 2014, written by Mr. David Patterson of the Michigan AQD Technical Programs Unit. On November 3, 2014, Ms. Sharon LeBlanc of the Michigan DEQ was present to witness a portion of the testing.

J.C. Weadock Units 7 & 8 are pulverized coal-fired boilers. Each boiler's full load rating is 1,050,000 lbs/hr steam flow at 165 MW gross (155 MW net) load. Air emissions are controlled through the use of blended western sub-bituminous and eastern bituminous coal and electrostatic precipitators (ESP's). In addition, both units employ a sulfur trioxide injection system, which may be used (if necessary) to enhance the collection efficiency of the ESP.

The particulate matter sampling procedure, as outlined in Reference Method 17 of 40 CFR 60-Appendix A, was followed throughout the test. In addition, equations contained in Method 5B of Michigan Rule 336.2011 were also utilized to determine the amount of excess air and correct the particulate matter concentration to 50% excess air.

SOURCE INFORMATION

Consumers Energy Company
J.C. Weadock Generating Plant
2555 N. Weadock Highway
Essexville, MI 48732

Contact: Mr. George Eurich (989)891-3317

TESTING FIRM INFORMATION

Consumers Energy Company
Regulatory Compliance Testing Section
J.C. Weadock Plant
2555 N. Weadock Highway
Essexville, MI 48732

Contact: Mr. Brian Miska (989)891-3415

Summary of Results

During the testing period, Unit #7 burned approximately 23.9% Eastern coal and 76.1% Western coal. Testing was conducted as close to full load as possible, with an average unit load of 149.33 MW.

During the testing period, Unit #8 burned approximately 27.2% Eastern coal and 72.8% Western coal. The Unit 8 average load was 99 MW, this was due to a de-rate of approximately 50 MW, due to the North half of the Precipitator (D) Field being out of service.

Testing was conducted on Units 7 & 8 to demonstrate compliance with the facility's current ROP (No. MI-ROP-B2840-2009a) particulate matter emission limit. The particulate emission limit for Unit 7 is specified in Condition II.B. of Table E-3.1 EGWEADOCK7. The particulate emission limit for Unit 8 is specified in Condition II.B. of Table E-3.2 EGWEADOCK8. The permitted limit is summarized in Table 1 below:

Table 1. Summary of EGWEADOCK7 & EGWEADOCK8 PM Emission Limit

Pollutant	Limit
PM	0.18 pounds per 1,000 pounds exhaust gas, corrected to 50% excess air

As shown in Table 2 below, each individual run, as well as the average particulate emission rate, was below the emission limit of 0.18 pounds per 1,000 pounds for Unit 7. Thus, Unit 7 is in compliance with the ROP particulate matter emission limit.

Table 2. Summary of Unit 7 PM Emission Test Results

Run Number	Gas Volume (acfm)	Outlet Grain Loading (gr/dscf)	Particulate Concentration (lb/mmBtu)	Particulate Concentration (lb/hr)	Lb/1,000 lbs Gas Flow*
Run 1	533,848	0.0178	0.0359	47.1819	0.0289
Run 2	537,025	0.0295	0.0601	78.0639	0.0479
Run 3	552,730	0.0173	0.0363	47.6042	0.0292
Average	541,201	0.0215	0.0441	57.6167	0.0353

*Emissions in pounds of particulate per 1,000 pounds gas flow, corrected to 50% excess air.

As shown in Table 3 below, each individual run, as well as the average particulate emission rate, was below the emission limit of 0.18 pounds per 1,000 pounds for Unit 8. Thus, Unit 8 is in compliance with the ROP particulate matter emission limit.

Table 3. Summary of Unit 8 PMI Emission Test Results

Run Number	Gas Volume (acfm)	Outlet Grain Loading (gr/dscf)	Particulate Concentration (lb/mmBtu)	Particulate Concentration (lb/hr)	Lb/1,000 lbs Gas Flow*
Run 1	437,729	0.0177	0.0408	39.3121	0.0319
Run 2	414,746	0.0160	0.0358	33.0530	0.0282
Run 3	433,443	0.0192	0.0442	41.6898	0.0345
Average	428,640	0.0176	0.0403	38.0183	0.0316

*Emissions in pounds of particulate per 1,000 pounds gas flow, corrected to 50% excess air.

TEST PROTOCOL

Particulate Emission Testing
Consumers Energy Company
J C Weadock Station, Units 7 & 8

SOURCE INFORMATION

Consumers Energy Company
J.C. Weadock Generating Plant
2555 N. Weadock Hwy.
Essexville, MI 48732

Contact: George Eurich (989) 891-3317

TESTING FIRM INFORMATION

Consumers Energy Company
Engineering Services Department
2555 N. Weadock Hwy.
Essexville, MI 48732

Contact: Brian Miska (989) 891-3415

INTRODUCTION

This testing is being performed per Renewable Operating Permit No. MI-ROP-B2840-2009a.

SOURCE DESCRIPTION

Consumers Energy Company, J C Weadock Generating Plant units 7 and 8 are pulverized coal fired boilers. The unit 7 boiler full load rating is 1,050,000 lbs/hr steam flow at 165 MW gross (155 MW net) load. The unit 8 boiler is rated at 1,050,000 lbs/hr steam flow at 165 MW gross (155 MW Net) load. Units 7 & 8 have separate exhaust ducts that go to a common stack. Testing is performed on the two separate ducts individually prior to them entering the stack.

Particulate control is accomplished on both units by electrostatic precipitators furnished by Western Precipitator. Each precipitator consists of two parallel chambers, each with

four fields in series. The design collection efficiency is 99% for each unit, with a design gas volume of 545,000 ACFM, and an average design gas velocity of 5.95 ft/sec. A Wahlco sulfur trioxide flue gas conditioning system is used to enhance precipitator collection efficiency on each unit, while low sulfur coal is used for fuel.

TEST PROCEDURE

The sampling procedure as outlined in Method 17 of 40 CFR 60 of the Federal Register and State of Michigan General Rules Method 5B will be followed throughout the test.

The estimated flue gas conditions at J C Weadock Unit 7 are 8% moisture, 300 degrees F, and a velocity of 25 fps. The estimated flue gas conditions at J C Weadock Unit 8 are 8% moisture, 300 degrees F, and a velocity of 25 fps.

The test conditions will be as close to full load as possible.

Three runs will constitute a complete test. A run will include 2 minutes of sampling at each of 56 points for a total of 112 minutes per run.

Plant operating data that will be included in the report will be: load in megawatts, steam flow, and stack opacity.

The cross-section at the sampling site is divided into equal areas as defined in Method 1. The particulate material will be collected isokinetically from the gas stream and its weight determined on a dry basis. The isokinetic variation on the tests performed is shown on the summary sheet. The allowable range according to Method 17 is $100\% \pm 10\%$.

A flow diagram of the sampling train is attached with the report. A sample nozzle is connected to the primary filter housing, followed by a secondary filter. This assembly is connected to a probe which is connected to a moisture trap. This is followed by a leak free Method 17 test module.

A type "S" pitot tube is attached to the probe to measure the stack gas velocity. Temperature measurements are made with a thermocouple wire attached to the pitot tube and a digital indicator.

Moisture is determined using Method 4, 40 CFR Part 60.

Analysis of the flue gas is performed by Method 3A, 40 CFR Part 60.

TEST PROCEDURE CONT.

Before sampling can be started, a preweighed thimble filter and backup filter are placed in their respective holders. 100ml of water are put into the moisture trap and an impinger with silica gel is pre-weighed. The sample train is then assembled and leak checked at 10" Hg vacuum. At this time, the pitot tube assembly is also leak checked.

The isokinetic meter rate is calculated with a computer spreadsheet after the temperature and velocity head of each traverse point is determined. Adjustment of the sampling rate is made by using a calibrated orifice. Field data is recorded into the computer spreadsheet at each sample point.

Extreme care is exercised during the sample recovery period. The collected condensate in the moisture trap is measured. The filter assembly is removed and disassembled in the laboratory. The thimble and back up filter are both dried for the same time period and at the same temperature that they were subjected to before they were used. The filters are then weighed to determine the net weight of the particulate material. The nozzle is washed with D.I. water into a beaker and the wash water is then evaporated from the beaker. Following the evaporation, the beaker is reweighed. Any weight gain is added to the weights of the primary and secondary filters.

Sample Procedure

The sampling procedures as outlined in Method 17 of 40 CFR 60 of the Federal Register and State of Michigan General Rules Method 5B were followed throughout the test.

During the test of Unit 7 on November 3, 2014, the unit operated at 150 MW Gross. On November 4, 2014, Unit 8 operated at 99 MW Gross. Soot blowing and ash removal occurred as normal during testing, with at least one soot blow occurring during one test run for each Unit. A coal sample was taken during each run.

Plant operating data included in the report consists of: load in megawatts, steam flow in 1000 lbs/hr, and percent stack opacity.

Historical cyclonic flow test data from October 21, 2002 is being submitted to meet the requirements of Method 1. Written approval of this approach was granted by Jennifer L. Barre, MDEQ-AQD Technical Programs Unit-Field Operations Section, on January 19, 2005.

Three runs constitute a complete test. A run includes 112 minutes of sampling, which results in 2 minutes at each of the 56 sampling points. The cross sectional area at the sampling site was determined as specified in Method 1.

Unit 8 test run 1, after 112 minutes of sampling at 99 MW, the total volume sampled was only 28.51 dscf and not the required 30 dscf. This was due to Unit 8 operating with a 50 MW Derate, due to the North half of the (D) Precipitator Field being out of service. The reduced load on the unit resulted in a lower flue gas velocity. The Sampling time was adjusted to 140 minutes (2.5 minutes per point) for runs 2 and 3, which resulted in a sample volume over 30 dscf. The test run 1 sample volume was reported to Ms. Sharon LeBlanc and permission was granted to include run 1 in the report.

The particulate material was collected isokinetically from the gas stream and its weight was determined on a dry basis. The isokinetic variation on the tests performed is shown on the summary sheet. The allowable range as specified in Method 17 is $100\% \pm 10\%$.

A flow diagram of the sampling train is included in this section of the report. A sample nozzle was connected to the primary filter housing, followed by a secondary filter. This assembly was connected to a probe extension. The gas sample was drawn through the filter assembly and probe, into a moisture trap, and then into the leak-free Method 17 test module.

A type "S" pitot tube was attached to the probe to measure the stack gas velocity. Stack gas temperature measurements were made with a thermocouple wire attached to the pitot tube, and read on a digital indicator.

Before sampling was started, a pre-weighed thimble filter and backup filter were placed into the filter housing assembly. 100 ml of water was put into the first chamber of the moisture trap. The second chamber of the moisture trap was left empty, and the third chamber was partially filled

with indicating type silica gel desiccant. The sample train was then assembled and leak checked at 15" Hg vacuum. The pitot tube assembly was also leak checked at this time.

The isokinetic meter rate was calculated at each traverse point by entering the differential pressure and temperature into the test spreadsheet. Adjustment of the sampling rate was made by using the calibrated orifice at the discharge of the dry gas meter. Each traverse point was sampled for at least two minutes. The sample time for each traverse point was the same.

SAMPLING PROCEDURE CONT.

Field data, including differential pressure, stack gas temperature, dry gas meter temperature, stack gas O₂, and CO₂ was recorded at each traverse point.

Moisture was determined using Method 4, 40 CFR Part 60.

Analysis of the flue gas was performed by Method 3A, 40 CFR Part 60. A Servomex O₂/CO₂ analyzer was used.

Extreme care was exercised during the sample recovery period. The collected condensate in the moisture trap was measured. The filter assembly was removed and disassembled the laboratory. The thimble and backup filters were both dried at the same temperature and the for the same time period as they were before they were used. They were then weighed to determine the net weight of the particulate material collected. The nozzle was washed with deionized water into a pre-weighed beaker. The water was evaporated from the sample and the beaker was weighed to determine the net weight of particulate matter captured in the nozzle. This weight was added to the weight of particulate matter collected in the primary and secondary filters.