Consumers Energy

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Test Report

Renewable Operating Permit Emissions Test EUTURBINEC1-1 & EUTURBINEC1-2 St. Clair Gas Compressor Station

St. Clair Compressor Station
10021 Marine City Highway
Ira Township, Michigan 48023

Test Date:

May 19, 2015

RECEIVED
JUL 15 2015
AIR QUALITY DIV.

July 14, 2015
Work Order No. 24148566
Revision 0

Test Performed by the Consumers Energy Company
Regulatory Compliance Testing Section
Laboratory Services Department

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
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 St. Clair Compressor Station County St. Clair

Source Address 10021 Marine City Highway City Ira

AQD Source ID (SRN) B6637 ROP No. MI-ROP-B6637-2010 ROP Section No. _____

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:

Test Report for Combustion Turbines C1-1 & C1-2

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

Michael Vigrass	Manager, Natural Gas Compression	(248) 763-9609
Name of Responsible Official (print or type)	Title	Phone Number

Signature of Responsible Official — Date: 7-14-15

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

1.0 INTRODUCTION

Identification, location and dates of tests

This report summarizes the results of testing conducted on May 19, 2015 at Consumers Energy Company's (CEC) St. Clair Compressor Station. CEC's Regulatory Compliance Testing Section (RCTS) conducted performance tests on two (2) identical low-NOx Solar natural gas-fired turbines, identified as EUTURBINEC1-1 and EUTURBINEC1-2 (collectively identified as FGTURBINES). The engines are located and operating at the St. Clair Compressor Station in Ira, Michigan. Please note that reproducing portions of this test report may omit critical substantiating documentation or cause information to be taken out of context. If any portion of this report is reproduced, please exercise due care in this regard.

Purpose of testing

The purpose of the testing was to re-establish the range of gas producer speed within which the turbines can operate and continuously comply with the applicable nitrogen oxides (NO_x) and carbon monoxide (CO) emission limits. The NO_x and CO emission limits applicable to the turbines are specified in Conditions I.1 and I.2 of Table FGTURBINES in the Renewable Operating Permit (ROP), and are summarized in Table 1 below.

Table 1

Summary of Units C1-1 and C1-2 NO_x and CO Emission Limits

Pollutant	Limit	Time Period/Operating Scenario	Equipment
NO_x	9.0 pounds	Per hour	Two turbines combined
	39.0 tons	Per year	
	0.47 grams	Per horsepower-hour (hp-hr) (corrected to 15% oxygen (O_2), on a dry basis, at 100% speed and 100% torque)	Each turbine
	150.0 ppm	At 15% O_2 on a dry gas basis	Each turbine
CO	20.7 pounds	Per hour	Two turbines combined
	90.6 tons	Per year	
	1.09 gram	Per hp-hr (corrected to 15% O_2, on a dry basis, at 100% speed and 100% torque)	Each turbine

Brief description of source

The St. Clair Compressor Station is a natural gas compressor station. The purpose of the facility is to maintain pressure of natural gas in order to move it in and out of storage reservoirs and along the pipeline system. Both turbines are Solar Centaur T4500 exclusively fired with pipeline quality natural gas. Each of the Solar combustion turbines are equipped with integral SoLoNOx

combustors. These combustors incorporate a dry low NO_x combustion technology that reduces the formation of nitrogen oxides.

Names, addresses, and telephone numbers of the contacts for information regarding the test and the test report, and names and affiliation of all personnel involved in conducting the testing

A Test Protocol, dated April 15, 2015, was submitted and subsequently approved by the MDEQ in their letter dated April 28, 2015. RCTS Technical Analysts Gregg Koteskey and Joe Mason performed the tests on May 19, 2015. CEC Senior Engineer Ms. Amy Kapuga was onsite to coordinate the collection of process data. St. Clair Field Leader, Mr. Brian Mauzy, coordinated the test and CEC Station Operator, Barry Selweski, collected operating data. MDEQ representatives Mr. David Patterson, Mr. Sebastian Kallumkal, Ms. Kerry Kelly and Mr. Samuel Liveson were on site to witness a portion of this test event.

Table 2

Test Program Participants

Responsible Party	Address	Contact
Test Facility	St. Clair Compressor Station 10021 Marine City Highway Ira, Michigan 48023	Mr. Brian Mauzy 586-716-3331 brian.mauzy@cmsenergy.com
Corporate Air Quality Contact	Consumers Energy Company Environmental Services Department 1945 West Parnall Road Jackson, Michigan 49201	Ms. Amy Kapuga 517-788-2201 amy.kapuga@cmsenergy.com
Test Representative	Consumers Energy Company Regulatory Compliance Testing Section 17010 Croswell Street West Olive, Michigan 49460	Mr. Joe Mason, QSTI 231-720-4856 joe.mason@cmsenergy.com
State Representatives	Michigan Department of Environmental Quality Air Quality Division-Technical Programs Unit Lansing, Michigan	Mr. David Patterson 269-567-3553 pattersond2@michigan.gov
	Michigan Department of Environmental Quality Air Quality Division – SE Michigan District 27700 Donald Court Warren, Michigan 48092	Mr. Sebastian Kallumkal 269-567-3553 kallumkals@michigan.gov
		Ms. Kerry Kelly 269-567-3553 kellyk6@michigan.gov
		Mr. Samuel Liveson 586-753-3749 livesons1@michigan.gov

2.0 SUMMARY OF RESULTS

Operating Data

Operating data collected during each test run included power turbine speed, gas producer speed, fuel gas flow, horsepower, suction pressure, discharge pressure, air inlet temperature, ambient temperature and barometric pressure.

Applicable Permit Number

The St. Clair Compressor Station is currently operating pursuant to the terms and conditions of ROP No. MI-ROP- N6637-2010. Performance tests were conducted, as required, on two (2), identical, low-NO_x Solar natural gas-fired combustion turbines identified as EUTURBINEC1-1 and EUTURBINEC1-2 (collectively identified as FGTURBINES).

Results

The purpose of the testing was to re-establish the range of gas producer speed within which the turbines can operate and continuously comply with the applicable NO_x and CO emission limits. A summary of the test results are presented below.

Table 3
Summary of Turbines C1-1 and C1-2 NO_x and CO Emissions

Parameter	Turbine C1-1				Turbine C1-2			
	98.9% GPS		90.8% GPS		98.8% GPS		91.0% GPS	
	NO_x	CO	NO_x	CO	NO_x	CO	NO_x	CO
ppm, corrected to 15% oxygen	38.1	--	47.4	--	55.7	--	42.3	--
g/bhp-hr[1]	0.73	0.03	1.15	0.08	1.01	0.22	0.93	0.63
lbs/hr	6.21	0.26	6.45	0.43	8.56	1.90	5.24	3.58
tons/yr*	27.22	1.14	28.23	1.89	37.50	8.34	22.97	15.68

[1] The g/bhp-hr emission limits are only applicable at 100% gas producer speed.
* Based on 8,760 hours per year

The stack test data indicates that the maximum combined NO_x emission rate for Turbines C1-1 & C1-2 is 15.01 pounds per hour, and the maximum combined CO emission rate is 4.01 pounds per hour.

3.0 SOURCE DESCRIPTION

Description of Process

As noted previously, the St. Clair Compressor Station is a natural gas compressor station. The purpose of the facility is to maintain pressure of natural gas in order to move it in and out of storage reservoirs and along the pipeline system. For purposes of natural gas compression, the station utilizes three (3) natural gas-fired reciprocating engine drive compressor units (designated as C2-2, C2-3 and C2-4) and two (2) natural gas-fired combustion turbine-driven compressor units (designated as C1-1 and C1-2). The tested equipment consists of the two (2) identical low-NOx Solar T4500 natural gas-fired combustion turbines, identified as EUTURBINEC1-1 and EUTURBINEC1-2 (collectively identified as FGTURBINES). These turbines are simple cycle units that are used to provide mechanical energy. The mechanical energy provided by these turbines is used to drive natural gas compression equipment. Each of the Solar T4500 combustion turbines are equipped with integral SoLoNOx combustors. These combustors incorporate a dry low-NO_x combustion technology that reduces the formation of nitrogen oxides.

Per the ROP, the primary parameter used to regulate the operation of the combustion turbines is the percentage of gas producer speed. These turbines are operated within a range of gas producer speeds, established through testing, within which the NO_x and CO emission limits have been demonstrated.

Process Flow Sheet or Diagram

NA

Type and Quantity of Raw Material Processed During the Tests

NA

Maximum and Normal Rated Capacity of the Process

EUTURBINEC1-1 and EUTURBINEC1-2 are limited to a maximum output of approximately 4,300 horsepower each. At this achievable output, the heat input rating of each turbine is approximately 45 million Btu/hr.

Description of Process Instrumentation Monitored During the Test

Turbine operating data collected during each test run included power turbine speed, gas producer speed, fuel gas flow, horsepower, suction pressure, discharge pressure, air inlet temperature, ambient temperature and barometric pressure. All process data was collected in the station control room. Ambient temperature and barometric pressure were collected at the test trailer. Operational data could not be obtained electronically on the day of testing. The station operators were able to print screen shots of the data, which is summarized in Attachment 1.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

Description of sampling train(s) and field procedures

All testing, sampling, analytical, and calibration procedures used for this test program were performed in accordance with 40 CFR, Part 60, Appendix A. The NO_x and CO concentrations from the turbines were determined in accordance with EPA Reference Method 7E, using specific applications, as necessary, from Method 20 and Method 10, respectively. The carbon dioxide (CO_2) concentrations from the turbines were determined in accordance with EPA Reference Method 3A.

For each turbine, the exhaust gases were measured at both the minimum and the maximum achievable gas producer speed (expressed as a percentage of maximum speed). The minimum producer speed tested was approximately 90% of load and the maximum producer speed tested was approximately 100% of load. A minimum of three 21-minute test runs were conducted at each of these gas producer speeds.

The exhaust gases were extracted from the stacks with a non-heated Type 316 stainless steel probe (due to the high exhaust gas temperatures) into a heated Teflon sample line which prevented moisture from condensing until the exhaust gases were run through an electronic chiller unit which removed the moisture prior to injection into the various analyzers (NO_x, CO, and CO_2). A diagram of the sampling system is presented as Figure 1.

A stratification test was performed at each unit in accordance with Method 1 specifications, as directed by Method 7E, Section 8.1.2 to determine the appropriate number of traverse points. The concentrations measured at each of the twelve individual traverse points differed less than 5% of the mean concentration of all the traverse points, allowing the sampling to be performed from a single point in the centroid of each stack. This stratification data is provided in Attachment 4.

CO_2 diluent concentrations were measured using a non-dispersive infrared (NDIR) Thermo Model 410i analyzer equipped with paramagnetic O_2 analysis capacity, following the guidelines of U.S. EPA Method 3A, *Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from a Stationary Source (Instrumental Analyzer Procedure)*. NO_x concentrations were measured monitored using a Thermo-Environmental (Thermo) Model 42I-HL chemiluminescent analyzer following the guidelines of U.S. EPA Method 7E, *Determination of Nitrogen Oxides from Stationary Sources (Instrumental Analyzer Procedure)*.
CO concentrations were measured using a Thermo Model 58i NDIR analyzer following the guidelines of U.S. EPA Reference Method 10, *Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure).*

Quality Assurance Procedures

Each U.S. EPA reference method performed during this test contains specific language stating that to obtain reliable results, persons using these methods should have a thorough knowledge of the techniques associated with each method. To that end, CEC RCTS attempts to minimize any factors which could cause sampling errors by implementing a quality assurance (QA) program into every component of field testing, including the following information.

U.S. EPA Protocol gas standards certified according to the U.S. EPA Traceability Protocol for Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997 or May, 2012 version and certified to have a total relative uncertainty of ±1 percent were used to calibrate the analyzers during the test program. Although not required in the context of this Parts 60 and 63 test program, the vendors providing the calibration gases also participate in the Protocol Gas Verification Program (PGVP), an EPA audited program developed for 40 CFR Part 75.

The extractive sample system instruments were calibrated and operated following the appropriate method guidelines, based on specifications contained in Method 7E (as referenced in Methods 3A and 10). Before daily testing began, an Analyzer Calibration Error (ACE) test was conducted by introducing the calibration gases directly into each analyzer. If the measured response didn't meet the ±2 percent of instrument span specification, or within 0.5 ppmv absolute difference to pass the ACE check, appropriate action was taken and the ACE was repeated. Prior to beginning the first run, an initial system bias check was conducted by introducing the low and upscale calibration gases into the sampling system at the probe outlet and drawing them through the sample conditioning system in the same manner as the exhaust gas sample, while measuring the instrument response. Each instrument response must meet a specification of ≤ 5.0 percent of instrument span.

Low and upscale bias calibrations were performed after each run thereafter to quantify system calibration drift and bias. During the initial system bias tests, system response time was measured and the sample flow rate throughout the remainder of the test was monitored to maintain the sample flow rate within 10 percent of the average flow rate observed during the response time test. Sampling for each run was started after twice the system response time had elapsed.

Description of recovery and analytical procedures

NA

Dimensioned sketch showing all sampling ports in relation to breeching and to upstream and downstream disturbances or obstructions of gas flow and a sketch of cross-sectional view of stack indicating traverse point locations and exact stack dimensions

Figure 2 shows the combustion turbine exhaust stack arrangement and location of test ports (same for each of Units C1-1 and C1-2).

5.0 TEST RESULTS AND DISCUSSION

Detailed tabulation of results, including process operating conditions and exhaust gas conditions

Table 1 contains a summary of the NO_x and CO emission rates, and associated gas producer speeds, observed for each of the units during testing conducted on May 19, 2015. Operational data, individual run concentrations and emissions, calculation spreadsheets, field data sheets, calibration information and fuel analyses are contained in Attachments 1 - 5.

It should be noted that operating data was not collected during Runs 1 & 2 for Turbine C1-2. After conducting two (2) more test runs (Runs 3 & 4), and demonstrating that they were consistent, the MDEQ approved the use of these two (2) runs as a complete test.

Discussion of significance of results relative to operating parameters and emission regulations

The NO_x lb/hr emission rates were above the emission limits at each of the tested gas producer speeds. These abnormal emissions are believed to be the result of a turbine malfunction due to faulty fuel system components. As described below, the investigation and corrective actions initiated resulted in both turbines appearing to be compliant with the applicable NO_x and CO emission limits based on an emission check by the vendor.

Discussion of any variations from normal sampling procedures or operating conditions, which could have affected the results

As described below, excess fuel was being fed to the turbines, due to a faulty pilot valve, resulting in abnormal combustion.

Documentation of any process or control equipment upset condition which occurred during the testing

Due to schedule conflicts, along with the fact that the station operators were not able to collect the operational data electronically on the day of testing, the emission calculations were not finalized until June 29, 2015. A Solar Field Service representative arrived onsite on July 6, 2015. After trouble-shooting, the Solar representative determined that pilot valves on both units were not closing properly. This results in excess fuel being fed to the turbines, thereby resulting in abnormal combustion. The Solar representative then manually moved the valve to the closed position, and turbine combustion appeared to return to normal. Consumers Energy ordered replacement valves and installed them upon delivery. Solar then conducted an emission check and both units were meeting the vendor emission guarantee rates.

Description of any major maintenance performed on the air pollution control device(s) during the three month period prior to testing

Semi-annual maintenance, which consisted of an Engine and Compressor Inspection, as well as an internal unit wash, was conducted by the OEM (Solar) on EUTURBINEC1-1 and EUTURBINEC1-2 during the week of May 4, 2015. The inspection included a borescope (visual), lube oil sample, pressure and temperature checks, and software updates. No issues were discovered; however, emission verification was not conducted.

In the event of a re-test, a description of any changes made to the process or air pollution control device(s)

Pilot valves were replaced on both units. Solar then conducted an emission check and both units were meeting the vendor emission guarantee rates. The units are scheduled to be re-tested beginning Monday, July 20, 2015.

Results of any quality assurance audit sample analyses required by the reference method

NA

Calibration sheets for the dry gas meter, orifice meter, pitot tube, and any other equipment or analytical procedures which require calibration

Attachment 4 contains the analyzer calibration data, response time test results, NO_2 to NO converter efficiency check and calibration gas Certificates of Analysis.

Sample calculations of all the formulas used to calculate the results

Sample calculations for all formulas used in the test report are contained in Attachment 5.

Copies of all field data sheets, including any pre-testing, aborted tests, and/or repeat attempts

Please refer to Attachment 1 for process data collected during the test runs; Attachment 2 for calculation spreadsheets for each of the test runs; and Attachment 3 for data sheets with the measured concentrations for each test run.

Copies of all laboratory data including QA/QC

NA

TABLE 4
SUMMARY OF NOX AND CO EMISSIONS
ST. CLAIR COMPRESSOR STATION
TURBINE C1-1, HIGH LOAD
MAY 19, 2015

Time Period	Run 1 1440-1500	Run 2 1517-1537	Run 3 1553-1613	Averages
Process Conditions				
Gas Producer Speed, % of Maximum:	98.9	98.8	99.0	**98.9**
Power Turbine Speed, % of Maximum:	77.8	77.8	77.7	**77.8**
Horsepower:	3861	3858	3876	**3865**
Fuel Flow, SCFM	720.1	713.6	715.0	**716.3**
Suction Pressure, PSIG:	613.8	612.7	615.4	**614.0**
Discharge Pressure, PSIG:	1067.8	1074.4	1077.1	**1073.1**
Outlet Gas Conditions				
Drift Corrected Carbon Dioxide Concentration, Dry (Percent):	2.68	2.65	2.65	**2.66**
Drift Corrected Carbon Monoxide Concentration, Dry (ppmdv):	2.19	2.0	2.0	**2.1**
Drift Corrected Carbon Monoxide Concentration (ppmdv @ 15% O2):	2.76	2.56	2.53	**2.62**
Drift Corrected Nitrogen Oxides Concentration, Dry (ppmdv):	30.7	29.7	29.9	**30.1**
Drift Corrected Nitrogen Oxides Concentration (ppmdv @15% O2):	38.7	37.7	38.0	**38.1**
NOx Emission Rate, Grams Per Brake Horsepower:	0.74	0.72	0.72	**0.73**
NOx Emission Rate, pound per hour:	6.34	6.12	6.19	**6.21**
NOx Emission Rate, tons per year:	27.75	26.82	27.10	**27.22**
Carbon Monoxide Emission Rate, Grams Per Brake Horsepower:	0.03	0.03	0.03	**0.03**
Carbon Monoxide Emission Rate, pound per hour:	0.28	0.25	0.25	**0.26**
Carbon Monoxide Emission Rate, tons per year:	1.21	1.11	1.10	**1.14**

TABLE 5
SUMMARY OF NOX AND CO EMISSIONS
ST. CLAIR COMPRESSOR STATION
TURBINE C1-1, LOW LOAD
MAY 19, 2015

Time Period	Run 1 1629-1649	Run 2 1707-1727	Run 3 1746-1806	Averages
Process Conditions				
Gas Producer Speed, % of Maximum:	90.8	90.8	90.8	**90.8**
Power Turbine Speed, % of Maximum:	70.7	70.1	69.9	**70.2**
Horsepower:	2552	2550	2548	**2550**
Fuel Flow, SCFM	597.4	599.7	594.9	**597.4**
Suction Pressure, PSIG:	624.4	627.9	627.5	**627.0**
Discharge Pressure, PSIG:	1045.8	1037.1	1034.4	**1039.0**
Outlet Gas Conditions				
Drift Corrected Carbon Dioxide Concentration, Dry (Percent):	2.43	2.43	2.41	**2.43**
Drift Corrected Carbon Monoxide Concentration, Dry (ppmdv):	3.91	3.8	3.5	**3.8**
Drift Corrected Carbon Monoxide Concentration (ppmdv @ 15% O2):	5.41	5.3	4.94	**5.22**
Drift Corrected Nitrogen Oxides Concentration, Dry (ppmdv):	35.1	36.2	31.1	**34.1**
Drift Corrected Nitrogen Oxides Concentration (ppmdv @15% O2):	48.7	50.1	43.5	**47.4**
NOx Emission Rate, Grams Per Brake Horsepower:	1.18	1.22	1.05	**1.15**
NOx Emission Rate, pound per hour:	6.61	6.84	5.89	**6.45**
NOx Emission Rate, tons per year:	28.96	29.94	25.8	**28.23**
Carbon Monoxide Emission Rate, Grams Per Brake Horsepower:	0.08	0.10	0.10	**0.08**
Carbon Monoxide Emission Rate, pound per hour:	0.45	0.44	0.41	**0.43**
Carbon Monoxide Emission Rate, tons per year:	1.96	1.93	1.78	**1.89**

TABLE 6
SUMMARY OF NOX AND CO EMISSIONS
ST. CLAIR COMPRESSOR STATION
TURBINE C1-2, HIGH LOAD
MAY 19, 2015

Time Period	Run 3 1107-1127	Run 4 1517-1537	Averages
Process Conditions			
Gas Producer Speed, % of Maximum:	98.8	98.9	**98.8**
Power Turbine Speed, % of Maximum:	79.0	77.5	**78.2**
Horsepower:	3874	3839	**9855**
Fuel Flow, SCFM	676.3	675.0	**675.6**
Suction Pressure, PSIG:	595.9	609.1	**603.1**
Discharge Pressure, PSIG:	1089.0	1074.4	**1081.1**
Outlet Gas Conditions			
Drift Corrected Carbon Dioxide Concentration, Dry (Percent):	2.43	2.42	**2.43**
Drift Corrected Carbon Monoxide Concentration, Dry (ppmdv):	14.55	14.8	**14.7**
Drift Corrected Carbon Monoxide Concentration (ppmdv @ 15% O2):	20.17	20.5	**20.35**
Drift Corrected Nitrogen Oxides Concentration, Dry (ppmdv):	39.7	40.5	**40.1**
Drift Corrected Nitrogen Oxides Concentration (ppmdv @15% O2):	55.1	56.3	**55.7**
NOx Emission Rate, Grams Per Brake Horsepower:	0.99	1.02	**1.01**
NOx Emission Rate, pound per hour:	8.47	8.65	**8.56**
NOx Emission Rate, tons per year:	37.11	37.88	**37.5**
Carbon Monoxide Emission Rate, Grams Per Brake Horsepower:	0.22	0.23	**0.22**
Carbon Monoxide Emission Rate, pound per hour:	1.89	1.92	**1.90**
Carbon Monoxide Emission Rate, tons per year:	8.27	8.41	**8.34**

TABLE 7
SUMMARY OF NOX AND CO EMISSIONS
ST. CLAIR COMPRESSOR STATION
TURBINE C1-2, LOW LOAD
MAY 19, 2015

Time Period	Run 1 1153-1213	Run 2 1233-1253	Run 3 1315-1335	Averages
Process Conditions				
Gas Producer Speed, % of Maximum:	91.0	90.1	91.0	**91.0**
Power Turbine Speed, % of Maximum:	71.7	70.4	69.6	**70.6**
Horsepower:	2581	2546	2546	**2558**
Fuel Flow, SCFM	544.3	544.6	545.9	**544.7**
Suction Pressure, PSIG:	610.2	615.5	620.9	**615.1**
Discharge Pressure, PSIG:	1045.7	1036.1	1032.8	**1038.6**
Outlet Gas Conditions				
Drift Corrected Carbon Dioxide Concentration, Dry (Percent):	2.23	2.24	2.25	**2.24**
Drift Corrected Carbon Monoxide Concentration, Dry (ppmdv):	31.5	31.6	31.4	**31.5**
Drift Corrected Carbon Monoxide Concentration (ppmdv @ 15% O2):	47.7	47.6	47.0	**47.5**
Drift Corrected Nitrogen Oxides Concentration, Dry (ppmdv):	28.1	28.0	28.1	**28.1**
Drift Corrected Nitrogen Oxides Concentration (ppmdv @15% O2):	42.6	42.2	42.2	**42.3**
NOx Emission Rate, Grams Per Brake Horsepower:	0.93	0.93	0.93	**0.93**
NOx Emission Rate, pound per hour:	5.27	5.22	5.24	**5.24**
NOx Emission Rate, tons per year:	23.09	22.88	22.93	**22.97**
Carbon Monoxide Emission Rate, Grams Per Brake Horsepower:	0.63	0.60	0.60	**0.63**
Carbon Monoxide Emission Rate, pound per hour:	3.60	3.59	3.55	**3.58**
Carbon Monoxide Emission Rate, tons per year:	15.75	15.73	15.56	**15.68**

FIGURE 1

Methods 3A, 7E & 10 Sampling Apparatus Schematic

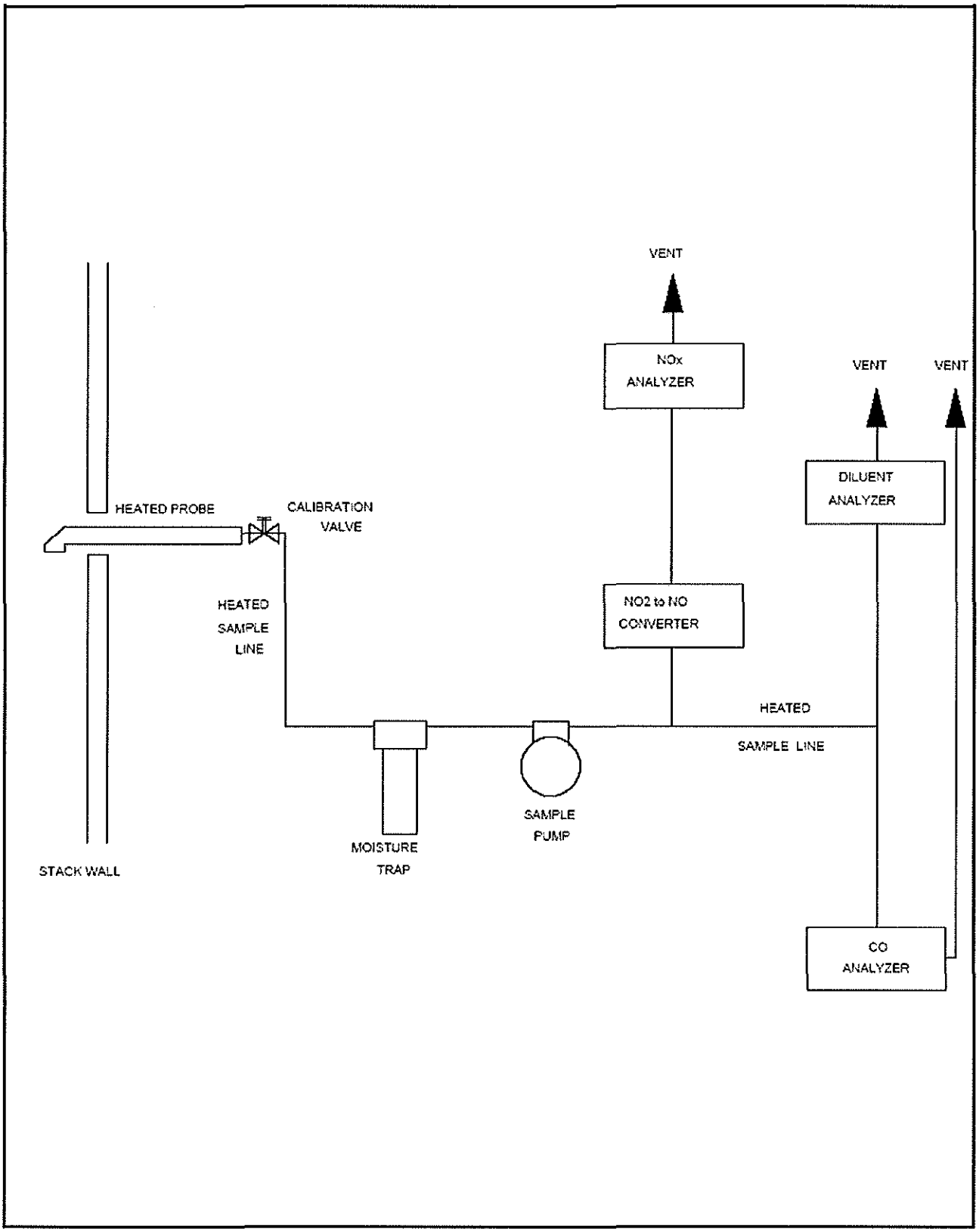
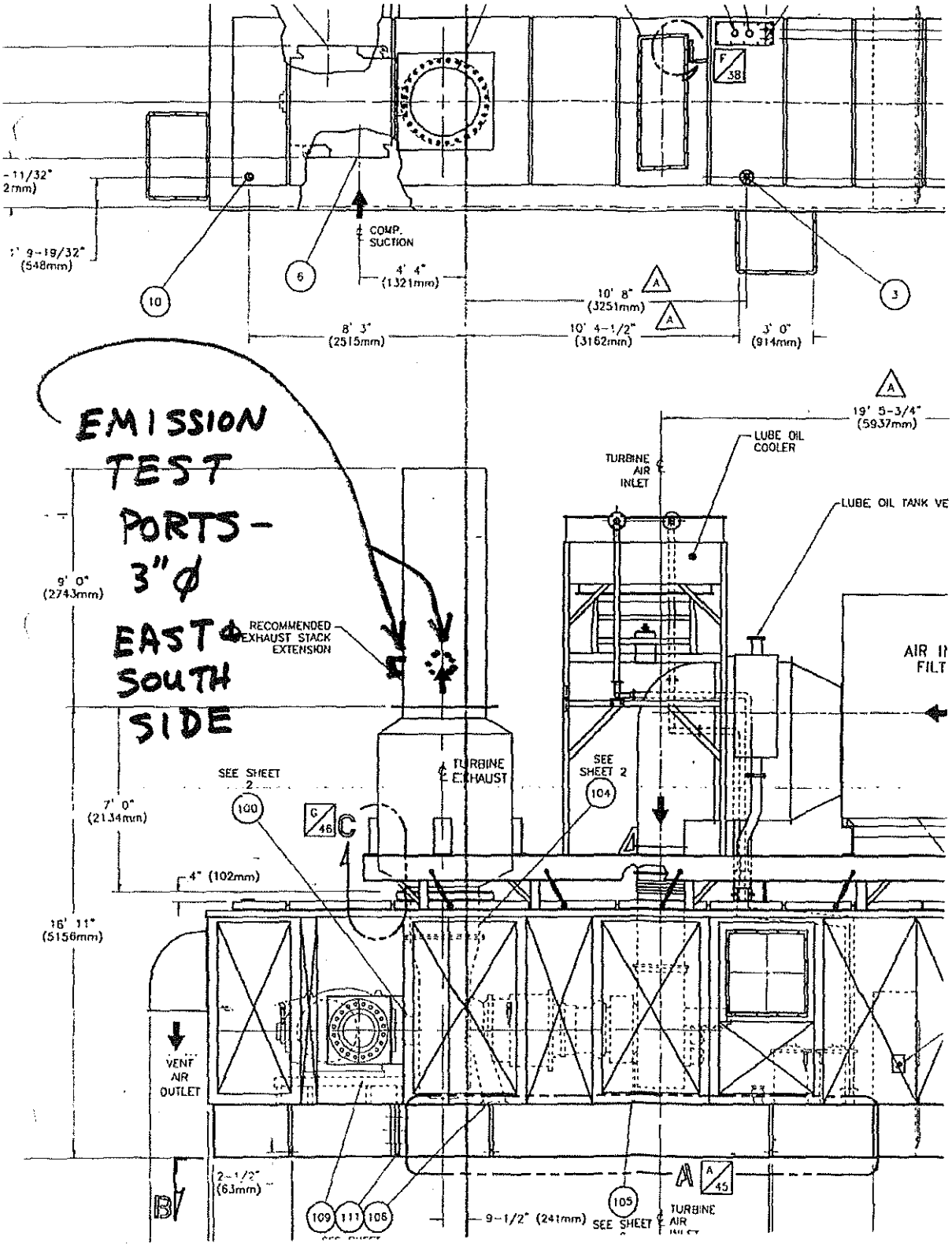

VENT
NOx
ANALYZER
VENT
VENT
DILUENT
ANALYZER
HEATED PROBE
CALIBRATION
VALVE
HEATED
SAMPLE
LINE
NO2 to NO
CONVERTER
HEATED
SAMPLE LINE
SAMPLE
PUMP
MOISTURE
TRAP
STACK WALL
CO
ANALYZER

FIGURE 2

Turbine C1-1 and C1-2 Stack Schematic


EMISSION TEST PORTS - 3"ϕ EAST & SOUTH SIDE
COMP. SUCTION
4' 4" (1321mm)
10' 8" (3251mm)
8' 3" (2515mm)
10' 4-1/2" (3162mm)
3' 0" (914mm)
19' 5-3/4" (5937mm)
LUBE OIL COOLER
TURBINE AIR INLET
LUBE OIL TANK VE
AIR I FILT
RECOMMENDED EXHAUST STACK EXTENSION
9' 0" (2743mm)
7' 0" (2134mm)
4" (102mm)
16' 11" (5156mm)
SEE SHEET 2
TURBINE EXHAUST
SEE SHEET 2
VENT AIR OUTLET
2-1/2" (63mm)
9-1/2" (241mm)
SEE SHEET
TURBINE AIR