DTE Energy

# COMPLIANCE TEST REPORT

for

# TOTAL PARTICULATE MATTER (PM), FINE PARTICULATE MATTER ($PM_{10/2.5}$) AND CONDENSIBLE PARTICULATE EMISSIONS

**UNIT 2**

RECEIVED
FEB 03 2014
AIR QUALITY DIV.

**St. Clair Power Plant**
**East China, Michigan**

**December 2013**

Prepared By
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DTE Energy®

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## EXECUTIVE SUMMARY

DTE Energy's Environmental Management and Resources (EMR) Field Services Group performed emissions testing on the exhaust of Unit 2 at the St. Clair Power Plant, located in St. Clair, Michigan while burning Chem-Mod treated coal (REF). The testing was required by the Michigan Department of Environmental Quality (MDEQ) Permit-to-Install #176-09 to document total filterable particulate matter (PM), $PM_{10}$ (particulate matter less than 10 microns diameter), $PM_{2.5}$ (particulate matter less than 2.5 microns diameter), and condensible particulate matter (CPM) stack emissions while firing REF coal during normal boiler operating conditions. The testing was conducted on December 3-5, 2013.

A summary of the emission test results are shown below:

### Emissions Testing Summary
### St. Clair Unit 2
### December 3-5, 2013

| Source | Filterable PM (lbs/1000 lbs)[(1)] | $PM_{10}$ (lb/hr) | $PM_{2.5}$ (lb/hr) | Condensible PM (lb/hr) |
|---|---|---|---|---|
| Unit 2 | 0.003 | 4.7 | 4.4 | 11.3 |

(1) Unit 2 Permit Limit 0.17 lb/1000lbw @ 50% excess air

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## 1.0 INTRODUCTION

DTE Energy's Environmental Management and Resources (EMR) Field Services Group performed emissions testing on the exhaust of Unit 2 at the St. Clair Power Plant, located in St. Clair, Michigan while burning Chem-Mod treated coal (REF). The testing was required by the Michigan Department of Environmental Quality (MDEQ) Permit-to-Install #176-09 to document total filterable particulate matter (PM), $PM_{10}$ (particulate matter less than 10 microns diameter), $PM_{2.5}$ (particulate matter less than 2.5 microns diameter), and condensible particulate matter (CPM) stack emissions while firing REF coal during normal boiler operating conditions. The testing was conducted on December 3-5, 2013. Testing was performed pursuant to Title 40, *Code of Federal Regulations*, Part 60, Appendix A (40 CFR §60 App. A), Methods 1, 3, 4, 17, 201A and 202.

The fieldwork was performed in accordance with EPA Reference Methods and EMR Intent to Test[1], which was approved in a letter by Mr. Mark Dziadosz from the Michigan Department of Environmental Quality (MDEQ), dated May 28, 2013[2]. The following EMR personnel participated in the testing program: Mr. Mark Grigereit, Senior Environmental Specialist, Mr. Mark Westerberg, Environmental Specialist, and Mr. Fred Meinecke, Senior Environmental Technician. Mr. Grigereit was the project leader. Mr. Joe Neruda, Environmental Specialist at the plant provided process coordination for the testing program.

## 2.0 SOURCE DESCRIPTION

The St Clair Power Plant (SCPP) located at 4901 Pointe Drive in East China Township, Michigan, employs the use of six (6) coal-fired boilers. Units 1-4 each have Babcock and Wilcox boilers capable of producing 1,070,000 pounds per hour of steam. Units 1 and 4 are equipped with General Electric turbine generators each with a nominally rated capability of 167 megawatts (MW). Units 2 and 3 have Allis Chalmers turbine generators each with a nominally rated capability of 170 MW. The full load capability for Units 1-4, while firing coal only are 135 MW.

Units 6 and 7 have Combustion Engineering boilers capable of producing 2,100,000 and 3,580,000 pounds of steam per hour respectively. The turbine generators on each unit were manufactured by Westinghouse and have a nominally rated capability of 325 and 500 megawatts respectively. Full load capability for Units 6 and 7 while firing coal only is approximately 315 MW and 470 MW respectively.

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[1] MDEQ, Test Plan, Submitted May 1, 2013. (Attached-Appendix A)
[2] MDEQ, Approval Letter, dated May 28, 2013. (Attached-Appendix A)

The air pollution control equipment on Unit 2 consists of Wheelebrator Frye electrostatic precipitators on each unit that have design collection efficiencies of 99.6%. Each exhaust stack is 599 feet tall with an internal diameter of 13.3 feet.

During testing the unit was fired with 100% REF coal from the Chem-Mod facility. Testing of Unit 2 was performed at greater than 80% of normal full load capability while burning coal.

## 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* or listed as an approved "*Other Test Method*". 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 | Oxygen & CO2 | Instrumental Analyzer Method |
| USEPA Method 4 | Moisture Content | Field data analysis and reduction |
| USEPA Method 17 | Particulate Matter (In-Stack Filtration) | Gravimetric Analysis |
| USEPA Method 201A | $PM_{10/2.5}$ | Gravimetric Analysis |
| USEPA Method 202 | Condensible 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." On Unit 2 four (4) sampling ports were utilized, sampling at three (3) points per port for a total of twelve (12) sampling points. See Figure 1 for a diagram of the traverse/sampling points used.

Cyclonic flow checks were performed on the stack during the initial flow monitor certification RATA. Testing at the sampling location demonstrated that no cyclonic flow was present. No changes to the Stack have occurred since the cyclonic flow check was performed. Additionally, static pressure checks performed each day confirmed that the null angles were at 0°.

### *3.1.2 Method 2 Sampling Equipment*

The EPA Method 2 sampling equipment consisted of a 0-10" incline manometer. Method 201A utilized a calibrated S-type pitot tube ($C_p$ = 0.744) while Method 17 utilized an S-type pitot tube with a default calibration ($C_p$ = 0.84). Both sampling trains utilized a type-K calibrated thermocouple.

## 3.2 OXYGEN AND CARBON DIOXIDE (USEPA Method 3A)

### *3.2.1 Sampling Method*

Stack gas 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 $O_2$ / $CO_2$ analyzers utilize paramagnetic sensors.

### *3.2.2 $O_2$ / $CO_2$ Sampling Train*

On Unit 2 3, 4 the Method 3A sampling system consisted of directly sampling the exhaust of the dry gas meter for $O_2$/$CO_2$ using a Servomex 1400 $O_2$/$CO_2$ gas analyzer.

### *3.2.3 Sampling Train Calibration*

The $O_2$ / $CO_2$ analyzer was calibrated according to procedures outlined in USEPA Method 7E. Zero, span, and mid range calibration gases were introduced directly into the analyzer to verify the instruments linearity. The $O_2$/$CO_2$ concentrations were recorded on the field data sheets.

## 3.3 MOISTURE DETERMINATION (USEPA Method 4)

### *3.3.1 Sampling Method*

Determination of the moisture content of the exhaust gas was performed using the method described in USEPA Method 4, "Determination of Moisture Content in Stack Gases". The moisture was collected in glass impingers and the percentage of moisture was then derived from calculations outlined in USEPA Method 4.

## 3.4 PARTICULATE MATTER (USEPA METHOD 17)

### *3.4.1 Filterable Particulate Sampling Method*

USEPA Method 17, "Determination of Particulate Emissions from Stationary Sources – In-situ Filtration" was used to measure the filterable particulate emissions (see Figure 2 for a schematic of the sampling train). Triplicate, 60-minute sample runs were conducted on Unit 2.

The Method 17 modular isokinetic stack sampling system (Figure 2) consisted of the following:

(1) Stainless-steel button-hook nozzle
(2) Stainless Steel Filter Holder with 47 mm glass fiber filter
(2) Un-heated glass-lined probe and Teflon sample line
(3) Set of glass impingers for the collection of condensate for moisture determination
(4) Length of sample line
(5) Environmental Supply® control case equipped with a pump, dry gas meter, and calibrated orifice.

The filters used in the sampling were initially weighed to a constant weight as described in the Method 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 beakers, and evaporated to dryness at ambient temperature and pressure. The beakers and filters were then placed in a desiccator for a minimum of 24 hours prior to their initial final weight. Final weights were taken at 6 hour or greater intervals until two weights agreed within 0.5 mg. The data sheets containing the initial and final weights on the filters and beakers are located 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 17 sampling are located 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 (see Appendix D for equipment calibrations).

### 3.4.3 *Data Reduction*

Particulate data collected during the emissions testing was calculated and reported as grains per dry standard cubic foot (grains/dscf), pounds per 1000 pounds, wet, at 50% excess air (lbs/1000 $lb_{(w)}$ @ 50% EA), pounds per hour (lb/hr).

The PM emission calculations are based on calculations located in USEPA Method 5 and 19. Example calculations are presented in Appendix E.

## 3.5 $PM_{10}$ / $PM_{2.5}$ and CONDENSIBLE PM (USEPA METHODS 201A/202)

### 3.5.1 *$PM_{10}$ / $PM2.5$ Sampling (Method 201A)*

USEPA "Method 201A, "Determination of $PM_{10}$ and $PM_{2.5}$ Emissions from Stationary Sources" was used to measure the $PM_{10}$/$PM_{2.5}$ emissions on Unit 2 (see Figure 3 for a schematic of the sampling train). Triplicate, 120-minute test runs were conducted.

The Method 201A sampling train (Figure 3) consisted of the following:

(1) $PM_{10}$ Cyclone with nozzle followed by a $PM_{2.5}$ cyclone
(2) 47 mm glass fiber filter capable of capturing 0.3um size particulate
(3) Stainless steel probe with glass liner with attached s-type pitot tube and Type K thermocouple
(4) Method 202 glassware
(5) Method 5 umbilical and meter box.

Prior to performing each test run the entire sampling train was leak checked. At the completion of each test the cyclone was removed and a final leak was performed at the outlet of the probe. After the cyclone cooled, it was disassembled two sections of the cyclone were rinsed with acetone and the filter was placed into a Petri dish which was sealed. The collected fractions were as follows:

(1) PM between 10 and 2.5 microns – back half of $PM_{10}$ cyclone and front half of $PM_{2.5}$ Cyclone
(2) PM <2.5 microns – Back half of $PM_{2.5}$ cyclone and 47mm filter.

The acetone rinses were collected into pre-cleaned sample containers. The containers were labeled with the test number, sample fraction, 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 beakers, and evaporated to dryness at ambient temperature and pressure. The beakers and filters were then desiccated for 24 hours and weighed to a constant weight. The data sheets containing the initial and final weights on the filters and beakers are located 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.

### *3.5.2 Condensible Particulate Sampling Method (Method 202)*

USEPA Method 202, "Dry Impinger method for Determining Condensible Particulate Emissions from Stationary Sources" was used to measure the condensible particulate matter (CPM) on Unit 2 (see Figure 3 for a schematic of the sampling train). This method includes procedures for measuring both organic and inorganic CPM. The Method 202 samples were collected in conjunction with the Method 201A samples. Triplicate, 120-minute test runs were conducted. The Method 202 impinger configuration (Figure 3 - after the Method 201A cyclone assembly) consisted of the following:

(1) Method 23 type condenser (capable of cooling the stack gas to less than 85 °F
(2) Condensate dropout impinger (dry) without the bubbler tube
(3) Modified Greenburg-Smith impinger (dry) with no taper as a backup impinger
(4) 3" glass filter holder with a Teflon filter (maintained at a temperature ≤ 85 °F)
(5) Modified Greenburg-Smith impinger containing 100 millimeters (ml) of distilled de-ionized (DDI) water
(6) Modified Greenburg-Smith impinger containing approximately 300 grams of silica gel desiccant.

The condensate dropout impinger and backup impinger were placed in an insulated box with water at ≤ 85 °F. The water and silica gel impingers were placed in an ice water bath to maintain the exit gas temperature from the silica gel impinger below 68°F.

All Method 202 glassware was pre-cleaned prior to testing with soap and water, and rinsed using tap water, distilled de-ionized (DDI) water, acetone, and finally, hexane. After cleaning, the glassware was baked at 300 °C for 6 hours. Prior to each sampling run, the train glassware was rinsed thoroughly with distilled deionized ultra-filtered water.

As soon as possible after the post-test leak check was completed, the Method 201A/Method 17 probe and heated filter box was detached from the Method 202 condenser and impinger train. The Method 202 impinger train was then carefully disassembled. The liquid volume of each impinger was measured (by weight) and recorded on the field data sheet. The silica gel was re-weighed, and any increase was recorded on the field data sheets. Moisture from the condensate dropout impinger was added to the second impinger. The Method 202 impinger train was purged with ultra-high purity compressed nitrogen at 14 liters per minute for one hour. During the purge the condenser recirculation pump was operated and the first two impingers were heated/cooled to maintain the gas temperature exiting the CPM filter below 85 °F.

Contents from the dropout impinger and the impinger prior to the CPM filter were collected into a pre-cleaned sample container. The condenser, impingers and front-half of the CPM filter holder were rinsed with DDI water and the rinses added to the sample container. The condenser, impingers and front-half of the CPM filter holder were then rinsed with acetone followed by two rinses with hexane. The acetone and hexane rinses were collected into a pre-cleaned sample container. The CPM filter was recovered and placed into a labeled container. All containers were 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.

Collected blanks consisted of an acetone rinse blank, a DDI water rinse blank and a hexane rinse blank taken directly from the bottles used during recovery of the samples. Additionally, a field train blank was assembled and recovered following the same procedures used to prepare and recover the test samples.

Analysis of the Method 202 samples and blanks were conducted by Maxxam Analytics of Mississauga, Ontario. All analysis followed the procedures listed in Method 202. A complete laboratory report can be found in Appendix C. Blank corrections were applied to the samples following the procedures outlined in Method 202 (correcting the samples by less than or equal to 2.0 mg).

Field data sheets for the Method 201A/Method 202 sampling are located in Appendix B.

### 3.5.3 *Quality Control and Assurance*

All sampling and analytical equipment was calibrated according to the guidelines referenced in EPA Methods 201A/202.

### 3.5.4 *Data Reduction*

$PM_{10/2.5}$ sampling was performed utilizing Environmental Supply Company software. Emission rates were calculated utilizing this software as well. Emissions data collected during the emissions testing was reported as grains per dry standard cubic foot (grains/dscf) and pounds per hour (lb/hr).

## 4.0 OPERATING PARAMETERS

The test program included the collection of boiler load and stack emissions CEMs data during each test run. Parameters recorded included gross Megawatts (MW) and CEMs data ($SO_2$, $NO_x$, $CO_2$, and Opacity).

Process data collected from each Unit's digital control system included load in gross megawatts (MW), main steam flow in thousand pounds per hour (Klbs/hr), total fuel flow in million Btu per hour (MBtu/hr), and coal flow in tons per hour (Tons/hr).

Process data collected from the Chem-Mod fuels facility included the application rate of the MerSorb and S-Sorb in percentage (%) and tons per hour (Tons/hr). The treated coal was placed into silos and it took approximately 5-7 hrs for the treated coal to enter the boiler.

Coal samples were collected during each day of sampling and subject to proximate and ultimate analysis.

Operational data and results of the fuel analysis can be referred to in Appendix F.

## 5.0 DISCUSSION OF RESULTS

Table 1 presents the Particulate Emission testing results from Unit 2 while burning 100% REF coal. Particulate (Total Filterable, $PM_{10}$, $PM_{2.5}$, and Condensible PM) emissions are presented in grain per dry standard cubic foot (grains/DSCF) and pounds per hour (lbs/hr). Total filterable PM is reported in pounds per 1000 pounds(wet) at 50% excess air ($lb/1000lb_{(wet)}$ @ 50% ea). Additional test data presented for each test includes the Unit load in gross megawatts (GMW), stack temperature in degrees Fahrenheit ($^{o}F$), stack $CO_2$ in percent (%), opacity 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).

Testing demonstrated filterable particulate emissions significantly below the respective permit limit. Unit 2 had average filterable particulate emissions of 0.003 lb/1000 $lbs_{(wet)}$ @ 50% ea. The respective Permit Limit is 0.17 lb/1000 $lbs_{(wet)}$ @ 50% ea.

## 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."

Thom Snyder for:
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# Table No. 1
## PARTICULATE EMISSION TESTING SUMMARY (Chem-Mod)
## St. Clair Power Plant - Unit 2
### December 3-5, 2013

**Total Filterable PM**

| Test | Test Date | Test Time | Unit Load (GMW) | Stack Temperature (°F) | $CO_2$ (%) | Stack Velocity (ft/min) | Exhaust Gas Flowrates (ACFM) | (SCFM) | (DSCFM) | Total Filterable PM Emissions (grains/dscf) | (lbs/hr) | (lbs/1000 lbs)[1] | Opacity (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PM-1 | 3-Dec-13 | 8:10-9:16 | 125.8 | 271 | 9.4 | 4,790 | 668,828 | 465,587 | 422,031 | 0.001 | 4.4 | 0.003 | 0.0 |
| PM-2 | 3-Dec-13 | 9:32-10:40 | 126.1 | 268 | 9.2 | 4,878 | 681,060 | 476,327 | 444,063 | 0.001 | 4.8 | 0.003 | 0.0 |
| PM-3 | 3-Dec-13 | 10:56-12:05 | 126.0 | 267 | 9.3 | 4,821 | 673,071 | 471,334 | 437,097 | 0.001 | 5.3 | 0.003 | 0.0 |
| | *Average:* | | *126.0* | *269* | *9.3* | *4,830* | *674,320* | *471,083* | *434,397* | *0.001* | *4.9* | *0.003* | *0.0* |

(1) Permit Limit = 0.17 lb/1000 $lb_{(wet)}$ @50% excess air

**PM10**

| Test | Test Date | Test Time | Unit Load (GMW) | Stack Temperature (°F) | $CO_2$ (%) | Stack Velocity (ft/min) | Exhaust Gas Flowrates (SCFM) | (DSCFM) | PM10 Emissions (grains/dscf) | (lbs/hr) | Opacity (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PM10 - 1 | 4-Dec-13 | 8:51-11:10 | 124.8 | 272 | 9.4 | 4,489 | 435,507 | 396,001 | 0.002 | 5.1 | 0.0 |
| PM10 - 2 | 4-Dec-13 | 11:48-14:10 | 125.1 | 282 | 9.4 | 4,693 | 448,718 | 412,742 | 0.001 | 4.9 | 0.0 |
| PM10 - 3 | 5-Dec-13 | 8:24-10:52 | 124.8 | 283 | 9.4 | 4,733 | 450,781 | 414,536 | 0.001 | 4.1 | 0.0 |
| | *Average:* | | *124.9* | *279* | *9.4* | *4,638* | *445,002* | *407,760* | *0.001* | *4.7* | *0.0* |

**PM2.5**

| Test | Test Date | Test Time | Unit Load (GMW) | Stack Temperature (°F) | $CO_2$ (%) | Stack Velocity (ft/min) | Exhaust Gas Flowrates (SCFM) | (DSCFM) | PM2.5 Emissions (grains/dscf) | (lbs/hr) | Opacity (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PM10 - 1 | 4-Dec-13 | 8:51-11:10 | 124.8 | 272 | 9.4 | 4,489 | 435,507 | 396,001 | 0.001 | 4.6 | 0.0 |
| PM10 - 2 | 4-Dec-13 | 11:48-14:10 | 125.1 | 282 | 9.4 | 4,693 | 448,718 | 412,742 | 0.001 | 4.6 | 0.0 |
| PM10 - 3 | 5-Dec-13 | 8:24-10:52 | 124.8 | 283 | 9.4 | 4,733 | 450,781 | 414,536 | 0.001 | 4.1 | 0.0 |
| | *Average:* | | *124.9* | *279* | *9.4* | *4,638* | *445,002* | *407,760* | *0.001* | *4.4* | *0.0* |

**Condensables**

| Test | Test Date | Test Time | Unit Load (GMW) | Stack Temperature (°F) | $CO_2$ (%) | Stack Velocity (ft/min) | Exhaust Gas Flowrates (SCFM) | (DSCFM) | Condensable PM Emissions (grains/dscf) | (lbs/hr) | Opacity (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PM10 - 1 | 4-Dec-13 | 8:51-11:10 | 124.8 | 272 | 9.4 | 4,489 | 435,507 | 396,001 | 0.003 | 10.5 | 0.0 |
| PM10 - 2 | 4-Dec-13 | 11:48-14:10 | 125.1 | 282 | 9.4 | 4,693 | 448,718 | 412,742 | 0.003 | 10.0 | 0.0 |
| PM10 - 3 | 5-Dec-13 | 8:24-10:52 | 124.8 | 283 | 9.4 | 4,733 | 450,781 | 414,536 | 0.004 | 13.3 | 0.0 |
| | *Average:* | | *124.9* | *279* | *9.4* | *4,638* | *445,002* | *407,760* | *0.003* | *11.3* | *0.0* |

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# AUXILIARY TEST DATA (Chem-Mod)
## St. Clair Power Plant - Unit 2
### December 3-5, 2013

**Total Filterable PM**

| Test | Test Date | Test Time | Unit Load (GMW) | Total Coal Burned (Tons/Hr) | REF Application Rate S-Sorb (%) | REF Application Rate MerSorb (%) | CEMs Data SO2 (ppm) | CEMs Data NOx (ppm) |
|---|---|---|---|---|---|---|---|---|
| PM-1 | **3-Dec-13** | 8:10-9:16 | 125.8 | 67.0 | 0.326 | 0.021 | 180.0 | 189.0 |
| PM-2 | **3-Dec-13** | 9:32-10:40 | 126.1 | 66.6 | 0.326 | 0.021 | 180.8 | 188.5 |
| PM-3 | **3-Dec-13** | 10:56-12:05 | 126.0 | 66.8 | 0.326 | 0.021 | 181.9 | 185.7 |
| | ***Average:*** | | ***126.0*** | ***66.8*** | ***0.326*** | ***0.021*** | ***180.9*** | ***187.7*** |

**PM10/2.5 + Condensibles**

| Test | Test Date | Test Time | Unit Load (GMW) | Total Coal Burned (Tons/Hr) | REF Application Rate S-Sorb (%) | REF Application Rate MerSorb (%) | CEMs Data SO2 (ppm) | CEMs Data NOx (ppm) |
|---|---|---|---|---|---|---|---|---|
| PM10 - 1 | **4-Dec-13** | 8:51-11:10 | 124.8 | 68.3 | 0.320 | 0.0211 | 183.3 | 147.7 |
| PM10 - 2 | **4-Dec-13** | 11:48-14:10 | 125.1 | 68.3 | 0.320 | 0.0211 | 172.0 | 144.7 |
| PM10 - 3 | **5-Dec-13** | 8:24-10:52 | 124.8 | 65.1 | 0.326 | 0.0209 | 175.5 | 118.5 |
| | ***Average:*** | | ***124.9*** | ***67.2*** | ***0.322*** | ***0.0210*** | ***176.9*** | ***137.0*** |

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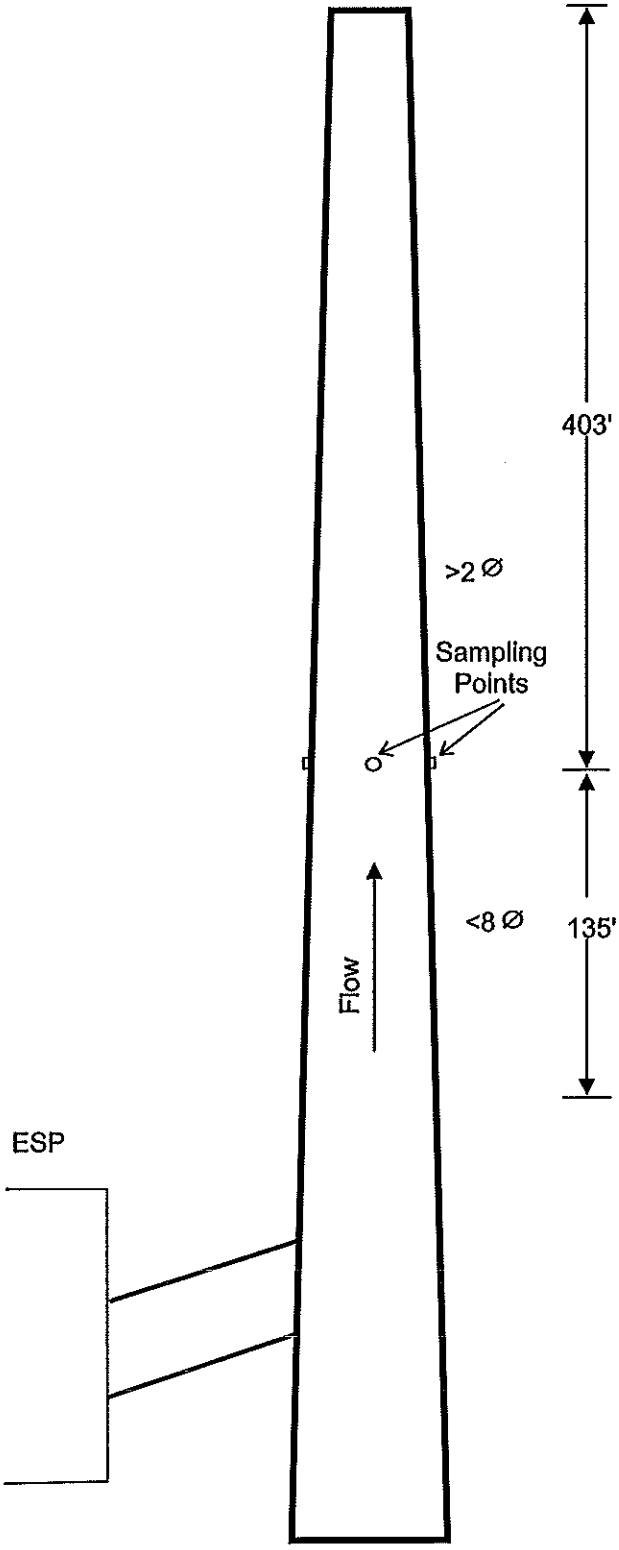
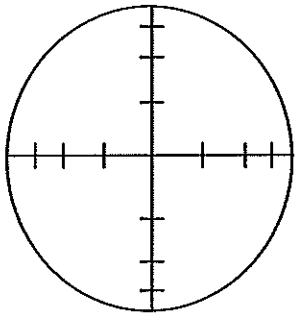
# Figure 1 – Sampling Location & Traverse Points
## St Clair Power Plant – Units 2
## December 3-5, 2013




Stack Diameter 13'-4"



Velocity Measurement Points

| Points | Distance From Inner Wall |
|---|---|
| 1 | 7.0 |
| 2 | 23.4 |
| 3 | 47.4 |

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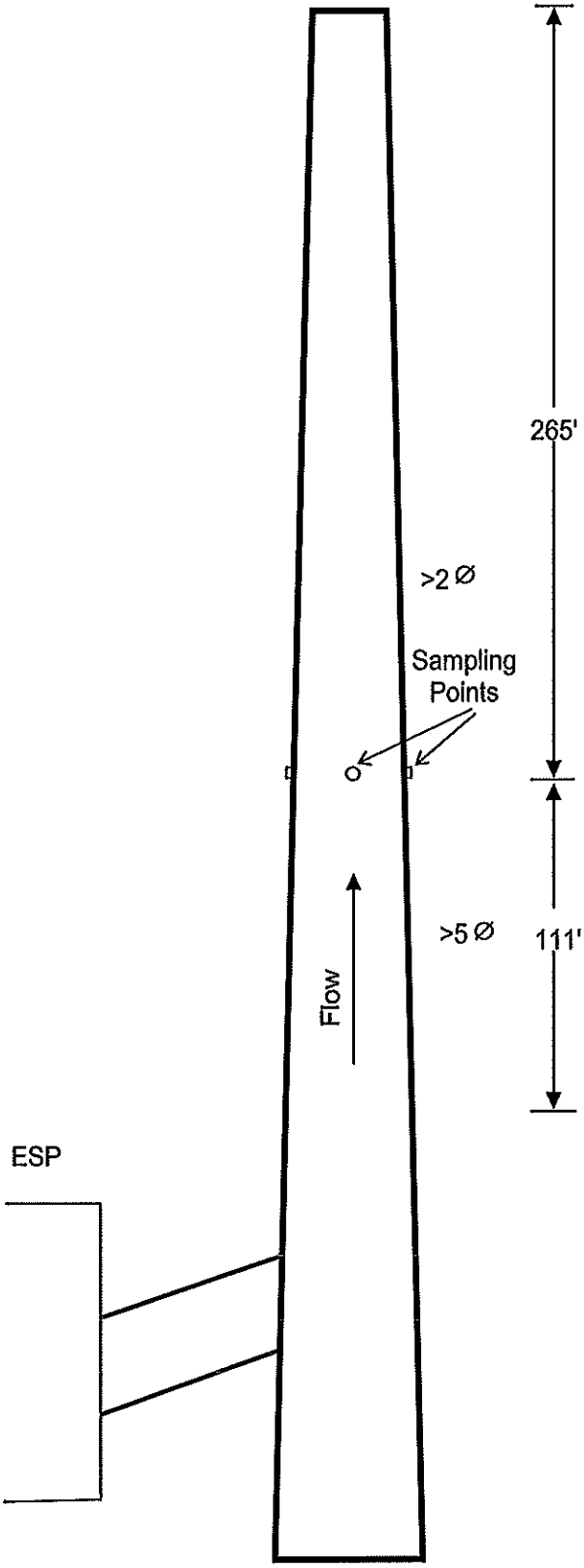
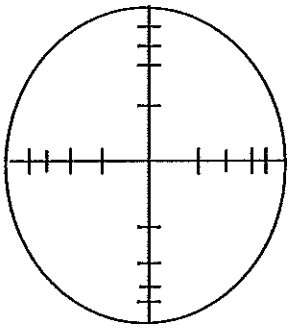
# Figure 2 – Sampling Location & Traverse Points
## St Clair Power Plant – Unit 6
## June 6-July 10, 2013




Stack Diameter 228"

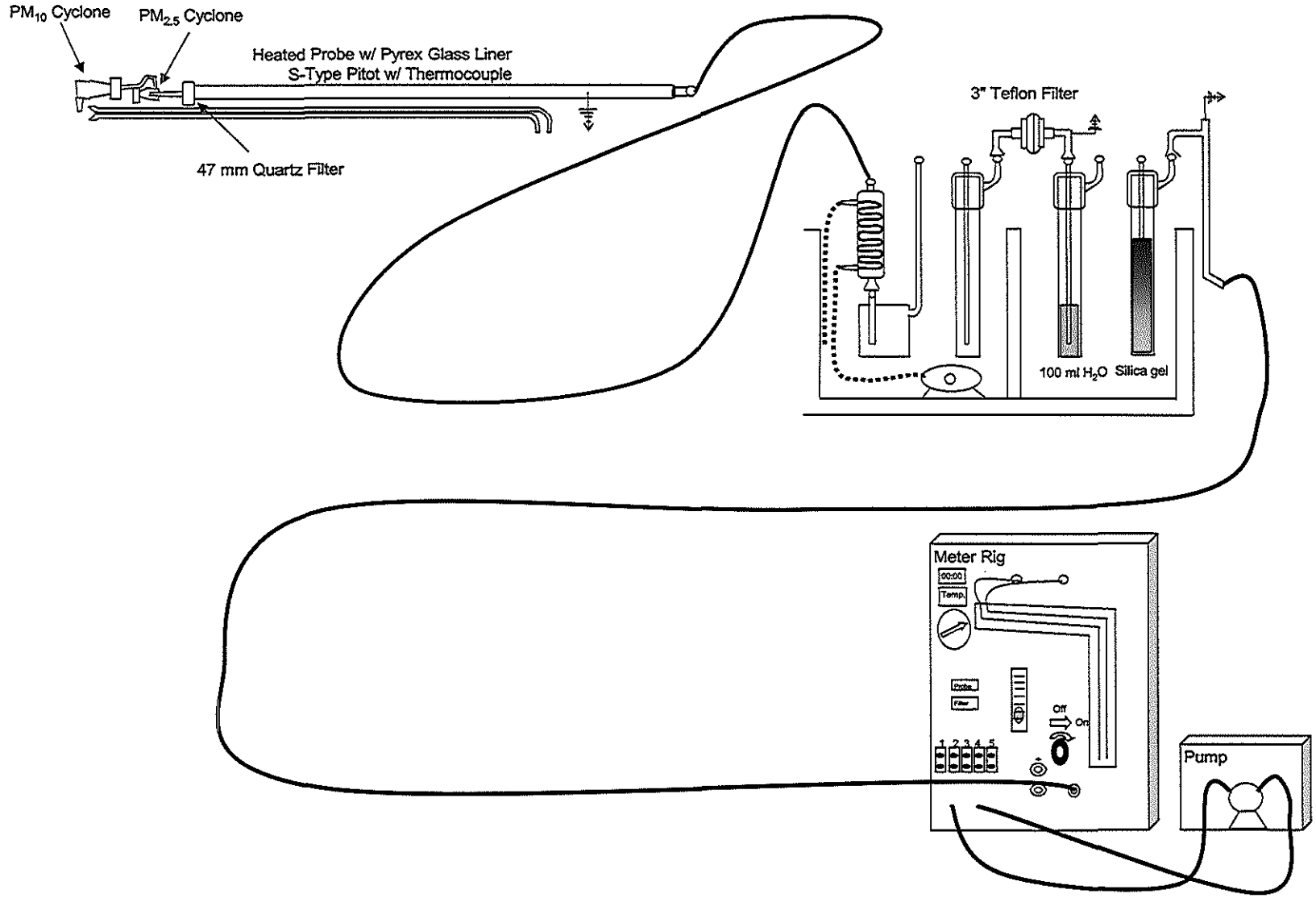


Velocity Measurement Points

| Points | Distance From Inner Wall |
|---|---|
| 1 | 7.3 |
| 2 | 23.9 |
| 3 | 44.2 |
| 4 | 73.6 |

DTE Energy

# Figure 3 – EPA Method 201a & 202
## St Clair Power Plant – Unit 2
## December 3-5, 2013



DTE Energy

# Figure 4 – EPA Method 17/202
## St Clair Power Plant – Unit 6
## June 6-July 10, 2013