Florida Gas Transmission Company

P.O. Box 945100, Maitland, Florida 32751 (407) 875-5800

March 19, 2001

CERTIFIED MAIL – RETURN RECEIPT

Mr. Clair H. Fancy, P.E.
Bureau of Air Regulation
Florida Department of Environmental Protection
Twin Towers Office Bldg.
2600 Blairstone
Tallahassee, FL 32399-2400

Reference: Facility: 0390029
Compressor Station No. 14, Gadsen County

Dear Mr. Fancy:

Subject: Application for Air Construction Permit

Florida Gas Transmission Company (FGT) is proposing to install a new Pignone PGT-10B 15,700 bhp compressor turbine, to upgrade an existing compressor turbine from 10,350 bhp to 13,000 bhp and to modify an existing 2,000 bhp reciprocating engine at the above referenced facility.

The facility is a major source under New Source Review definitions and the proposed new turbine and turbine modifications have associated NO_x emissions exceeding 40 tpy. The proposed modifications to the existing reciprocating engines will create reductions in NO_x emissions so that the net emissions do not exceed levels that are significant under Prevention of Significant Deterioration requirements. Therefore, a state only construction permit is required.

Enclosed is an Application with supporting documentation for an Air Construction Permit for the proposed modifications. FGT understands that no processing fee is required since this facility is operated under a Part 70 Permit.

If you have any questions or need additional information, please call me at (800) 381-1477.

Sincerely,

Jim Thompson
Project Manager, Environmental

CC: James Alexander, Phase V w/o attachments
Dan Pribble, w/o attachments
Frank Diemont
Clay Roesler
Jake Krautsch
Duane Pierce, AQMcs, LLC
Compressor Station No. 14

Florida Gas Transmission Company

Phase V Expansion Project

Compressor Station No. 14

APPLICATION
For
AIR CONSTRUCTION
PERMIT

March 2001

Prepared by AQMcs, LLC

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List of Tables

1.0 INTRODUCTION

Florida Gas Transmission Company (FGT), a Delaware Corporation and an ENRON/EL PASO affiliate of Houston, Texas, is proposing to expand its existing natural gas pipeline facility near Quincy, in Gadsen County, Florida (Compressor Station No. 14). This proposed modification is part of FGT's Phase V Expansion Project, aimed at increasing the supply capacity of FGT's network servicing domestic suppliers, commercial, and industrial customers in Florida. The scope of work for the Phase V Expansion Project includes expansion through the addition of state-of-the-art compressor engines at eight existing compressor stations and the development of two new compressor stations and pipeline within the State of Florida. The basic project components include:

- Mainline loops, additions, and replacements;
- Lateral loops and additions;
- Meter station additions, modifications, and expansions;
- Regulator additions, modifications, and expansions; and
- Compressor station additions and modifications.

Compressor Station No. 14 is located in Gadsden County, Florida, approximately 11 miles southwest of Quincy on Highway 65. Figure 1-1 shows the location of the existing compressor station.

The proposed expansion consists of the installation of a new 15,700 brake horsepower (bhp), natural gas-fired, turbine compressor engine and the upgrading of an existing turbine from 10,350 bhp to 13,000 bhp. The proposed new compressor turbine is a Pignone PGT10B equipped with dry low NO_X (oxides of nitrogen) combustion. The compressor turbine to be upgraded is a Solar Mars T-13000S equipped with dry low NO_X (oxides of nitrogen) combustion. The 10, 350 hp Solar Mars T-13000S unit is being constructed as part of FGT's Phase IV project. These compressor engines will be used solely for transporting natural gas by pipeline for distribution to markets in Florida.

Based on projected new annual emission rates, the proposed new sources would potentially constitute a significant modification at an existing major stationary source under Prevention of Significant Deterioration (PSD) regulations. However, FGT is also proposing to reduce the NO_x emissions from an existing 2,000 bhp reciprocating compressor engine by modifying the engine. Based on the projected net annual emission rate change, there will be no PSD significant increase in the emissions of any contaminant and a state only construction permit is required.

Engineering designs for the proposed expansion project include selection of an engine

incorporating dry low NO_X combustion technology with NOx emissions at 25 ppmv. This dry low NO_X technology for control of NO_X emissions would represent Best Available Control Technology (BACT) for the proposed new gas turbine engine under PSD requirements.

This narrative contains four additional sections. Descriptions of the existing operation at FGT's Compressor Station No. 14, the proposed new turbine, the proposed upgraded turbine and the proposed reciprocating engine modifications are presented in Section 2.0. The air quality review requirements and applicability of state and federal regulations are discussed in Section 3.0. References are included in Section 4.0.

FDEP permit application forms are provided in Attachment A. Attachment B contains a plot plan of the facility. Attachment C contains vendor information, Attachment D contains emission calculations, and Attachment E contains a test report for the current emissions of the engine to be modified and a summary test report of a similar unit that was modified.

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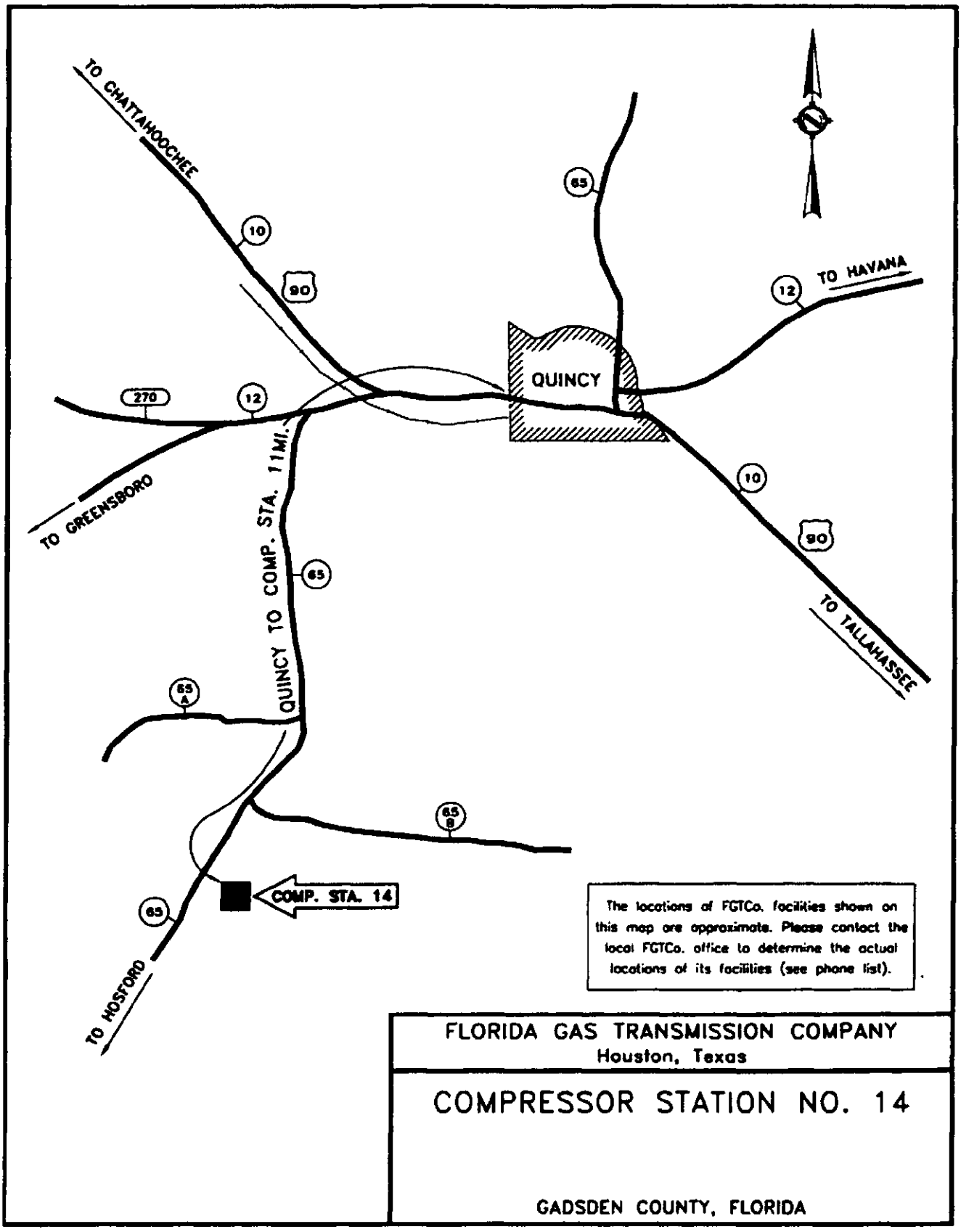
TO CHATTAHOOCHEE
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TO HAVANA
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QUINCY
270
12
TO GREENSBORO
QUINCY TO COMP. STA. 11MI.
65
10
90
TO TALLAHASSEE
65A
65B
COMP. STA. 14
65
TO HOSFORD
The locations of FGTCo. facilities shown on this map are approximate. Please contact the local FGTCo. office to determine the actual locations of its facilities (see phone list).
FLORIDA GAS TRANSMISSION COMPANY
Houston, Texas
COMPRESSOR STATION NO. 14
GADSDEN COUNTY, FLORIDA

2.0 PROJECT DESCRIPTION

A plot plan of FGT's Compressor Station No. 14, showing the location of the plant boundaries, the existing emission sources, and the location of the proposed engine addition, is presented in Attachment B. The following sections provide a description of the existing operations at this location, as well as a description of the proposed project.

2.1 Existing Operations

FGT's existing Compressor Station No. 14 consists of five 2,000 bhp, one 2,700 bhp natural-gas-fired reciprocating internal combustion (IC) engines and one 10,350 bhp natural gas-fired turbine. Table 2-1 summarizes engine manufacturer, model, and the date of installation for each of the existing engines. The original installation was made in 1958 (Compressor Engines 1401 through 1403). Engine 1404 was installed in 1966 and engine 1405 was installed in 1968. An addition referred to as Phase II was constructed in 1991 (Compressor Engine 1406) and was subject to PSD review. Compressor Engine 1407 is being installed in early 2001 as part of the Phase IV Expansion Project.

Of the existing engines, 1404 is being modified to reduce NO_X and CO emissions as part of this expansion project.

The existing facility also has supporting equipment including lube and used oil storage tanks, air compressors and emergency generators.

2.2 Proposed Compressor Station Addition

FGT proposes to increase the horsepower capacity of Compressor Station No. 14, as part of the Phase V Expansion Project. This will involve adding one new gas-fired turbine (Compressor Engine 1408) and upgrading an existing gas-fired turbine (Compressor Engine 1407). The proposed new engine and upgraded engine will be used to increase the volumetric delivery capacity by driving a gas compressor that is a part of a gas transmission line that transports natural gas from source wells in Texas and Louisiana for delivery throughout Florida. Without the proposed modifications, it would not be possible to increase the volumetric delivery capacity necessary to meet both short and long-term demands for natural gas in Florida.

2.2.1 New Compressor Turbine Engine Addition

FGT proposes to install one natural gas-fired turbine compressor unit and associated support equipment at Compressor Station No. 14. The turbine will be a Pignone PGT-10B engine

compressor unit rated at 15,700 bhp (ISO). Fuel will be exclusively natural gas from the FGT's natural gas pipeline. Engine specifications and stack parameters for the proposed engine are presented in Table 2-2.

Table 2-1 Summary of Existing Compressor Engines

Engine #	Date of Installation	Type	Manufacturer	Model #	Brake Horse Power (bhp)
1401	1958	Reciprocating	Worthington	SEHG-8	2,000
1402	1958	Reciprocating	Worthington	SEHG-8	2,000
1403	1958	Reciprocating	Worthington	SEHG-8	2,000
1404	1966	Reciprocating	Worthington	SEHG-8	2,000
1405	1968	Reciprocating	Worthington	SEHG-8	2,000
1406	1991	Reciprocating	Cooper-Bessemer	GMVR-12C	2,700
1407	2001	Turbine	Solar	Mars 90 T-13000S	10,350

Table 2-2 Proposed New Compressor Turbine (1408) Specifications and Stack Parameters

Parameter	Design
Compressor Engine	1408
Type	Gas Turbine
Manufacturer	Nuovo Pignone
Model	PGT10B
Unit Size	15,700 bhp
Heat Input [a]	134.77 MMBtu/hr
Maximum Fuel Consumption [b]	0.1296 MMscf/hr
Speed	7,900 rpm
Stack Parameters	
Stack Height	61.5 ft
Stack Diameter	7.6 ft
Exhaust Gas Flow	215,175 acfm
Exhaust Temperature	909 °F
Exhaust Gas Velocity	79.1 ft/sec

NOTE:

acfm	=	actual cubic feet per minute.
bhp	=	brake horsepower.
Btu/hp-hr	=	British thermal units per brake horsepower per hour.
°F	=	degrees Fahrenheit.
ft	=	feet.
ft/sec	=	feet per second.
MMscf/hr	=	million standard cubic feet per hour
rpm	=	revolutions per minute.

[a] Based on vendor heat rate value plus 10%

[b] Based on heating value for natural gas of 1040 British thermal units per standard cubic foot (Btu/scf).

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Hourly and annual emissions of regulated pollutants from the proposed engine under normal operating conditions are presented in Table 2-3. Emissions of oxides of nitrogen (NO_X, carbon monoxide (CO) and non-methane hydrocarbons (NMHC) are based on the engine manufacturer's supplied data (See Attachment C).

Typically, turbine vendors do not provide information on particulate matter (PM) or sulfur dioxide (SO2) emissions; therefore, particulate matter emissions are based upon USEPA publication AP-42 Table 3.1-2a (USEPA, 2000) and emissions of SO_2 are based on FGT's Federal Energy Regulatory Commission (FERC) certificate limit of 10 grains sulfur per 100 cubic feet of natural gas. Hazardous air pollutant (HAP) emissions are based upon the Gas Research Institute's (GRI) HapCalc software which uses USEPA emission factors, emission factors found in research literature and emission factors based on GRI research data.

Table 2-3 Emissions from Proposed New Compressor Turbine Engine (1408)

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	14.1 lb/hr	Manufacturer Data	14.10	61.8
Carbon Monoxide	5.14 lb/hr @ 100% load 17.34 lb/hr @ 60% load 22.50 lb/hr @ 50% load	Manufacturer Data	8.71[a]	38.1[b]
Volatile Organic Compounds	0.29 lb/hr @ 100% load 1.15 lb/hr @ 60% load 1.46 lb/hr @ 50% load	Manufacturer Data	0.58[c]	2.4[b]
Particulate Matter	0.0066 lb/MMBtu	AP-42, Table 3.1-2a	0.89	3.9
Sulfur Dioxide	10 grains/100 scf	FERC Limit	3.70	16.2
HAPs	Various see Attachment D	GRI HapCalc 3.0	0.75	3.3

a) Nominal CO (annual) rate, maximum 22.50 lb/hr
b) @ 100% load for 75% of time, 60% load for 15% of time & 50% load for 10% of time
c) Nominal VOC (annual) rate, maximum 1.46 lb/hr

All contaminants have decreasing lb/hr emission rates with decreasing engine load except CO and VOCs. The new turbine will be operated at less than 100% load at times. The load may commonly drop as low as 60% and occasionally to 50%. The CO and VOC emission rates on the PGT-10B increase with decreasing engine load. Emission rates are based on 100% load

(worse case) for all contaminants except CO and VOC. CO and VOC emission rates are based on operation at 100% load for 75% of the time (6570 hr/yr), 60% load for 15% (1314 hr/yr) of the time and 50% load for 10% of the time (876 hr/yr).

2.2.2 Upgraded Compressor Turbine

FGT proposes to upgrade one existing natural gas-fired turbine engine compressor unit at Compressor Station No. 14. This unit is currently being constructed as part of FGT's Phase IV Expansion Project, to be completed in early 2001. The engine is a Solar Mars 90 T-13000S turbine compressor unit flat rated at 10,350 bhp that will be upgraded to 13,026 bhp. Fuel will be exclusively natural gas from FGT's natural gas pipeline. Engine specifications and stack parameters for the proposed engine are presented in Table 2-4.

Table 2-4 Proposed Upgraded Turbine (1407) Specifications and Stack Parameters

Parameter	Design
Compressor Engine	1407
Type	Gas Turbine
Manufacturer	Solar
Model	Mars 90 T-13000S
Unit Size	13,026 bhp
Heat Input [a]	8,626 Btu/hp-hr
Maximum Fuel Consumption [b]	0.10804 MMscf/hr
Speed	8,412 rpm
Stack Parameters	
Stack Height	58 ft
Stack Diameter	7.5 ft x 8 ft (rectangular)
Exhaust Gas Flow	179,531 acfm
Exhaust Temperature	867 °F
Exhaust Gas Velocity	50.3 ft/sec

NOTE:

acfm	=	actual cubic feet per minute.
bhp	=	brake horsepower.
Btu/hp-hr	=	British thermal units per brake horsepower per hour.
°F	=	degrees Fahrenheit.
ft	=	feet.
ft/sec	=	feet per second.
MMscf/hr	=	million standard cubic feet per hour.
rpm	=	revolutions per minute.

[a] Based on vendor heat rate value plus 10%

[b] Based on heating value for natural gas of 1040 British thermal units per standard cubic foot (Btu/scf).

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Hourly and annual emissions of regulated pollutants from the proposed engine under normal operating conditions are presented in Table 2-5. Emissions of NOX, CO and VOCs are based on the engine manufacturer's supplied data (See Attachment C).

Typically, turbine vendors do not provide information on particulate matter or SO_2 emissions; therefore, particulate matter emissions are based upon USEPA publication AP-42 Table 3.1-2 (USEPA, 2000) and emissions of SO_2 are based on FGT's Federal Energy Regulatory Commission (FERC) certificate limit of 10 grains sulfur per 100 cubic feet of natural gas. Hazardous air pollutant (HAP) emissions are based upon the Gas Research Institute's (GRI) HapCalc software, which uses USEPA emission factors, emission factors found in research literature and emission factors based on GRI research data.

Table 2-5 Proposed Upgraded Turbine (1407) Compressor Engine Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	10.17 lb/hr	Manufacturer Data	10.17	44.5
Carbon Monoxide	12.38 lb/hr	Manufacturer Data	12.38	54.2
Volatile Organic Compounds	0.35 lb/hr	Manufacturer Data	0.35	1.6
Particulate Matter	0.0066 lb/MMBtu	AP-42, Table 3.1-2a	0.74	3.2
Sulfur Dioxide*	10 grains/100 scf	FERC Limit	3.09	13.5
HAPs	Various see Attachment D	GRI HapCalc 3.0	0.62	2.7

* Emissions based on vendor provided fuel use value plus 10 per cent

2.2.3 Proposed Reciprocating Engine Modifications

The following describes and explains the modifications to be made to Emission Unit 1404.

2.2.3.1 Background

For natural gas engines, there is small window of relative proportions of air and fuel for which combustion can occur. Too much air relative to the amount of fuel in a cylinder head will not ignite. Also, if there is not enough air relative to the amount of fuel in the cylinder head, it will not ignite.

"Rich burn" engines power most of the old pipeline compressors. This means that they mix air and fuel in proportions such that the combustible mixture is on the low air to fuel ratio side of the combustion envelope. It has been known for some time now that one of the secrets of producing less NO_X in the internal engine combustion process is to increase the air manifold pressure and operate at higher air to fuel ratios. By increasing the air manifold pressure, more air is let into the cylinder head per each stroke. This means that more air is added to the same or similar parts of fuel for each "explosion" that occurs in the cylinder head. The result is lower cylinder temperatures and lower NO_X levels.

Most of the original engine manufacturers (OEM's) want the users to purchase their kit for accomplishing the modifications. These kits consist of expensive jet cells, modifications to cylinder heads, a cooling system for the jet cells and sometimes a whole new turbocharger. These kits are designed to operate the engine at the high end of the air to fuel mixture window. While these kits reduce the amount of NO_X formation, they are generally expensive to install, increase the maintenance of the ignition and cooling systems and reduce the reliability of the compressor engine. Furthermore, as a side effect, they sometimes reduce fuel consumption slightly.

Most compressor engines have been operated with the same OEM engine parameters since their installation. Not many users will modify the operating parameters given by the OEM. However, with the need for cleaner combustion, OEM's started modifying the parameters by increasing the air to fuel ratio with their kits. Users caught on and later began implementing non-OEM approaches. FGT's approach is to increase the air to fuel ratio incrementally to reduce the amount of NO_X without the use of OEM systems. By doing this, many of the complicated, unreliable systems are not required. Since this approach generally cannot achieve the same air to fuel ratios it does not yield the same levels of NO_X reduction; however, significant reductions are still achieved.

With this approach, FGT has demonstrated significant emission reductions. FGT believes it has accomplished these reductions without the compromised reliability and increased complexity of the OEM packages; however, any unit modified, will have to operate at an increased fuel consumption rate and increased frequency of maintenance of the turbocharger.

Inlet air temperature is also another factor in NO_x production from an engine. Temperature, like pressure, affects density. Just as increased air pressure increases density, lower temperature increases density as well. The more dense the air, the more air that can be put into a cylinder head, and therefore the higher the air to fuel ratio of the engine and in turn, the less NO_x that will be produced. Conversely, as the ambient temperatures rises, less air is put in the engine, and more NO_x is produced. Temperatures fluctuate from season to season. However, the modification that increases air manifold pressure increases the air into the cylinder head for any ambient temperature. Thus the air to fuel ratios are higher for any air manifold temperature the engine has experienced in the past.

2.2.3.2 Engine Modifications

In order to reduce emissions, FGT selected an older slow speed engine (emission Unit 1404) at Compressor Station No. 14. The modifications consist of modifying the turbocharger aerodynamics and the control system for the unit. The result is lower emissions but at a cost of added fuel and harder work from the turbocharger.

The turbocharger modifications consist of removing the turbocharger and sending it to a turbocharger overhaul and manufacturing facility where the internals will be modified to produce more air at higher pressures. By increasing the capability of the turbocharger to produce more air and at a higher pressure, higher air to fuel mixtures can be achieved. This means lower NO_X. The facility modifies the internals of the turbocharger with the correct aerodynamic components to produce the required air. FGT re-installs the turbocharger and re-adjusts the controls to make the compressor unit run with the modified turbocharger. The adjustment will consist of setting the air manifold pressure at a higher level than it was previously operated. In doing so, more air will enter into the cylinder for about the same amount of fuel. This will increase the air to fuel ratio. When the air manifold pressure setpoint is put into the controls, the unit is capable of operating at a higher air manifold pressure than it has in the past and the NO_X rate is reduced.

The controls modification consists of determining new engine operating settings for the modified condition, drawing curves to control the compressor unit to the desired settings, and reconfiguring the main control logic to control the compressor unit.

The basic effect of the modification on the units is increased air pressure to the engine, allowing higher air to fuel ratios. The resulting side effect on the turbocharger is that it must turn faster and will cause more backpressure on the engine. In basic terms, the turbocharger will "work harder" and is expected to require overhaul on a more frequent basis. Furthermore, the increased backpressure requires that the engine burn more fuel to function at the same horsepower levels. Based on FGT testing results, the increased fuel consumption for the compressor unit at Compressor Station No. 14 will be about 10%.

Engine parameters are given in Table 2-6 and pre-modification and post-modification emission rates are given in Tables 2-7 and 2-8. Pre-modification emissions are based on stack testing conducted in April 2000. A copy of the test report is located in Attachment E. Post-modification emission rates are based upon stack testing of a similar unit that was modified (see Attachment E for a test report summary).

Table 2-6 Proposed Modified Engine (1404) Specifications and Stack Parameters

Parameter	Design
Compressor Engine	1404
Type	Reciprocating Engine
Manufacturer	Worthington
Model	SEHG-8
Unit Size	2,000 bhp
Specific Heat Input	8,250 Btu/hp-hr
Maximum Fuel Consumption [a]	0.01587 MMscf/hr
Stack Parameters	
Stack Height	28 ft
Stack Diameter	1.44 ft
Exhaust Gas Flow	11,637 acfm
Exhaust Temperature	700 °F
Exhaust Gas Velocity	36.3 ft/sec

NOTE:

acfm	=	actual cubic feet per minute.
bhp	=	brake horsepower.
Btu/hp-hr	=	British thermal units per brake horsepower per hour.
°F	=	degrees Fahrenheit.
ft	=	feet.
ft/sec	=	feet per second.
MMscf/hr	=	million standard cubic feet per hour.

[a] Based on heating value for natural gas of 1040 British thermal units per standard cubic foot (Btu/scf).

Table 2-7 Pre-modification (1404) Compressor Engine Potential Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	16.6 g/hp-hr	Test Data	73.19	320.6
Carbon Monoxide	0.91g/hp-hr	Test Data	4.01	17.6
Volatile Organic Compounds	0.09 g/hp-hr	Test Data	0.40	1.7
Particulate Matter	0.00999 lb/MMBtu	AP-42 Table 3.2-2	0.15	0.7
Sulfur Dioxide*	10 grains/100 scf	FERC Limit	0.41	1.8
HAPs	Various see Attachment D	GRI HapCalc 3.0	0.76	3.32

* Emissions based on vendor provided fuel use value

Table 2-8 Post-modification (1404) Compressor Engine Potential Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	9.2 g/hp-hr	Similar Unit Test Data	40.56	177.7
Carbon Monoxide*	0.8 g/hp-hr	Similar Unit Test Data	3.53	15.5
Volatile Organic Compounds	0.1 g/hp-hr	Similar Unit Test Data	0.44	1.9
Particulate Matter**	0.00999 lb/MMBtu	AP-42 Table 3.2-2	0.16	0.7
Sulfur Dioxide**	10 grains/100 scf	FERC Limit	0.45	2.0
HAPs	Various see Attachment D	GRI HapCalc 3.0	0.76	3.3

* EMISSION RATES REFLECT 80% control efficiency for CO converter
** Emissions based on vendor provided fuel use value plus expected 10 % fuel use increase

2.2.3.3 Catalytic Converter for CO Emission Reduction.

Since the modifications described above will result in an increase in CO emissions, a catalytic converter will be added to the modified engine to reduce CO emissions. The converter will be a HIS Emission Reduction Systems Model DeCOHx-120/150/20WRL Converter/Silencer. Vendor information is provided in Attachment D. The emission rates provided in Table 2.8 reflect reductions from this converter at approximately 47% control efficiency. The vendor is guaranteeing 90% control efficiency. A lower control level has been used in this application due to potential variations in the results of the modifications on different engines.

2.2.4 Fugitive Emissions

Potential new emissions from Compressor Station No. 14 also include fugitive emissions from the new valves and flanges that will be in gas service. These fugitive emissions have been estimated using USEPA factors for components in gas service at oil and gas facilities (EPA publication EPA-453/R-95-017, November 1995, "Protocol for Equipment Leak Emission Estimates"). Table 2-9 lists the quantities of existing and new components to be added as part of the Phase V Expansion Project and an estimate of the fugitive emissions from these sources.

2.2.5 Support Equipment Additions and Changes

In addition to the compressor engines, a new compressor building will be installed at the site. The location of the new building is shown on the facility plot plan contained in Attachment B. The new compressor building, housing the turbine, has approximate dimensions of 40 feet wide by 78.5 feet long by 35.3 feet high.

2.2.6 Emissions Summary

The total changes in emissions resulting from the project are listed on Table 2-10. As can be seen from the table, the emissions increases are not significant under PSD. The calculations used to estimate these emissions are presented in Attachment D.

Table 2-9 VOC Fugitive Emission Calculations and Summary

Component	Service	Component Count	Emissions * Factor (ton/yr)	NM/NE Fraction	Emissions (ton/yr)
Valves	Gas	54	0.0434606	0.05	0.12
Connector	Gas	0	0.0019316	0.05	0.00
Flanges	Gas	90	0.0037666	0.05	0.02
Open-Ended Line	Gas	15	0.0193158	0.05	0.01
Pumps	Gas	1	0.023179	0.05	0.00
Other	Gas	0	0.0849895	0.05	0.00
Valves	Light Oil	7	0.0241448	1.00	0.17
Connector	Light Oil	0	0.0020282	1.00	0.00
Flanges	Light Oil	18	0.0010624	1.00	0.02
Open-Ended Line	Light Oil	2	0.0135211	1.00	0.03
Pumps	Light Oil	0	0.1255527	1.00	0.00
Other	Light Oil	0	0.0724343	1.00	0.00
Valves	Heavy Oil	3	0.0000811	1.00	0.00
Connector	Heavy Oil	0	0.0000724	1.00	0.00
Flanges	Heavy Oil	11	0.0000038	1.00	0.00
Open-Ended Line	Heavy Oil	0	0.0013521	1.00	0.00
Other	Heavy Oil	0	0.0002994	1.00	0.00
				TOTAL:	**0.37**

* "EPA publication EPA-453/R-95-017, November 1995, "Protocol for Equipment Leak Emission Estimates"

Table 2-10 Potential Annual Emissions (tpy) Summary

SOURCE ID	DESCRIPTION	NO_x	CO	VOC[a]	SO_2	PM
	EXISTING FACILITY					
1401	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.7
1402	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.7
1403	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.7
1404	2000 bhp Recip. Engine[b]	320.6	17.6	1.7	1.8	0.7
1405	2000 bhp Recip. Engine	212.5	27.0	1.7	1.8	0.7
1406	2700 bhp Recip. Engine	46.3	48.7	11.6	2.0	0.4
1407	10,350 bhp Turbine Engine	38.6	47.0	1.3	11.7	2.5
GEN03	637 bhp Recip. Engine	0.7	0.6	0.2	0.0	0.0
	OTHER SOURCES: [c]	0.0	0.0	3.5	0.0	0.0
EXISTING ANNUAL POTENTIALTOTALS:		**1256.2**	**221.9**	**45.5**	**22.7**	**6.4**
	PROPOSED MODIFIED FACILITY					
1401	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.6
1402	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.6
1403	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.6
1404	2,000 bhp recip engine – modified[d]	177.7	15.5	1.9	2.0	0.7
1405	2,000 bhp recip engine	212.5	27.0	8.5	1.8	0.6
1406	2700 bhp Recip. Engine	46.3	48.7	11.6	2.0	0.4
1407	13,000 bhp Turbine Engine –upgraded	44.5	54.2	1.6	13.6	3.0
1408	15,700 bhp Turbine engine – new	61.8	38.1	2.4	15.4	3.5
GEN03	637 bhp Recip. Engine	0.7	0.6	0.2	0.0	0.0
	OTHER SOURCES: [c]	0.0	0.0	3.9	0.0	0.0
PROPOSED ANNUAL POTENTIAL TOTALS:		**1181**	**265.1**	**55.6**	**40.2**	**10**
NET CHANGES IN POTENTIAL EMISSIONS:		**-75.2**	**43.2**	**10.1**	**17.5**	**3.6**

(a) VOC = Non-methane/non-ethane HC
(b) Based on stack testing
(c) Other Sources Includes ancillary equipment, storage tanks and equipment leaks
(d) Based on test data for a similar unit

3.0 REGULATORY ANALYSIS

This section presents a review of federal and Florida State air quality regulations, which govern the operations and proposed modifications to be conducted at Compressor Station No. 14.

3.1 Federal Regulations Review

The federal regulatory programs administered by the USEPA have been developed under the authority of the Clean Air Act. The following subsections review the essential elements of the federal regulatory program and the impact they have on the operations and proposed modifications at Compressor Station No. 14.

3.1.1 Classification of Ambient Air Quality

The 1970 Amendments to the CAA gave the USEPA specific authority to establish the minimum level of air quality that all states would be required to achieve. These minimum values or standards were developed in order to protect the public health (primary) and welfare (secondary). The federally promulgated standards and additional state standards are presented on Table 3-1.

Areas of the country that have air quality equal to or better than these standards (i.e., ambient concentrations less than a standard) are designated as "Attainment Areas", while those where monitoring indicates air quality is worse than the standards are known as "Non-attainment Areas." The designation of an area has particular importance for a proposed project as it determines the type of permit review to which the application will be subject.

Major new sources or major modifications to existing major sources located in attainment areas are required to obtain a PSD permit before initiation of construction. Similar sources located in areas designated as non-attainment or that adversely impact such areas undergo more stringent Non-attainment New Source Review (NNSR). In either case, it is necessary, as a first step, to determine the air quality classification of a project site.

All areas of all states are classified as either attainment, non-attainment or unclassifiable for each criteria pollutant. Gadsen County in designated as unclassifiable or attainment for all criteria pollutants. These designations were obtained from 40 CFR 81.310, as updated in the June 5, 1998 Federal Register (FR31036) and 62-204.340 F.A.C.

Table 3-1 National and State Ambient Air Quality Standards ($\mu g/m^3$)

POLLUTANT	AVERAGING PERIOD	EPA STANDARDS		FLORIDA STANDARDS
		PRIMARY	SECONDARY	
PM_{10}	24-hour[1]	150	150	150
	Annual[2]	50	50	50
SO_2	3-hour[1]	---	1,300	1,300
	24-hour[1]	365	---	260
	Annual[2]	80	---	60
CO	1-hour[1]	---	40,000	40,000
	8-hour[1]	10,000	---	10,000
NO_2	Annual[2]	100	100	100
O_3	1-hour[3]	235	235	235

1) Not to be exceeded more than once per year.
2) Never to be exceeded.
3) Not to be exceeded on more than 3 days over 3 years.

Sources: 40 CFR 50; 36FR22384; Chap. 17-2.300.

The designation of Unclassifiable indicates that there is insufficient monitoring data to prove that the area has attained the federal standards; however, the limited data available indicate that the standard has been achieved. Areas with this classification are treated as attainment areas for permitting purposes. Since Gadsen County is considered in attainment for all pollutants, the proposed new emissions are potentially subject to PSD review and not non-attainment review.

3.1.2 PSD Applicability

The 1977 CAA Amendments added Part C: Prevention of Significant Deterioration to the Act. This part required proposed new major stationary sources or existing sources planning a major modification in an area that has attained the National AAQS, to conduct a preconstruction review that includes a detailed analysis of the impacts from the source's emissions.

Federal air quality permitting regulations for attainment areas are codified in the Code of Federal Regulations (CFR), Title 40- Protection of the Environment, Part 52.21 - Prevention of Significant Deterioration (40 CFR 52.21).

For the PSD regulations to apply to a given project, the project's potential to emit must constitute a major stationary source or major modification to an existing major stationary source. A major

stationary source is defined as any of the 28 sources identified in 40 CFR 52.21 that has a potential to emit 100 tons or more per year of any regulated pollutant, or any other stationary source that has the potential to emit 250 tons or more per year of a regulated pollutant. "Potential to emit" is determined on an annual basis after the application of air pollution control equipment, or any other federally enforceable restriction.

According to the "Draft New Source Review Workshop (NSR) Manual (USEPA, October 1990)," for a modification to be classified as major and therefore, subject to PSD review:

(1) The modification must occur at an existing major stationary source, and

(2) The net emissions increase of any pollutant emitted by the source, as a result of modification, is "significant", or

(3) The modification results in emissions increases, which if considered alone would constitute a major stationary source.

"Significant" emission rates are defined as amounts equal to or greater than the emission rates given in Table 3-2.

Table 3-2 Applicability of PSD Significant Emission Rates

Pollutant	Emission Rate Tons/Year
Carbon Monoxide	100
Nitrogen Oxides	40
Sulfur Dioxide	40
Particulate Matter (PM/PM_{10})	25/15
Ozone (VOC)	40
Lead	0.6
Fluorides	3
Reduced Sulfur including Hydrogen Sulfide	10
Total Reduced Sulfur including Hydrogen Sulfide	10
Sulfuric Acid Mist	7
Lead	0.6
Mercury	0.1
VOC = Volatile Organic Compounds Sources:40 CFR 52.21(b)(23); Table 212.400-2 62-212 F.A.C.	

Proposed project increases are determined for each pollutant and are equal to the actual emissions (average of the actual emissions over the two years immediately prior to the proposed project) subtracted from the proposed new allowable emissions. Fugitive emissions are only included in the potential to emit if the source is one of the 28 named source categories in 40 CFR 52.21(b)(1) or belongs to a stationary source category that is subject to an NSPS proposed prior to August 7, 1980 or that is subject to an NESHAPS promulgated prior to August 7, 1980. For this project, proposed new NO_X emissions are significant.

Netting is required for each regulated pollutant for which the proposed project increases (decreases are not considered yet) result in a significant increase in emissions. Netting is performed by identifying both the creditable and contemporaneous increases and the reductions in emissions. The contemporaneous period is defined as the period of time from five years prior to estimated start of construction through estimated start of operation.

a. 7 / 14 / 01 Date of estimated start of construction.

b. 7 / 14 / 96 Five years prior to estimated start of construction date.

c. 10 / 14 / 01 Date of estimated start of operation.

d. 7 / 14 / 96 to 10 / 14 / 01 Contemporaneous period (b. to c.).

The requirements for creditable increases and reductions are listed below.

- The increases/reductions occurred within the contemporaneous period.
- For each unit at the source at which the change occurred, the increases/reductions were calculated as the allowable emissions after the change minus the actual emissions averaged over the two-year period immediately preceding the change.
- The increases/reductions occurred at the applicant's contiguous or adjacent plant site and came from units under the same common ownership or control.
- The reductions have not been relied upon in issuing a previous PSD permit (including use in netting for a PSD permit).
- The reductions have not been relied upon in issuing a non-attainment permit and the

reductions have not been used as an offset1 in a non-attainment permit or reserved in an application for use as an offset.

- The reductions will be federally enforceable by the start of construction of the proposed project and actually accomplished by the start of operation.

- The reductions have the same qualitative significance for public health as the increase from the proposed project.

Actual emission changes are provided in Table 3.3 and a summary of contemporaneous emission increases and decreases for Compressor Station No. 14 are listed in Table 3.4.

Table 3-3 Actual Annual Emissions

Emission Unit	Total Hours of Operation 1/1/99 Through 12/31/00	*A.* Average Annual Hours of Operation	*B.* NOx Emission Rate (lbs/hr)	*A x B /2000* NOx Actual Annual Emission Rate (tpy)
1407 (Ph IV)*	0.0	0.0	0.0	0.0
GEN03*	0.0	0.0	0.0	0.0
1404	13,671	6835.5	73.19	250.2
1407 (Ph V)	0.0	0.0	0.0	0.0
1408	0.0	0.0	0.0	0.0

* Installed February 2001

Table 3-4 Contemporaneous Emission Changes

Project Date	Emission Unit At Which Change Occurred	Project Name Or Activity	A. Allowable Emissions After The Activity (Tons/Year)	B. Actual Emissions Prior To The Activity (Tons/Year)	Difference (A-B) (Tons/Year)	Creditable Decrease Or Increase
NOx						
01/01/01	1407 (Ph IV)	New turbine	38.6	0.0	38.6	38.6
01/01/01	GEN03	New Generator	0.7	0.0	0.7	0.7
12/01/01	1404	Engine modified	177.7	250.2	-72.5	-72.5
12/01/01	1407 (Ph V)*	Uprated turbine	5.9	0.0	5.9	5.9
12/01/01	1408	New turbine	61.8	0.0	61.8	61.8
						34.5

* Phase V portion only

Since Compressor Station No. 14 is not one of the 28 named source categories, but does emit >250 TPY of at least one regulated pollutant, it is considered a major source. However, the net increase in emissions resulting from the proposed actions will not exceed the PSD significant rates; therefore, the compressor station is not subject to PSD pre-construction review as shown in Table 3.6.

Table 3-5 PSD Applicability

Regulated Pollutant:	**NO_X**
Significance level as defined in 40 CFR 52.21(b)(23)	40
Net contemporaneous change from Table3-4 (tpy)	34.5
Is PSD review applicable?	No

3.1.3 Non-Attainment New Source Review (NNSR) Applicability

Based on the current non-attainment provisions, all new major stationary sources, or major modifications to such sources, located in a non-attainment area must undergo non-attainment New Source Review, if they have the potential to emit above an NSR significant threshold. For major new sources or major modifications in an attainment or unclassifiable area, the non-attainment provisions apply if the source or modification is located within the area of influence of a non-attainment area. The area of influence is defined as an area, which is outside the boundary of a non-attainment area, but within the locus of all points that are 50 kilometers outside the non-attainment area.

Compressor Station No. 14 is located in an area that is designated as either attainment or not classifiable for all criteria pollutants and is not located in an area of influence outside a non-attainment area. Therefore, this compressor station is not subject to federal non-attainment New Source Review.

3.1.4 Applicability of New Source Performance Standards (NSPS)

Standards of Performance for New Sources are published in 40 CFR 60. All Standards apply to all new sources within a given category, regardless of geographic location or ambient air quality at the location.

The new turbine to be installed at Compressor Station No. 14 is subject to Subpart GG, Standards of Performance for Stationary Gas Turbines, because it will have a maximum heat input at peak load of >10.7 gigajoules/hour (10 MMBtu/hr) based on the lower heating value of the natural gas fuel. This regulation establishes emission limits for NO_X and SO_2 and requires performance testing and daily monitoring of fuel nitrogen and sulfur.

The NO_x emission limit for Subpart GG is calculated as follows:

$STD = 0.0150\ (14.4/Y) + F$

STD = Allowable NO_x emissions % by volume

Y = Heat rate at peak load not to exceed 14.4 Kj/watt-hour

F = NO_x emission allowance

The fuel bound nitrogen in natural gas is less than 0.015% by weight. Therefore, the value of F as defined in 40 CFR 60.332(3) is equal to zero.

For new Engine No. 1408

Y = Btu/bhp-hr x 1.055 Kj/Btu x hp-hr/745.7 watt-hour

= 7,807 Btu/bhp-hr x 1.055 Kj/Btu x hp-hr/745.7 watt-hour

= 11.0 Kj/watt-hr

STD = 0.0150 (14.4/11.0) + 0

= 0.0196 %

= 196 ppm_v

For uprated Engine No. 1407

Y = Btu/bhp-hr x 1.055 Kj/Btu x hp-hr/745.7 watt-hour

= 7,842 Btu/bhp-hr x 1.055 Kj/Btu x hp-hr/745.7 watt-hour

= 11.1 Kj/watt-hr

STD = 0.0150 (14.4/11.1) + 0

= *0.0195 %*

= 195 ppm_v

Table 3-6 summarizes the NSPS applicability for the proposed gas engines.

The two turbines at this facility will both meet the NSPS for NO_X of 196 ppmv and 195 ppmv (i.e., manufacturer's estimation of 25 ppmv), and for SO_2 of 150 ppmv (estimated for these turbines to be 4 ppmv).

3.1.2.6 Good Engineering Practice (GEP) Stack Height Analysis

The 1977 CAA Amendments require that the emission limitation required for control of any pollutant not be affected by a stack that exceeds GEP height. Further, no dispersion credit is given during air quality modeling for stacks that exceed GEP. GEP stack height is defined as the highest of:

- 65 meters; or
- a height established by applying the formula

  $H_{GEP} = H + 1.5 L$

Table 3-6 Applicability of New Source Performance Standards

NSPS Subpart	NSPS Regulations	Equipment	Fuel	Pollutant	Heat Input Applicability	Equipment Design Maximum*	NSPS Emission Limits	Equipment Emissions
GG	60.332(a)(2)	Engine No. 1407 Gas Turbine	Gas	NO_2	>10 MM Btu/hr	102 MM Btu/hr	195 ppm_v	25 ppm_v
GG	60.333(a)	Engine No. 1407 Gas Turbine	Gas	SO_2	>10 MM Btu/hr	102 MM Btu/hr	150 ppm_v	~4 ppm_v
NSPS Subpart	**NSPS Regulations**	**Equipment**	**Fuel**	**Pollutant**	**Heat Input Applicability**	**Equipment Design Maximum***	**NSPS Emission Limits**	**Equipment Emissions**
GG	60.332(a)(2)	Engine No. 1408 Gas Turbine	Gas	NO_2	>10 MM Btu/hr	122 MM Btu/hr	196 ppm_v	25 ppm_v
GG	60.333(a)	Engine No. 1408 Gas Turbine	Gas	SO_2	>10 MM Btu/hr	122 MM Btu/hr	150 ppm_v	~4 ppm_v

Design maximum based on vendor data.

Where:

H_{GEP} = GEP Stack Height,
H = Height of the structure or nearby structure, and
L = Lesser dimension (height or projected width) of the nearby structure; or

- a height demonstrated by fluid modeling or field study.

A structure or terrain feature is considered nearby if a stack is within a distance of five times the structure's height or maximum projected width. Only the smaller value of the height or projected width is used and the distance to the structure cannot be greater than 0.8 kilometers. Although GEP stack height regulations require that the stack height used in modeling for determining compliance with National AAQS and PSD increments not exceed GEP stack height, the actual stack height may be greater.

The stack height regulations also increase GEP stack height beyond that resulting from the formula in cases where plume impaction occurs. Plume impaction is defined as concentrations measured or modeled to occur when the plume interacts with elevated terrain. Elevated terrain is defined as terrain that exceeds the height calculated by the GEP stack height formula. Because terrain in the vicinity of the project site is generally flat, plume impaction was not considered in determining the GEP stack height.

The proposed stack for the new turbine (Engine No. 1408) at Compressor Station No. 14 will be 61.5 feet (18.74 meters) tall. Based on the proposed building dimensions, the calculated GEP stack height is less than 65 meters; therefore, GEP stack height is 65 meters. Since the stack is less than GEP stack height, it complies with the regulatory requirement.

3.1.5 Applicability of National Emission Standards for Hazardous Air Pollutants (NESHAPS)

Currently the only NESHAPS potentially applicable to this compressor station is 40 CFR 63 Subpart HHH. Compressor Station No. 14 has no affected sources as defined by 40 CFR 63 Subpart HHH and is, therefore, not subject to this subpart.

There are potential future regulations that may affect sources at this facility, but these regulations have not been promulgated at this time.

3.2 Florida State Air Quality Regulations

Compressor Station No. 14 is currently operating under Permit No. 0390029-002-AV and is subject to the provisions of that permit. Rule 62, F.A.C., contains the air quality rules and regulations for the State of Florida. The primary federal regulations that affect Compressor Station No. 14 have been incorporated into or are referenced by these rules. The significant state regulations that are applicable to the new emission units are briefly listed below.

3.2.1 Rule 62-210.300 Permits Required

FGT is required to obtain a construction permit prior to construction of new emission units. This requirement is being met by the submittal of this application.

3.2.2 Rule 62-204.240 Ambient Air Quality Standards

FGT must not violate any of the ambient air quality standards listed under this rule. The proposed new emissions will not violate any air quality standards. Potential NOx emissions and impacts will be decreased.

3.2.3 Rule 62-296.320(2) Objectionable Odors

This rule prohibits the discharge of pollutants that will cause or contribute to an objectionable odor. There will be no odors from the proposed changes.

3.2.4 Rule 62-296.320(4)(b)1 General Particulate Emission Limiting Standards.

FGT is prohibited from allowing the new compressor engine to discharge into the atmosphere the emissions of air pollutants, the density of which is equal to or greater than that designated as Number 1 on the Ringelmann Chart (20 percent opacity). The new and modified engines will not violate this standard.

3.2.5 Rule 62-210.300(3)(a) Exempt Emissions Units and/or Activities.

The emissions from the fugitive leak emissions are insignificant sources and are exempt from the permitting requirements of Chapter 62-210 Stationary Sources - General Requirements, 62-213 Operation Permits For Major Sources Of Air Pollution and 62-4 Permits.

4.0 REFERENCES

Gas Research institute, 1999. GRI-HAPCalc Software Version 3.0, Radian International, LLC.

U.S. Environmental Protection Agency (USEPA). 1980. PSD Workshop Manual. Research Triangle Park, NC.

U.S. Environmental Protection Agency (USEPA). 2000. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources (5th Ed.) AP-42. Supplement E, Research Triangle Park, NC.

Attachment A

DEP Forms

Department of
Environmental Protection

Division of Air Resources Management

APPLICATION FOR AIR PERMIT - TITLE V SOURCE

See Instructions for Form No. 62-210.900(1)

I. APPLICATION INFORMATION

Identification of Facility

1. Facility Owner/Company Name: Florida Gas Transmission Company	
2. Site Name: Compressor Station No. 14	
3. Facility Identification Number: 0390029	[ ] Unknown
4. Facility Location: Street Address or Other Locator: Rt. 3 Box 3390, Highway 65 S City: Quincy County: Gadsen Zip Code: 32351-9803	
5. Relocatable Facility? [ ] Yes [X] No	6. Existing Permitted Facility? [X] Yes [ ] No

Application Contact

1. Name and Title of Application Contact: Jim Thompson, Director of Environmental	
2. Application Contact Mailing Address: Organization/Firm: Florida Gas Transmission Company Street Address: 111 Kelsey Lane, Ste. A City: Tampa State: FL Zip Code: 33619	
3. Application Contact Telephone Numbers: Telephone: (800) 381-1477	Fax: (813) 655-3951

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	3/26/01
2. Permit Number:	0390029-003-AC
3. PSD Number (if applicable):	
4. Siting Number (if applicable):	

Purpose of Application

Air Operation Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[ ] Initial Title V air operation permit for an existing facility which is classified as a Title V source.

[ ] Initial Title V air operation permit for a facility which, upon start up of one or more newly constructed or modified emissions units addressed in this application, would become classified as a Title V source.

Current construction permit number: _____

[ ] Title V air operation permit revision to address one or more newly constructed or modified emissions units addressed in this application.

Current construction permit number: _____

Operation permit number to be revised: _____

[X] Title V air operation permit revision or administrative correction to address one or more proposed new or modified emissions units and to be processed concurrently with the air construction permit application. (Also check Air Construction Permit Application below.)

Operation permit number to be revised/corrected: ____ 0390029-001-AV_____

[ ] Title V air operation permit revision for reasons other than construction or modification of an emissions unit. Give reason for the revision; e.g., to comply with a new applicable requirement or to request approval of an "Early Reductions" proposal.

Operation permit number to be revised: _____

Reason for revision: _____

Air Construction Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[X] Air construction permit to construct or modify one or more emissions units.

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Owner/Authorized Representative or Responsible Official

1. Name and Title of Owner/Authorized Representative or Responsible Official:
   Danny Pribble, Vice President, Operations

2. Owner/Authorized Representative or Responsible Official Mailing Address:
   Organization/Firm: Florida Gas Transmission Company
   Street Address: P.O. Box 1188
   City: Houston State: TX Zip Code: 77251

3. Owner/Authorized Representative or Responsible Official Telephone Numbers:
   Telephone: (713) 345-7162 - Fax: (713) 646-3201

4. Owner/Authorized Representative or Responsible Official Statement:

   I, the undersigned, am the owner or authorized representative(check here [ ], if so) or the responsible official (check here [X], if so) of the Title V source addressed in this application, whichever is applicable. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.*

   Signature Date 3/16/01

* Attach letter of authorization if not currently on file.

Professional Engineer Certification

1. Professional Engineer Name: Kevin McGlynn
   Registration Number: 50908

2. Professional Engineer Mailing Address:
   Organization/Firm: McGlynn Consulting Company
   Street Address: 1967 Commonwealth Lane
   City: Tallahassee State: FL Zip Code: 32303

3. Professional Engineer Telephone Numbers:
   Telephone: (850)380-5035 Fax: (850) 350-5002

4. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

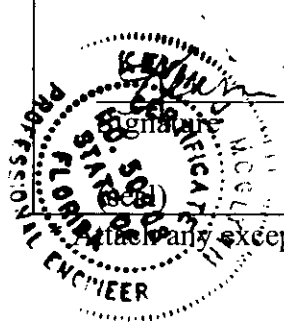
(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain a Title V source air operation permit (check here [ ], if so), I further certify that each emissions unit described in this Application for Air Permit, when properly operated and maintained, will comply with the applicable requirements identified in this application to which the unit is subject, except those emissions units for which a compliance schedule is submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X], if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [X], if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.



Signature

March 9, 2001
Date

(Seal)

*Attach any exception to certification statement.

Scope of Application

Emissions Unit ID	Description of Emissions Unit	Permit Type	Processing Fee
007	Reciprocating I. C. Compressor Engine No. 1404, 2000 bhp, Natural Gas Fired	NA	$0
007	Turbine Compressor Engine No. 1407, 13,026 bhp,Natural Gas Fired	NA	$0
	Turbine Compressor Engine No. 1408, 15,700 bhp,Natural Gas Fired	NA	$0

Application Processing Fee

Check one: [ ] Attached - Amount: $_____ [X] Not Applicable_

Construction/Modification Information

1. Description of Proposed Project or Alterations:

Florida Gas Transmission Company (FGT) is proposing to install a new Pignone PGT-10B 15,700 bhp compressor turbine, to upgrade an existing Solar Mars 90 T-13000S to 13,026 bhp and to modify one existing 2,000 bhp reciprocating engine.

2. Projected or Actual Date of Commencement of Construction: 09/01/01

3. Projected Date of Completion of Construction: 12/01/01

Application Comment

This proposed modification is part of FGT's Phase V Expansion project, aimed at increasing the supply capacity of FGT's network servicing domestic, commercial, and industrial customers in Florida.

The existing facility is currently operating under Permit No. 0390029-001-AV.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 16	East (km): 719.97	North (km): 3377.39	
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 30/30/38		Longitude (DD/MM/SS): 84/42/28	
3. Governmental Facility Code: 0	4. Facility Status Code: A	5. Facility Major Group SIC Code: 49	6. Facility SIC(s): 4922
7. Facility Comment (limit to 500 characters): Compressor Station No. 14 is an existing natural gas pipeline compressor station with six reciprocating compressor engines and one compressor turbine.			

Facility Contact

1. Name and Title of Facility Contact: Wade Collins, Team Environmental Leader		
2. Facility Contact Mailing Address: Organization/Firm: Florida Gas Transmission Company Street Address: Rt. 3, Box 3390, Hwy 65 South City: Quincy	State: FL	Zip Code: 32351-9803
3. Application Contact Telephone Numbers: Telephone: (850) 350-5300	Fax: (850) 350-5301	

Facility Regulatory Classifications

Check all that apply:

1. [ ] Small Business Stationary Source? [ ] Unknown
2. [X] Major Source of Pollutants Other than Hazardous Air Pollutants (HAPs)?
3. [ ] Synthetic Minor Source of Pollutants Other than HAPs?
4. [X] Major Source of Hazardous Air Pollutants (HAPs)?
5. [ ] Synthetic Minor Source of HAPs?
6. [ ] One or More Emissions Units Subject to NSPS?
7. [ ] One or More Emission Units Subject to NESHAP?
8. [ ] Title V Source by EPA Designation?
9. Facility Regulatory Classifications Comment (limit to 200 characters): HAPs major source definition based on calculations performed using the Gas Research Institute's GRI-HAPCalc 3.0 software.

List of Applicable Regulations

FDEP Title V Core List	
62-296-320(4)(b)1 General Visible Emissions Standards	
40 CFR 60, Subpart GG Standards of Performance for Stationary Gas-fired Turbines	

B. FACILITY POLLUTANTS

List of Pollutants Emitted

1. Pollutant Emitted	2. Pollutant Classif.	3. Requested Emissions Cap lb/hour	tons/year	4. Basis for Emissions Cap	5. Pollutant Comment
NO_X	A				
CO	A				
VOC	B				
SO_2	B				
PM	B				
HAPs	A				

C. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Area Map Showing Facility Location:
   [X]Attached, Document ID: *Narrative Fig. 1-1* [ ] Not Applicable [ ] Waiver Requested

2. Facility Plot Plan:
   [X] Attached, Document ID:_*Att. B*__ [ ] Not Applicable [X] Waiver Requested

3. Process Flow Diagram(s):
   [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested

4. Precautions to Prevent Emissions of Unconfined Particulate Matter:
   [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested

5. Fugitive Emissions Identification:
   [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested

6. Supplemental Information for Construction Permit Application:
   [X] Attached, Document ID:__*Att. C*_ [ ] Not Applicable

7. Supplemental Requirements Comment:

Attachment B contains a plot plan.

Attachment C has vendor-supplied information.

Attachment D has supporting calculations.

Attachment E consists of a pre-modification test report for Engine 1404 and a test summary for modified unit 1205.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

8. List of Proposed Insignificant Activities:
   [ ] Attached, Document ID:_____ [X] Not Applicable

9. List of Equipment/Activities Regulated under Title VI:
   [ ] Attached, Document ID:_____
   [ ] Equipment/Activities On site but Not Required to be Individually Listed
   [X] Not Applicable

10. Alternative Methods of Operation:
    [ ] Attached, Document ID:_____ [X] Not Applicable

11. Alternative Modes of Operation (Emissions Trading):
    [ ] Attached, Document ID:_____ [X] Not Applicable

12. Identification of Additional Applicable Requirements:
    [ ] Attached, Document ID:_____ [X] Not Applicable

13. Risk Management Plan Verification:
    [ ] Plan previously submitted to Chemical Emergency Preparedness and Prevention Office (CEPPO). Verification of submittal attached (Document ID:_____) or previously submitted to DEP (Date and DEP Office:_____)
    [ ] Plan to be submitted to CEPPO (Date required:_____)
    [X] Not Applicable

14. Compliance Report and Plan:
    [ ] Attached, Document ID:_____ [X] Not Applicable

15. Compliance Certification (Hard-copy Required):
    [ ] Attached, Document ID: _____ [X] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[X] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[ ] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

15,700 bhp natural gas fired turbine compressor unit, Engine No. 1408

4. Emissions Unit Identification Number: [X] No ID
ID: [ ] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
A	10/14/01	49	[ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

The proposed new turbine engine will be a Pignone PGT10B engine compressor unit ISO rated at 15,700 bhp. Fuel will be exclusively natural gas from FGT's gas pipeline. The proposed engine will incorporate dry, low NO_X combustion technology.

Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

The proposed engine will incorporate dry, low NOX combustion technology.

2. Control Device or Method Code(s): NA

Emissions Unit Details

1. Package Unit:
   Manufacturer: Pignone Model Number: PGT10B
2. Generator Nameplate Rating: MW
3. Incinerator Information:
   Dwell Temperature: °F
   Dwell Time: seconds
   Incinerator Afterburner Temperature: °F

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:	134.77	mmBtu/hr	
2. Maximum Incineration Rate: NA	lb/hr	tons/day	
3. Maximum Process or Throughput Rate: NA			
4. Maximum Production Rate: NA			
5. Requested Maximum Operating Schedule:			
	24 hours/day	7 days/week	
	52 weeks/year	8760 hours/year	
6. Operating Capacity/Schedule Comment (limit to 200 characters):			

Heat input is 134.77 MM Btu/hr based on vendor specifications of 122.52 MM Btu/hr plus 10%.

C. EMISSIONS UNIT REGULATIONS
(Regulated Emissions Units Only)

List of Applicable Regulations

FDEP Title V Core List	
62-296.320(4)(b)1 General Visible Emissions Standards	
40 CFR 60, Subpart GG Standards of Performance for Stationary Gas-fired	

D. EMISSI2ON POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? 1408	2. Emission Point Type Code: 1	
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point): NA		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: None		
5. Discharge Type Code: V	6. Stack Height: 61.5 feet	7. Exit Diameter: 7.6 feet
8. Exit Temperature: 909 °F	9. Actual Volumetric Flow Rate: 215,230 acfm	10. Water Vapor:
11. Maximum Dry Standard Flow Rate: dscfm	12. Nonstack Emission Point Height: feet	
13. Emission Point UTM Coordinates: Zone: 16 East (km): 719.97 North (km): 3377.39		
14. Emission Point Comment (limit to 200 characters):		

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment __1__ of __1__

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
Natural gas fired reciprocating internal combustion engine driving a natural gas compressor, operating full time.		
2. Source Classification Code (SCC): 2-02-002-01	3. SCC Units: million cubic feet burned	
4. Maximum Hourly Rate: 0.1296	5. Maximum Annual Rate: 1135.3	6. Estimated Annual Activity Factor: NA
7. Maximum % Sulfur: 0.03	8. Maximum % Ash: 0.0	9. Million Btu per SCC Unit: 1040
10. Segment Comment (limit to 200 characters): fuel use based on vendor heat rate value of 7804 Btu/bhp-hr plus 10%. Percent Sulfur is based on maximum Federal Energy Regulatory Commission (FERC) limit of 10 gr S/100scf and gas density of 0.0455 lb/scf.		

Segment Description and Rate: Segment _NA__ of _____

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):	CC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
VOC			EL
SO_2			EL
PM			EL
NO_X			EL
CO			EL
PM_{10}			EL
HAPs			NS

Emissions Unit Information Section ___1___ of ___4___

Pollutant Detail Information Page ___1__ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: NOX	2. Total Percent Efficiency of Control:
3. Potential Emissions: 14.1 lb/hour 61.76 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 14.1 lb/hr Reference: Vendor's data	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (14.1 lb/hr)(1 ton/2000 lb)(8760hr/1 yr) = 61.76 tons/year	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Vendor's data based on ISO conditions and site elevation.	

Allowable Emissions Allowable Emissions ___1_ of __1__

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units: 25 ppmv	4. Equivalent Allowable Emissions: 14.1 lb/hour 61.76 tons/year
5. Method of Compliance (limit to 60 characters): Initial performance test.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): 40 CFR 60.332(3) limits NOX emissions to 196 ppmv.	

Emissions Unit Information Section ___1___ of ___4___

Pollutant Detail Information Page ___2__ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control:
3. Potential Emissions: 22.50 lb/hour 98.55 tons/year	4. Synthetically Limited? [Y]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 12.70 lb/hr @ 75% load; 6.9 lb/hr @ 100% load Reference: Vendor's data	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (22.5 lb/hr)(1 ton/2000 lb)(8760 hr/yr) = 98.55 tons/yr 100% load for 6570 hr/yr, 60% load for 1314 hr/yr and 50% load for 876 hr/yr. (5.14 lb/hr)(1 ton/2000 lb)(6570 hr/yr) = 16.88 tons/yr (17.34 lb/hr)(1 ton/2000 lb)(1314 hr/yr) = 11.39 tons/yr (22.5 lb/hr)(1 ton/2000 lb)(876 hr/yr) = 9.86 tons/yr 16.88 tpy + 11.39 tpy + 9.86 tpy = 38.1 tpy = 8.71 lb/hr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Vendor's data based on ISO conditions at various loads.	

Allowable Emissions Allowable Emissions ___1__ of __3___

1. Basis for Allowable Emissions Code: ESCPSD	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: 5.14 lb/hour 16.9 tons/year
5. Method of Compliance (limit to 60 characters): Compliance test and Recordkeeping of hours of operation and load.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): Hours at 100% load = to 6750 hr/yr or more (5.14 lb/hr)(1 ton/2000 lb)(6570 hr/yr) = 16.88 tons/yr	

Emissions Unit Information Section ___1___ of ___4___

Pollutant Detail Information Page ___2__ of ___6___

Allowable Emissions Allowable Emissions ___2_ of __3___

1. Basis for Allowable Emissions Code: ESCPSD	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: 17.34 lb/hour 11.4 tons/year
5. Method of Compliance (limit to 60 characters): Compliance test and Recordkeeping of hours of operation and load.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): Hours at 60% load = to 1314 hr/yr or less (17.34 lb/hr)(1 ton/2000 lb)(1314 hr/yr) = 11.39 tons/yr	

Allowable Emissions Allowable Emissions ___3_ of __3___

1. Basis for Allowable Emissions Code: ESCPSD	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: 22.5 lb/hour 9.9 tons/year
5. Method of Compliance (limit to 60 characters): Compliance test and Recordkeeping of hours of operation and load.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): Hours at 100% load = to 876 hr/yr or less (22.5 lb/hr)(1 ton/2000 lb)(876 hr/yr) = 9.86 tons/yr	

Emissions Unit Information Section ___1___ of ___4___

Pollutant Detail Information Page ___3_ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: VOC	2. Total Percent Efficiency of Control:
3. Potential Emissions: 1.46 lb/hour 6.39 tons/year	4. Synthetically Limited? [Y]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 14.6 lb/hr THC Reference: Vendor's data	7. Emissions Method Code: 5

8. Calculation of Emissions (limit to 600 characters):
(1.46 lb/hr)(1 ton/2000 lb)(8760 hr/yr) = 6.39 tons/yr

100% load for 6570 hr/yr, 60% load for 1314 hr/yr and 50% load for 876 hr/yr.
(0.29 lb/hr)(1 ton/2000 lb)(6570 hr/yr) = 0.95 tons/yr
(1.15 lb/hr)(1 ton/2000 lb)(1314 hr/yr) = 0.76 tons/yr
(1.46 lb/hr)(1 ton/2000 lb)(876 hr/yr) = 0.64 tons/yr
0.95 tpy + 0.76 tpy + 0.64 tpy = 2.35 tpy = 0.54 lb/hr

9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):

Vendor's data based on ISO conditions at various loads for total hydrocarbons (THC). VOCs assumed to be 10% of THC

Allowable Emissions Allowable Emissions __1__ of __3__

1. Basis for Allowable Emissions Code: ESCPSD	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: 0.29 lb/hour 0.95 tons/year

5. Method of Compliance (limit to 60 characters):
Compliance test and Recordkeeping of hours of operation and load.

6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):

Hours at 100% load = to 6750 hr/yr or more
(0.29 lb/hr)(1 ton/2000 lb)(6570 hr/yr) = 0.89 tons/yr

Allowable Emissions Allowable Emissions __2__ of __3__

1. Basis for Allowable Emissions Code: ESCPSD	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: 1.15 lb/hour 0.76 tons/year
5. Method of Compliance (limit to 60 characters): Compliance test and Recordkeeping of hours of operation and load.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): Hours at 100% load = to 1314 hr/yr or more (1.15 lb/hr)(1 ton/2000 lb)(1314 hr/yr) = 0.76 tons/yr	

Allowable Emissions Allowable Emissions __3__ of __3__

1. Basis for Allowable Emissions Code: ESCPSD	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: 1.46 lb/hour 0.64 tons/year
5. Method of Compliance (limit to 60 characters): Compliance test and Recordkeeping of hours of operation and load.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): Hours at 100% load = to 876 hr/yr or more (1.46 lb/hr)(1 ton/2000 lb)(876 hr/yr) = 0.64 tons/yr	

Emissions Unit Information Section ___1___ of ___4___

Pollutant Detail Information Page ___4_ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: SO2	2. Total Percent Efficiency of Control:
3. Potential Emissions: 3.70 lb/hour 16.22 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 10 gr/100scf Reference: Vendor's fuel use and FERC limitation	7. Emissions Method Code: 3
8. Calculation of Emissions (limit to 600 characters): (10 gr S/100 scf)(0.1296 MMscf/hr)(1 lb/7000 gr) = 1.85 lb S/hr (1.85 lb S/hr)(2 lb SO2/lb S) = 3.70 lb SO2/hr (3.70 lb SO2/hr)(8760 hr/yr)(1 ton/2000 lb) = 16.22 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): SO2 emission factor is based on maximum Federal Energy Regulatory Commission (FERC) limit of 10 gr S/100 scf and gas density of 0.0455 lb/scf.	

Allowable Emissions Allowable Emissions ___1_ of __1__

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 4 ppmv	4. Equivalent Allowable Emissions: 3.70 lb/hour 16.2 tons/year
5. Method of Compliance (limit to 60 characters): Initial performance test and fuel monitoring.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): 40 CFR 60.332(3) limits SO2 emissions to 150 ppmv.	

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.89 lb/hour 3.88 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.0066 lb/MM Btu Reference: Table 3.1-2a, AP-42 4/00, Supplement E	7. Emissions Method Code: 4
8. Calculation of Emissions (limit to 600 characters): (0.0066 lb/MM Btu)(134.27 MM Btu/hr) = 0.89 lb/hr (0.89 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 3.88 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: HAPs	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.751 lb/hour 3.29 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.0217 g/hp-hr Reference: GRI-HAPCalc 3.0	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (0.0217g/hp-hr)(15,700 hp-hr)(1 lb/453.6 g) = 0.751 lb/hr (0.751/lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 3.29 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Detailed calculations provided in Attachment D. HAP emissions are also included in VOC emissions.	

Allowable Emissions Allowable Emissions ___NA__ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

H. VISIBLE EMISSIONS INFORMATION
(Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation _____ of _____

1. Visible Emissions Subtype: VE20	2. Basis for Allowable Opacity: [X] Rule [ ] Other
3. Requested Allowable Opacity: Normal Conditions: 20 % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment (limit to 200 characters):	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __NA_ of _____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	[ ] Rule [ ] Other
4. Monitor Information: Manufacturer: Model Number: Serial Number:	
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment (limit to 200 characters):	

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
3. Detailed Description of Control Equipment [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
7. Operation and Maintenance Plan [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [X] Attached, Document ID:_*Narrative*__ [ ] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: Supplemental information is provided in the narrative description and Attachment C accompanying these forms.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation
[ ] Attached, Document ID:_____ [X] Not Applicable

12. Alternative Modes of Operation (Emissions Trading)
[ ] Attached, Document ID:_____ [X] Not Applicable

13. Identification of Additional Applicable Requirements
[ ] Attached, Document ID:_____ [X] Not Applicable

14. Compliance Assurance Monitoring Plan
[ ] Attached, Document ID:_____ [X] Not Applicable

15. Acid Rain Part Application (Hard-copy Required) NA

[ ] Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
Attached, Document ID:_____

[ ] Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
Attached, Document ID:_____

[ ] New Unit Exemption (Form No. 62-210.900(1)(a)2.)
Attached, Document ID:_____

[ ] Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)
Attached, Document ID:_____

[ ] Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)
Attached, Document ID:_____

[ ] Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)
Attached, Document ID:_____

[ ] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[X] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[ ] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

13,026 bhp natural gas fired turbine compressor unit, Engine No. 1407

4. Emissions Unit Identification Number: [X] No ID
ID: [ ] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
A	2/15/01	49	[ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

The existing Solar Mars 90 turbine engine will be uprated from 10,350 bhp to 13, 026 bhp. Fuel will be exclusively natural gas from the FGT's gas pipeline. The proposed engine will incorporate dry, low NO_X combustion technology.

Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

The proposed engine will incorporate dry, low NOX combustion technology.

2. Control Device or Method Code(s): NA

Emissions Unit Details

1. Package Unit:		
Manufacturer:	Solar	Model Number: Mars 90 T-13000S
2. Generator Nameplate Rating:		MW
3. Incinerator Information:		
	Dwell Temperature:	°F
	Dwell Time:	seconds
	Incinerator Afterburner Temperature:	°F

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:	112.81		mmBtu/hr
2. Maximum Incineration Rate: NA	lb/hr		tons/day
3. Maximum Process or Throughput Rate: NA			
4. Maximum Production Rate: NA			
5. Requested Maximum Operating Schedule:			
	24 hours/day		7 days/week
	52 weeks/year		8760 hours/year
6. Operating Capacity/Schedule Comment (limit to 200 characters):			
Heat input is 112.81 MM Btu/hr based on vendor specifications of 7,842 Btu/hp-hr plus 10% and 13,026 bhp.			

C. EMISSIONS UNIT REGULATIONS
(Regulated Emissions Units Only)

List of Applicable Regulations

FDEP Title V Core List	
62-296.320(4)(b)1 General Visible Emissions Standards	
40 CFR 60, Subpart GG Standards of Performance for Stationary Gas-fired	

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? 1408	2. Emission Point Type Code: 1	
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point): NA		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: None		
5. Discharge Type Code: V	6. Stack Height: 58 feet	7. Exit Diameter: 7.5 x 8 feet
8. Exit Temperature: 867 °F	9. Actual Volumetric Flow Rate: 179,531 acfm	10. Water Vapor:
11. Maximum Dry Standard Flow Rate: dscfm	12. Nonstack Emission Point Height: feet	
13. Emission Point UTM Coordinates: Zone: 16 East (km): 719.97 North (km): 3377.39		
14. Emission Point Comment (limit to 200 characters):		

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment __1__ of __1__

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
Natural gas fired reciprocating internal combustion engine driving a natural gas compressor, operating full time.		
2. Source Classification Code (SCC): 2-02-002-01	3. SCC Units: million cubic feet burned	
4. Maximum Hourly Rate: 0.10847	5. Maximum Annual Rate: 950.21	6. Estimated Annual Activity Factor: NA
7. Maximum % Sulfur: 0.03	8. Maximum % Ash: 0.0	9. Million Btu per SCC Unit: 1040
10. Segment Comment (limit to 200 characters): fuel use based on vendor heat rate value plus 10%. Percent Sulfur is based on maximum Federal Energy Regulatory Commission (FERC) limit of 10 gr S/100scf and gas density of 0.0455 lb/scf.		

Segment Description and Rate: Segment _NA__ of _____

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):	CC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
VOC			EL
SO_2			EL
PM			EL
NO_X			EL
CO			EL
PM_{10}			EL
HAPs			NS

Emissions Unit Information Section ___2___ **of** ___4___

Pollutant Detail Information Page ___1__ **of** ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: NOX	2. Total Percent Efficiency of Control:
3. Potential Emissions: 10.17 lb/hour 44.54 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 10.17 lb/hr Reference: Vendor's data	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (10.17 lb/hr)(1 ton/2000 lb)(8760hr/1 yr) = 44.54 tons/year	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Vendor's data based on ISO conditions with site elevation.	

Allowable Emissions Allowable Emissions ___1_ of __1__

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units: 25 ppmv	4. Equivalent Allowable Emissions: 10.2 lb/hour 44.5 tons/year
5. Method of Compliance (limit to 60 characters): Initial performance test.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): 40 CFR 60.332(3) limits NOX emissions to 195 ppmv.	

Emissions Unit Information Section ___2___ of ___4___

Pollutant Detail Information Page ___2__ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control:
3. Potential Emissions: 12.38 lb/hour 54.22 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 12.38 lb/hr Reference: Vendor's data	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (12.38 lb/hr)(1 ton/2000 lb)(8760 hr/1 yr) = 54.22 tons/year	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Vendor emission factor is based on a guaranteed value of 50 ppmv. FGT testing of similar units has never given values higher than 35 ppmv and they have usually been below 20 ppmv. 40 ppmv is more representative of expected values.	

Allowable Emissions Allowable Emissions __NA__ of ____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: VOC	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.355 lb/hour 1.55 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 3.546 lb/hr UHC Reference: Vendor's data	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Vendor factor for unburned hydrocarbons (UHC) = 3.546 lb/hr. Assume 10% is VOC. (0.355 lb/hr)(1 ton/2000 lb)(8760 hr/1 yr) = 1.55 tons/year	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters):	

Allowable Emissions Allowable Emissions __NA__ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

Emissions Unit Information Section ___2___ of ___4___

Pollutant Detail Information Page ___4_ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: SO2	2. Total Percent Efficiency of Control:
3. Potential Emissions: 3.10 lb/hour 13.57 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 10 gr/100scf Reference: Vendor's fuel use and FERC limitation	7. Emissions Method Code: 3
8. Calculation of Emissions (limit to 600 characters): (10 gr S/100 scf)(0.10804 MMscf/hr)(1 lb/7000 gr) = 1.54 lb S/hr (1.54 lb S/hr)(2 lb SO2/lb S) = 3.10 lb SO2/hr (3.10 lb SO2/hr)(8760 hr/yr)(1 ton/2000 lb) = 13.57 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Based on vendor's heat rate data plus 10%. SO2 emission factor is based on maximum Federal Energy Regulatory Commission (FERC) limit of 10 gr S/100 scf and gas density of 0.0455 lb/scf.	

Allowable Emissions Allowable Emissions ___1_ of __1__

1. Basis for Allowable Emissions Code: RULE	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units: 4 ppmv	4. Equivalent Allowable Emissions: 3.09 lb/hour 13.5 tons/year
5. Method of Compliance (limit to 60 characters): Initial performance test and fuel monitoring.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): 40 CFR 60.332(3) limits SO2 emissions to 150 ppmv.	

Emissions Unit Information Section ___2___ of ___4___

Pollutant Detail Information Page ___5__ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM/PM10	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.74 lb/hour 3.25 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.0066 lb/MM Btu Reference: Table 3.1-2a, AP-42 4/00 Supplement E	7. Emissions Method Code: 4
8. Calculation of Emissions (limit to 600 characters): (0.0066 lb/MM Btu)(112.36 MM Btu/hr) = 0.74 lb/hr (0.74 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 3.25 ton/y	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Based on vendor's heat rate data plus 10%.	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: HAPs	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.623 lb/hour 2.73 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.0217 g/hp-hr Reference: GRI-HAPCalc 3.0	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (0.0217 g/hp-hr)(13,026 hp-hr)(1 lb/453.6 g) = 0.623 lb/hr (0.623 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 2.73 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Detailed calculations provided in Attachment D. HAP emissions are included in VOC emissions.	

Allowable Emissions Allowable Emissions ___NA__ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

H. VISIBLE EMISSIONS INFORMATION
(Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation _____ of _____

1. Visible Emissions Subtype: VE20	2. Basis for Allowable Opacity: [X] Rule [ ] Other
3. Requested Allowable Opacity: Normal Conditions: 20 % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment (limit to 200 characters):	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __NA_ of _____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	[ ] Rule [ ] Other
4. Monitor Information: Manufacturer: Model Number: Serial Number:	
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment (limit to 200 characters):	

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
3. Detailed Description of Control Equipment [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
7. Operation and Maintenance Plan [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [X] Attached, Document ID:_Narrative__ [ ] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: Supplemental information is provided in the narrative description and Attachment C accompanying these forms. Emissions testing has not been performed on this unit.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation
[ ] Attached, Document ID:_____ [X] Not Applicable

12. Alternative Modes of Operation (Emissions Trading)
[ ] Attached, Document ID:_____ [X] Not Applicable

13. Identification of Additional Applicable Requirements
[ ] Attached, Document ID:_____ [X] Not Applicable

14. Compliance Assurance Monitoring Plan
[ ] Attached, Document ID:_____ [X] Not Applicable

15. Acid Rain Part Application (Hard-copy Required) NA

[ ] Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
Attached, Document ID:_____

[ ] Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
Attached, Document ID:_____

[ ] New Unit Exemption (Form No. 62-210.900(1)(a)2.)
Attached, Document ID:_____

[ ] Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)
Attached, Document ID:_____

[ ] Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)
Attached, Document ID:_____

[ ] Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)
Attached, Document ID:_____

[ ] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[X] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[ ] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

Reciprocating I.C. Engine 1404, 2000 bhp, natural gas fired

4. Emissions Unit Identification Number: ID: 007 [ ] No ID [ ] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
A	1966	49	[ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

This is an existing 2000 bhp reciprocating compressor engine that is being modified. See Narrative Section 2.2.3 for description of modifications. The modification will result in a decrease in NO_x emissions and an increase in fuel use.

Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

See Narrative Section 2.2.3.

2. Control Device or Method Code(s):

Emissions Unit Details

1. Package Unit:
   Manufacturer: Worthington Model Number: SEHG-8
2. Generator Nameplate Rating: MW
3. Incinerator Information:
   Dwell Temperature: °F
   Dwell Time: seconds
   Incinerator Afterburner Temperature: °F

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:	16.5	mmBtu/hr	
2. Maximum Incineration Rate: NA	lb/hr	tons/day	
3. Maximum Process or Throughput Rate: NA			
4. Maximum Production Rate: NA			
5. Requested Maximum Operating Schedule:			
	24 hours/day	7 days/week	
	52 weeks/year	8760 hours/year	
6. Operating Capacity/Schedule Comment (limit to 200 characters):			
Manufacturer rated at 2000 bhp. Heat output based on expected 10% increase after modification.			

C. EMISSIONS UNIT REGULATIONS2
(Regulated Emissions Units Only)

List of Applicable Regulations

FDEP Title V Core List	
62-296.320(4)(b)1 General Visible Emissions Standards	

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? 1404	2. Emission Point Type Code: 1	
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point): NA		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: None		
5. Discharge Type Code: V	6. Stack Height: 28 feet	7. Exit Diameter: 1.44 feet
8. Exit Temperature: 700 °F	9. Actual Volumetric Flow Rate: 11,637 acfm	10. Water Vapor: %
11. Maximum Dry Standard Flow Rate: dscfm	12. Nonstack Emission Point Height: feet	
13. Emission Point UTM Coordinates: Zone: 16 East (km): 719.97 North (km): 3377.39		
14. Emission Point Comment (limit to 200 characters):		

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment __1__ of __1__

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
Natural gas fired reciprocating internal combustion engine driving a natural gas compressor, operating full time.		
2. Source Classification Code (SCC): 2-02-002-54	3. SCC Units: million cubic feet burned	
4. Maximum Hourly Rate: 0.0159	5. Maximum Annual Rate: 139.02	6. Estimated Annual Activity Factor: NA
7. Maximum % Sulfur: 0.03	8. Maximum % Ash: 0.0	9. Million Btu per SCC Unit: 1040
10. Segment Comment (limit to 200 characters): Percent Sulfur is based on maximum Federal Energy Regulatory Commission (FERC) limit of 10 gr S/100scf and gas density of 0.0455 lb/scf.		

Segment Description and Rate: Segment _NA__ of _____

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):	CC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
VOC			EL
SO_2			EL
PM/PM_{10}			EL
NO_X			EL
CO	99		EL
HAPs			NS

Emissions Unit Information Section ___3___ of ___4___

Pollutant Detail Information Page ___1___ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: NOX	2. Total Percent Efficiency of Control:
3. Potential Emissions: 40.56 lb/hour 177.7 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 9.2 g/hp-hr Reference: Test data for similar unit	7. Emissions Method Code: 1
8. Calculation of Emissions (limit to 600 characters): (9.2 g/hp-hr)(2000 bhp)(1lb/453.6 g) = 40.56 lb/hr (40.56 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 177.7 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Expected emission rate based upon test data for modified engine of the same model.	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

Emissions Unit Information Section ___3___ of ___4___

Pollutant Detail Information Page ___2___ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: CO	2. Total Percent Efficiency of Control:
3. Potential Emissions: 3.53 lb/hour 15.5 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.8 g/hp-hr Reference: Test data for similar unit	7. Emissions Method Code: 1
8. Calculation of Emissions (limit to 600 characters): (0.8 g/hp-hr)(2000 bhp)(1lb/453.6 g) = 3.53 lb/hr (3.53 lb/hr)(1 ton/2000 lb)(8760 hr/1 yr) = 15.5 tons/year	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Expected emission rate based upon test data for modified engine of the same model. Catalytic converter used for control.	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

Emissions Unit Information Section ___3___ of ___4___

Pollutant Detail Information Page ___3___ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: VOC	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.44 lb/hour 1.93 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.1 g/hp-hr Reference: Test data for similar unit	7. Emissions Method Code: 1
8. Calculation of Emissions (limit to 600 characters): (0.1 g/hp-hr)(2000 bhp)(1lb/453.6 g) = 0.44 lb/hr (0.44 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 1.93 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Expected emission rate based upon test data for modified engine of the same model.	

Allowable Emissions Allowable Emissions __NA__ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

Emissions Unit Information Section ___3___ of ___4___

Pollutant Detail Information Page ___4___ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units - Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: SO2	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.45 lb/hour 2.0 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 10 grains/100 scf Reference: FERC maximum allowable	7. Emissions Method Code: 2
8. Calculation of Emissions (limit to 600 characters): (10.0 gr S/100 scf)(0.0159 MM scf/hr)(1 lb/7000 gr) = 0.23 lb S/hr (0.23 lb S/hr)(2 lb/lb S) = 0.45 lb SO2/hr (0.45 lb SO2/hr)(8760 hr/yr)(1 ton/2000 lb) = 1.98 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Projected fuel use based on test data. SO2 emission factor is based on maximum Federal Energy Regulatory Commission (FERC) limit of 10 gr S/100 scf and gas density of 0.0455 lb/scf.	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

Emissions Unit Information Section ___3___ of ___4___

Pollutant Detail Information Page ___5___ of ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: PM	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.16 lb/hour 0.72 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.00999 lb/MM Btu Reference: AP-42 Section 3.2 Table 3.2-2, 4/00 Supplement E	7. Emissions Method Code: 4
8. Calculation of Emissions (limit to 600 characters): (0.00999 lb/MM Btu)(16.5 MM Btu/hr) = 0.16 lb/hr (0.16 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 0.72 ton/y	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Projected fuel use based on test data.	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

Emissions Unit Information Section ___3___ **of** ___4___

Pollutant Detail Information Page ___6___ **of** ___6___

G. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: HAPs	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.76 lb/hour 3.3 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: 0.172 g/hp-hr Reference: GRI-HAPCalc 3.0	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): (0.172 g/hp-hr)(2,000 hp-hr)(1 lb/453.6 g) = 0.758 lb/hr (0.758 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 3.32 ton/yr	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Detailed calculations provided in Attachment D. HAP emissions are included in VOC emissions.	

Allowable Emissions Allowable Emissions ___NA___ of _____

1. Basis for Allowable Emissions Code:	2. Future Effective Date of Allowable Emissions:
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

H. VISIBLE EMISSIONS INFORMATION
(Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation _____ of _____

1. Visible Emissions Subtype: VE20	2. Basis for Allowable Opacity: [X] Rule [ ] Other
3. Requested Allowable Opacity: Normal Conditions: 20 % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment (limit to 200 characters): Subject to 62-296-320(4)(b)1 General Visible Emissions Standards.	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor __NA_ of _____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement:	[ ] Rule [ ] Other
4. Monitor Information: Manufacturer: Model Number: Serial Number:	
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment (limit to 200 characters):	

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
3. Detailed Description of Control Equipment [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
7. Operation and Maintenance Plan [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [X] Attached, Document ID:_Narrative [ ] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: Process flow diagrams and fuel analyses have been previously submitted. Supplemental information is provided in the narrative description accompanying these forms. Attachment D contains an emissions test report for the pre-modification unit.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation
[ ] Attached, Document ID:_____ [X] Not Applicable

12. Alternative Modes of Operation (Emissions Trading)
[ ] Attached, Document ID:_____ [X] Not Applicable

13. Identification of Additional Applicable Requirements
[ ] Attached, Document ID:_____ [X] Not Applicable

14. Compliance Assurance Monitoring Plan
[ ] Attached, Document ID:_____ [X] Not Applicable

15. Acid Rain Part Application (Hard-copy Required) NA

[ ] Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
Attached, Document ID:_____

[ ] Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
Attached, Document ID:_____

[ ] New Unit Exemption (Form No. 62-210.900(1)(a)2.)
Attached, Document ID:_____

[ ] Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)
Attached, Document ID:_____

[ ] Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)
Attached, Document ID:_____

[ ] Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)
Attached, Document ID:_____

[ ] Not Applicable

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through J as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION
(All Emissions Units)

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[X] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Regulated or Unregulated Emissions Unit? (Check one)

[ ] The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.

[X] The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.

3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

Fugitive emissions from component leaks.

4. Emissions Unit Identification Number:
[X] ID: [ ] ID Unknown

5. Emissions Unit Status Code:	6. Initial Startup Date:	7. Emissions Unit Major Group SIC Code:	8. Acid Rain Unit?
C	12/01/00	49	[ ]

9. Emissions Unit Comment: (Limit to 500 Characters)

These are new fugitive leak emissions from new components (valves, flanges, etc.)

8Emissions Unit Control Equipment

1. Control Equipment/Method Description (Limit to 200 characters per device or method):

   NA

2. Control Device or Method Code(s): NA

Emissions Unit Details

1. Package Unit:
   Manufacturer: Model Number:
2. Generator Nameplate Rating: MW
3. Incinerator Information:
   Dwell Temperature: °F
   Dwell Time: seconds
   Incinerator Afterburner Temperature: °F

B. EMISSIONS UNIT CAPACITY INFORMATION
(Regulated Emissions Units Only)

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate:	mmBtu/hr			
2. Maximum Incineration Rate:	lb/hr	tons/day		
3. Maximum Process or Throughput Rate:				
4. Maximum Production Rate:				
5. Requested Maximum Operating Schedule:				
	24	hours/day	7	days/week
	52	weeks/year	8760	hours/year
6. Operating Capacity/Schedule Comment (limit to 200 characters):				

C. EMISSIONS UNIT REGULATIONS
(Regulated Emissions Units Only)

List of Applicable Regulations

None	

D. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? FUGITIVE	2. Emission Point Type Code: 4	
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point): NA		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: NA		
5. Discharge Type Code: F	6. Stack Height: NA feet	7. Exit Diameter: NA feet
8. Exit Temperature: 77 °F	9. Actual Volumetric Flow Rate: NA acfm	10. Water Vapor: NA %
11. Maximum Dry Standard Flow Rate: NA dscfm	12. Nonstack Emission Point Height: 0 feet	
13. Emission Point UTM Coordinates: Zone: 16 East (km): 719.97 North (km): 3377.39		
14. Emission Point Comment (limit to 200 characters):		

E. SEGMENT (PROCESS/FUEL) INFORMATION
(All Emissions Units)

Segment Description and Rate: Segment __1__ of __1__

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
Fugitive emissions from component leaks.		
2. Source Classification Code (SCC): 3-10-888-11	3. SCC Units: MM cubic feet produced	
4. Maximum Hourly Rate: 0	5. Maximum Annual Rate: 0	6. Estimated Annual Activity Factor: component count
7. Maximum % Sulfur: NA	8. Maximum % Ash: NA	9. Million Btu per SCC Unit: NA
10. Segment Comment (limit to 200 characters): Based on count of new components and USEPA emission factors provided in EPA publication EPA-453/R-95-017, November 1995, "Protocol for Equipment Leak Emission Estimates"		

Segment Description and Rate: Segment _NA__ of __NA_

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

F. EMISSIONS UNIT POLLUTANTS
(All Emissions Units)

1. Pollutant Emitted	2. Primary Control Device Code	3. Secondary Control Device Code	4. Pollutant Regulatory Code
VOC			NS

Emissions Unit Information Section ___4__ of ___4__

Pollutant Detail Information Page ___1__ of ___1__

G. EMISSIONS UNI2 POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units -
Emissions-Limited and Preconstruction Review Pollutants Only)

Potential/Fugitive Emissions

1. Pollutant Emitted: VOC	2. Total Percent Efficiency of Control:
3. Potential Emissions: 0.084 lb/hour 0.37 tons/year	4. Synthetically Limited? [ ]
5. Range of Estimated Fugitive Emissions: [ ] 1 [ ] 2 [ ] 3 _____ to _____ tons/year	
6. Emission Factor: lb/hr/component Reference: EPA-453/R-95-017, Protocol for Equipment Leak Emission Estimates"	7. Emissions Method Code: 5
8. Calculation of Emissions (limit to 600 characters): Assume non-methane/non-ethane fraction is 5%. (EPA tpy factor for specific component type) (Number of components of specific type) = tpy. lb/hr = (tons/year)(2000 lb/ton)(1 yr/8760 hr)	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Factors vary by component type. See Attachment D for specific factors and calculations.	

Allowable Emissions Allowable Emissions ___NA_ of _____

1. Basis for Allowable Emissions Code: NA	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units:	4. Equivalent Allowable Emissions: lb/hour tons/year
5. Method of Compliance (limit to 60 characters):	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters):	

H. VISIBLE EMISSIONS INFORMATION
(Only Regulated Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation ___NA__ of _____

1. Visible Emissions Subtype:	2. Basis for Allowable Opacity: [ ] Rule [ ] Other
3. Requested Allowable Opacity: Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance:	
5. Visible Emissions Comment (limit to 200 characters):	

I. CONTINUOUS MONITOR INFORMATION
(Only Regulated Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor _NA__ of _____

1. Parameter Code:	2. Pollutant(s):
3. CMS Requirement: [ ] Rule [ ] Other	
4. Monitor Information: Manufacturer: Model Number: Serial Number:	
5. Installation Date:	6. Performance Specification Test Date:
7. Continuous Monitor Comment (limit to 200 characters):	

J. EMISSIONS UNIT SUPPLEMENTAL INFORMATION
(Regulated Emissions Units Only)

Supplemental Requirements

1. Process Flow Diagram [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
3. Detailed Description of Control Equipment [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
7. Operation and Maintenance Plan [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [X] Attached, Document ID:_Narrative [ ] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: Process flow diagrams and fuel analyses have been previously submitted. Supplemental information is provided in the narrative description and Attachment D accompanying these forms.

Emissions Unit Information Section __4__ of __4__

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation
[ ] Attached, Document ID:_____ [X] Not Applicable

12. Alternative Modes of Operation (Emissions Trading)
[ ] Attached, Document ID:_____ [X] Not Applicable

13. Identification of Additional Applicable Requirements
[ ] Attached, Document ID:_____ [X] Not Applicable

14. Compliance Assurance Monitoring Plan
[ ] Attached, Document ID:_____ [X] Not Applicable

15. Acid Rain Part Application (Hard-copy Required)

[ ] Acid Rain Part - Phase II (Form No. 62-210.900(1)(a))
Attached, Document ID:_____

[ ] Repowering Extension Plan (Form No. 62-210.900(1)(a)1.)
Attached, Document ID:_____

[ ] New Unit Exemption (Form No. 62-210.900(1)(a)2.)
Attached, Document ID:_____

[ ] Retired Unit Exemption (Form No. 62-210.900(1)(a)3.)
Attached, Document ID:_____

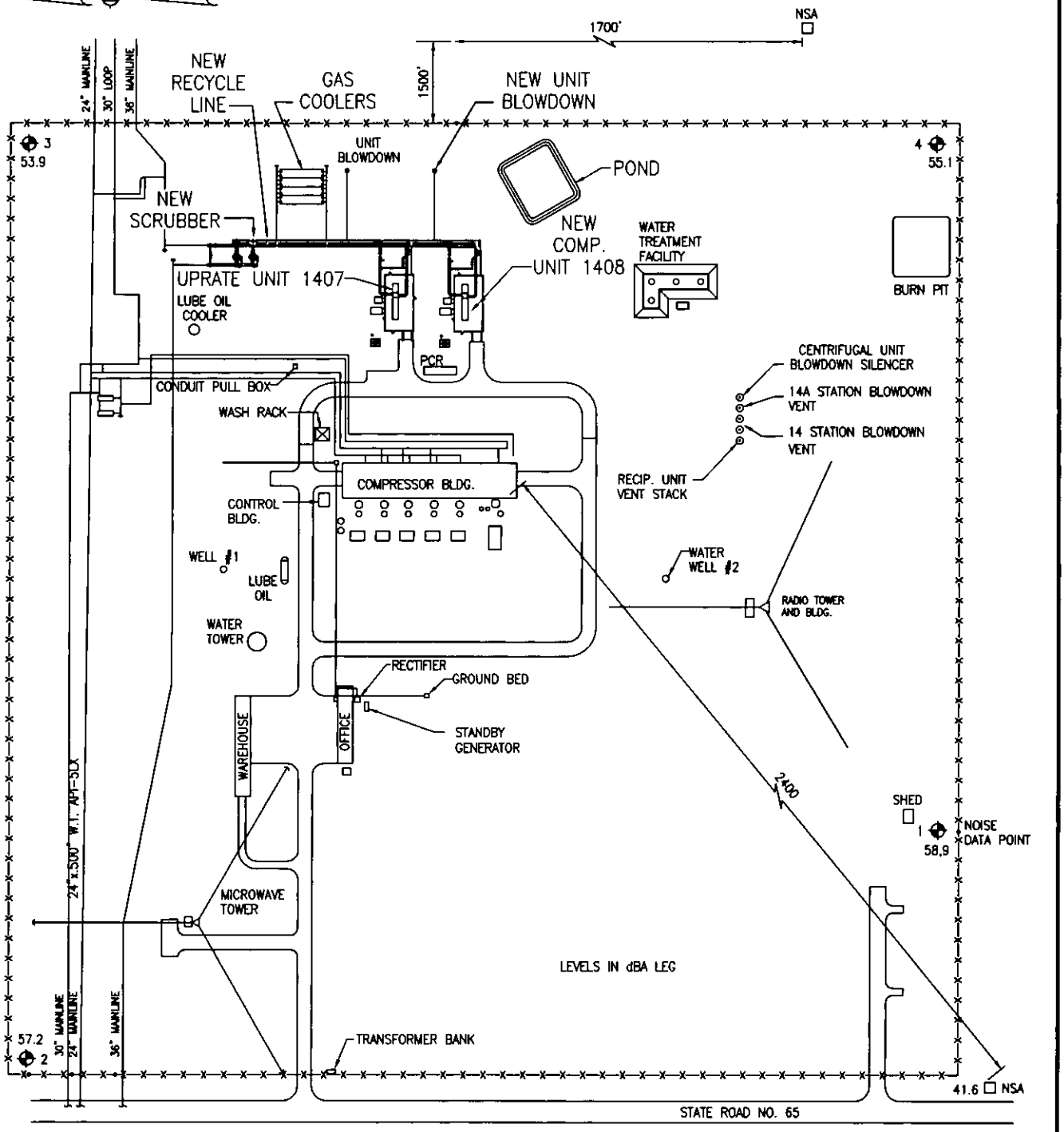
[ ] Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.)
Attached, Document ID:_____

[ ] Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.)
Attached, Document ID:_____

[X] Not Applicable

Attachment B

Plot Plan



NOISE DATA:

Avg. 3–15 Sec.

LEQ taken 2 p.m. 1/8/91

Temp. 52°F

Wind: 2–3 MPH SE

FLORIDA GAS TRANSMISSION COMPANY

PROPOSED FGT PHASE V
COMPRESSOR STATION NO. 14A
PLOT PLAN

DWG. NO. NV-4 9/15/00

NV4.DWG - 07/17/2000 - 08:03

Attachment C

Vendor Information

Pignone Model PGT10B Turbine

Solar Model Mars 90 T-13000S Turbine

HIS Emission Reduction Systems Model DeCOHx Converter/Silencer

Pignone Model PGT10B Turbine

Nuovo Pignone FIRENZE	CLIENTE - CUSTOMER ENRON ENGINEERING COMPANY
	LOCALITA' - PLANT LOCATION FLORIDA/ALABAMA - USA
COMMESSA - JOB **1604866-66-67-68**	IMPIANTO - PLANT FGT PHASE V

TITOLO - TITLE

EXPECTED EMISSION DATA

REV	DESCRIZIONE - DESCRIPTION	PREPD	CONT'D/CHKD	APP. APPRD	DATA - DATE
2	GENERAL REVISION	AIT			15/12/00
1	CUSTOMER COMMENTS INCLUDED	AIT			02/11/00
0	EMESSO - ISSUED	AIT	Carlo Bellli	Ficano	04/10/00

ITEM

N. SOM38867/4

LINGUA-LANG.: A

PAGINA-SHEET: 1 / 2

SOSTITUISCE IL - REPLACES

SOSTITUITO DA - REPLACED BY

File: c:\data\prj\enron\emissions2.doc

Nuovo Pignone

FRAME

ISO

% Load	100	90	80	70	60	50
Hp	15700	14130	12560	10990	9420	7850
Exhaust ACFM	203557	197108	190636	179898	167739	155705
Exhaust Mass Flow lb/s	103.54	103.45	103.33	100.07	95.56	90.81
ExhaustTemp °F	909	868	826	793	763	735
Fuel Flowrate MMbtu/hr	122.52	114.17	105.72	96.10	86.25	76.61
Fuel Heat val. Btu/lb	20823	20823	20823	20823	20823	20823
Fuel Flow lb/h	5884	5483	5077	4615	4142	3679
NOx ppmvd @15%O2	25	25	25	25	25	25
CO ppmvd @15%O2	15	15	20	30	55	75
UHC ppvw @15%O2	7	7	10	20	30	40
VOC Lb/h	0.29104	0.29104	0.41516	0.80036	1.14704	1.4552
UHC Lb/h	1.36	1.36	1.94	3.74	5.36	6.8
NOx Lb/h	14.071	14.06	14.04	13.6	12.99	12.34
CO Lb/h	5.14	5.13	6.82	10.23	17.34	22.5

NOTES:

1) NOx values in ppmvd at ISO condition are contractually guaranteed. All other values per the above table have to be considered as expected values not subject to any contractual obligation.

2) In order to give in theis document the expected worst case conditions. All values herein are based on the referenced percentage of load at Full Speed.

		ITEM	
		N. SOM33867/4	
3	REVISED	LINGUA-LANG.	PAGINA-SHEET
REV	DESCRIZIONE - DESCRIPTION	A	2 / 3

SOSTITUISCE IL - REPLACES

SOSTITUITO DA - REPLACED BY

Solar Model Mars 90 T-13000S Turbine

SOLAR TURBINES INCORPORATED
ENGINE PERFORMANCE CODE REV. 2.85
CUSTOMER: FGT
JOB ID:

DATE RUN: 22-NOV-00
RUN BY: Casadonte, Corrine

NEW EQUIPMENT PREDICTED EMISSION PERFORMANCE
DATA FOR STATION 14

Fuel: SD NATURAL GAS
Water Injection: NO
Number of Engines Tested: 0
Model: MARS 90-T13002S CS/MD 122F MATCH GAS
Emissions Data: REV. 0.0

Customer: FGT
Inquiry Number: Station 12

CRITICAL WARNINGS IN USE OF DATA FOR PERMITTING

1. Short term permitting values such as PPMV or lbs/hr should be based on worst case actual operating conditions specific to the application and the site. Worst case for one pollutant is not necessarily the same for another. The values on this form are only predicted emissions at one specific operating condition; not necessarily the worst case.

2. Long term reference emission units (e.g. tons/yr) should reference the average conditions at the site (e.g. ISO). That number should not be derived from the worst case value referenced above, or conversely this average must not be used to calculate worst case.

3. Nominal values are based on actual test results, or predicted in the case of no actual engine tests. Expected maximum values should be referenced for permitting.

4. If a SoLoNOx model is planned to be installed in the future, use no less than 50 PPMv CO.

The following predicted emissions performance is based on the following specific single point: (see attached)

Hp= 13026, %Full Load= 100.0, Elev= 200 ft, %RH= 60.0, Temperature= 59.0 F

NOX		CO		UHC		
NOM	MAX	NOM	MAX	NOM	MAX	
*	25.00	*	50.00	*	25.000	PPMvd at 15% O2
*	10.17	*	12.38	*	3.546	lbm/hr
*	44.54	*	54.24	*	15.532	ton/yr

Hp= 12375, %Full Load= 95.0, Elev= 200 ft, %RH= 60.0, Temperature= 59.0 F

NOX		CO		UHC		
NOM	MAX	NOM	MAX	NOM	MAX	
*	25.00	*	50.00	*	25.000	PPMvd at 15% O2
*	9.76	*	11.88	*	3.402	lbm/hr
*	42.73	*	52.03	*	14.901	ton/yr

Hp= 11723, %Full Load= 90.0, Elev= 200 ft, %RH= 60.0, Temperature= 59.0 F

NOX		CO		UHC		
NOM	MAX	NOM	MAX	NOM	MAX	
*	25.00	*	50.00	*	25.000	PPMvd at 15% O2
*	9.33	*	11.35	*	3.252	lbm/hr
*	40.84	*	49.73	*	14.242	ton/yr

Hp= 11072, %Full Load= 85.0, Elev= 200 ft, %RH= 60.0, Temperature= 59.0 F

NOX		CO		UHC		
NOM	MAX	NOM	MAX	NOM	MAX	
*	25.00	*	50.00	*	25.000	PPMvd at 15% O2
*	8.92	*	10.86	*	3.109	lbm/hr
*	39.06	*	47.56	*	13.619	ton/yr

Hp= 9769, %Full Load= 75.0, Elev= 200 ft, %RH= 60.0, Temperature= 59.0 F

NOX		CO		UHC		
NOM	MAX	NOM	MAX	NOM	MAX	
*	25.00	*	50.00	*	25.000	PPMvd at 15% O2
*	8.47	*	10.32	*	2.954	lbm/hr
*	37.11	*	45.18	*	12.939	ton/yr

Hp= 9118, %Full Load= 70.0, Elev= 200 ft, %RH= 60.0, Temperature= 59.0 F

NOX		CO		UHC		
NOM	MAX	NOM	MAX	NOM	MAX	
*	25.00	*	50.00	*	25.000	PPMvd at 15% O2
*	8.26	*	10.05	*	2.879	lbm/hr
*	36.16	*	44.03	*	12.610	ton/yr

* NOMINAL EMISSIONS DATA UNAVAILABLE FOR THIS ENGINE

OTHER IMPORTANT NOTES

1. Solar does not provide maximum values for water-to-fuel ratio, SOx, particulates, or conditions outside those above without separate written approval.
2. Solar can optionally provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
3. Fuel must meet Solar standard fuel specification ES 9-98. Predicted emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If the above information is being used regarding existing equipment, it should be verified by actual site testing.

SOLAR TURBINES INCORPORATED
ENGINE PERFORMANCE CODE REV. 2.85
CUSTOMER: FGT
JOB ID: STATION 14

DATE RUN: 22-NOV-00
RUN BY: Casadonte, Corrine

MARS 90-T13002S
CS/MD
122F MATCH
GAS
TME-2S REV. 2.1

DATA FOR NOMINAL PERFORMANCE

Fuel Type	SD NATURAL GAS	
Elevation	Feet	200
Inlet Loss	in. H2O	0
Exhaust Loss	in. H2O	0

LOAD		**FULL**	**95%**	**90%**	**85%**	**75%**	**70%**
Engine Inlet Temp.	Deg. F	59.0	59.0	59.0	59.0	59.0	59.0
Relative Humidity	%	60.0	60.0	60.0	60.0	60.0	60.0
Elevation Loss	Hp	96	91	86	81	71	67
Inlet Loss	Hp	0	0	0	0	0	0
Exhaust Loss	Hp	0	0	0	0	0	0
Driven Equipment Speed	RPM	8412	8292	8154	8013	7806	7687
Optimum Equipment Speed	RPM	8412	8292	8154	8013	7806	7687
Gas Generator Speed	RPM	11168	11066	10964	10865	10702	10614
Specified Load	Hp	FULL	12375	11723	11072	9769	9118
Net Output Power	Hp	13026	12375	11723	11072	9769	9118
Fuel Flow	MMBtu/hr	102.15	98.02	93.72	89.64	85.17	83.01
Heat Rate	Btu/Hp-hr	7842	7921	7994	8096	8719	9104
Inlet Air Flow	lbm/hr	316804	311200	305346	298866	287432	281950
Engine Exhaust Flow	lbm/hr	320719	314933	308889	302232	290619	285050
PCD	psi(g)	226.8	220.6	214.3	207.5	191.2	183.3
PT Inlet Temp. (T5)	Deg. F	1253	1227	1201	1179	1183	1186
Compensated PTIT	Deg. F	1272	1247	1221	1198	1203	1205
Exhaust Temperature	Deg. F	867	853	838	827	845	854

HIS Emission Reduction Systems Model DeCOHx Converter/Silencer

HIS Emissions Reduction Systems

HIS Emissions Reduction Systems

DeCOEx SILENCER in OXIDATION SERVICE

* SPECIFICATIONS
* OPERATION CONDITIONS
* INSTALLATION INSTRUCTIONS
* CLEANING INSTRUCTIONS
* DISASSEMBLY INSTRUCTIONS
* TROUBLE SHOOTING INSTRUCTIONS

9837 Whithorn Drive · Houston, Texas 77095 · 281-463-8883
P.O. Box 1639 · Cypress, Texas 77410 · Fax 281-463-8951

OXIDATION SERVICE

DeCOHx

H.L. Harris

The DeCCHx Silencer in oxidation service provides simultaneous reduction of CO, NMHC, aldehydes and HAP exhaust emissions, and exhaust noise for lean burning (oxygen rich), engines.

SPECIFICATIONS (General)

The DeCOHx Silencer design shall be multi-chamber, reactive type for the noise level specified, or the "generic" description "Commercial," "Standard," "Residential," or "Hospital."

Construction shall be of heavy gauge, carbon steel plate, minimum 11 gauge, rolled and continuously welded, incorporating standard flanged and dished heads for pressure vessel-like construction.

Flanges shall be 150 lb. F.F. ANSI diameter and drilling template.

Couplings shall be 3000 lb. rating and shall be sufficient in number to provide sample ports for: Catalyst upstream temperature, catalyst downstream temperature, high temperature alarm/shutdown, and drain.

Pressure drop, including exit loss to atmosphere, will be limited to 5.0 inches of water column, unless otherwise specified.

The DeCOHx Silencer shall be equipped with optional mounting brackets, trunnion pins, legs, or other types of supports for horizontal or vertical installation.

The DeCOHx Silencer shall be equipped with a "catalyst portal" at near midsection for easy access to the catalyst monolith, a seal ring shall provide the catalyst monolith a seal against exhaust gas bypass, and support to withstand vibration and thermal stress.

The DeCOHx Silencer shall be installed in a manner which best fits the piping configuration (with side inlet and/or side outlet) and in a location where inlet gas temperature is approximately 550°F minimum to 1200°F maximum.

The DeCHOx Silencer shall have external surfaces metallized by the flame spray method for carbon steel construction.

OXIDATION SERVICE

DeCOHx

H.L. Harris

CATALYST

A noble metal catalyst is offered for simultaneous reduction of CO, NMHC, aldehydes and HAP. Due to the high concentrations of oxygen in the exhaust of lean burn engines, the oxidation of CO and NMHC can easily be accomplished by the following reactions:

1. $2CO + O_2 \rightarrow 2CO_2$
2. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
3. $2H_2 + O_2 \rightarrow 2H_2O$

PERFORMANCE

Operating as prescribed in the "OPERATING CONDITIONS" portion of these specifications, the DeCHOx Silencer will perform to reduce exhaust emissions to the following minimum values. Catalyst application can be made to provide emissions rates lower than those stated here.

CO	reduction by 90% or more
NMHC/ROG	reduction to 70% (depending on gas composition and exhaust gas temperature)

New catalyst performance can be more than 99 percent efficient. As aging and accumulation of sulphated ash occur, performance will be within above limits until cleaning is required.

The catalyst in the DeCOHx Silencer has an operational life expectancy of five (5) to seven (7) years. Operation and maintenance within good operating practices will provide a long and trouble-free life.

for Oil and Fuel Specifications
Oxidation Service

DeCOHx

H.L. Harris

CATALYTIC CONVERTER/SILENCER OPERATING CONDITIONS

Exhaust gas temperature to the catalyst is to be 550°F minimum to 1200°F maximum. Reaction occurs at catalyst inlet temperature lower than 550°F, but reduction efficiency is decreased. Exhaust gas temperature below 700°F reduces the oxidation efficienty of VOCs.

Engine crankcase is to be properly vented to reduce oil carryover to the exhaust stream.

Combustibles content in the exhaust gas shall not produce catalyst outlet temperature higher than 1600°F.

Engine lube oil shall be no ash (0.0%) or low ash (0.5%) type. Oil lube additive packages shall not contain heavy metals or compounds in excess of those described in the following paragraph.

The following contaminants are known catalyst deactivators and contribute to shortened catalyst life: Heavy and base metals such as lead, mercury, arsenic, antimony, zinc, copper, tin, iron, barium, nickel and chrome, sulphur, silicon and phosphorous. Hence, the content of these elements in emissions at the catalytic inlet must not singularly exceed 1.0 ppm, or collectively must not exceed 5.0 ppm.

Chlorinated compounds in the fuel gas are not to exceed 10 ppm. Silicon compounds in the fuel gas are not to exceed 1 ppm. (Sulphur compounds in the fuel gas are not to exceed 400 ppm.)

Contaminants in excess of these amounts shall void the warranty.

Engine operation and maintenance shall be in accordance with manufacturers' recommended procedures at minimum and within good operation practices. A preventive or predictive maintenance program with attention to manufacturer's specific low emission operating parameters is preferred.

OXIDATION SERVICE

DeCOHx

H.L. Harris

INSTALLATION

The DeCOHx Silencer is installed in the same manner as the usual exhaust silencer or muffler, either in the horizontal or vertical position. Location should be as close to the engine manifold as practical, where exhaust temperature is at least 550°F.

The DeNOx Silencer shall be properly supported within the limits of good piping practice.

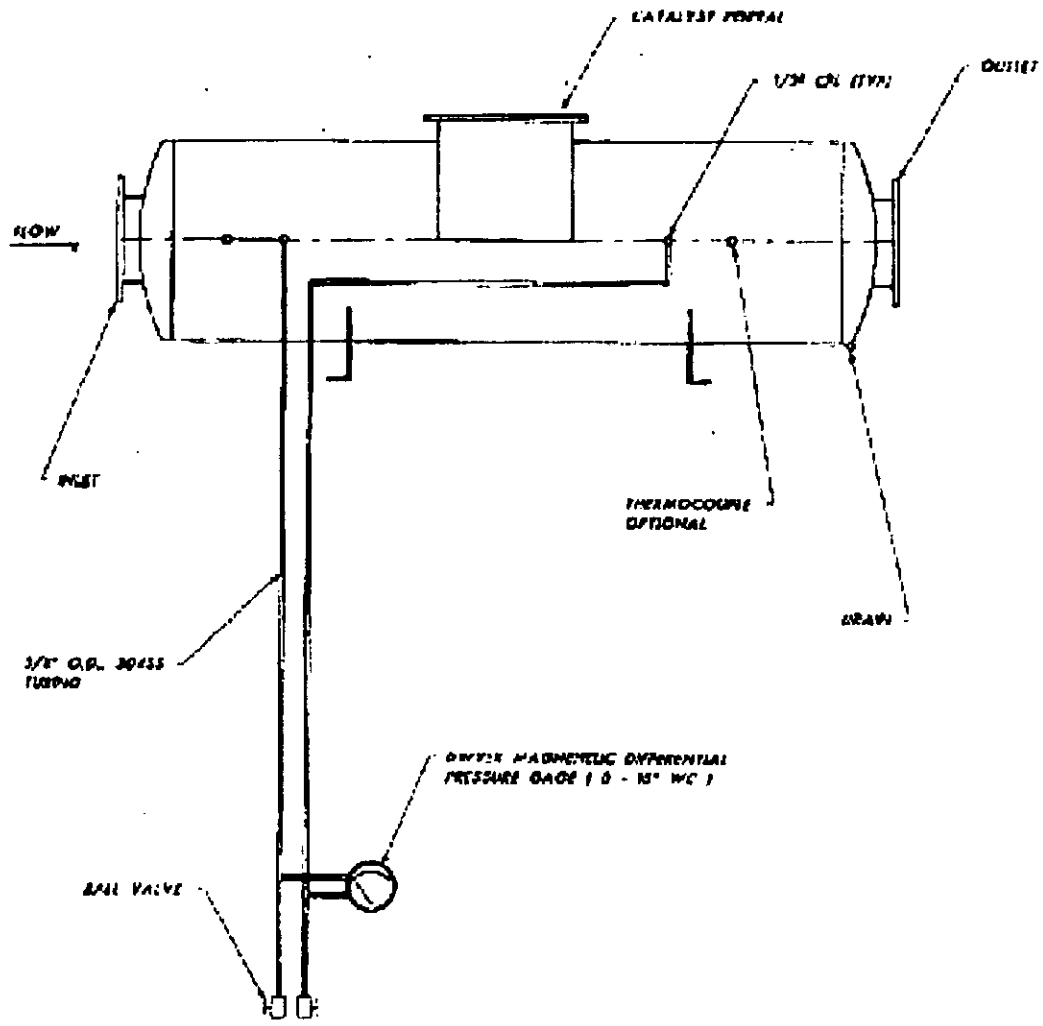
Multiple couplings are provided for gas sampling, pressure differential measurements, temperature monitoring, and drain of free liquid and condensate. See Figure 1 for typical installation of sample lines, differential pressure gage and thermocouple.

DeCOllx Silencer - Oxidation Service

SAMPLE LINE CONFIGURATION

REFERENCE DeCOllx

PREPARED BY H.L. Harris



Houston Industrial Silencing

OXIDATION SERVICE

DeCORx

M.L. Harris

CLEANING

The DeNOx Silencer catalyst module is accessible through the catalyst portal. Determine the safest method to disassemble the unit, then follow instructions described below.

There are several methods suggested for cleaning the catalyst monolith depending on the degree of loading. Following are some suggestions:

When the catalyst inlet has an accumulation of residual ash and other products of combustion (not caked oil), surfaces can be cleaned with the application of low pressure dry steam from the outlet side of the catalyst, blowing the dirt *away from* (instead of blowing into) the surface of the catalyst.

Another method is to soak the catalyst monolith in a solution of State 999 detergent in deionized water, rinse with deionized water, then blow dry when the particulate has soaked free.

When the "honeycomb" catalyst inlet is severely covered with oil carryover and other products of combustion, it is recommended that the module be cleaned with an ammonium hydroxide wash, free of lead and other heavy metals, and other contaminates which could poison the catalyst.

For assurance of cleanliness and inspection including refurbishment and repair, return the catalyst module to HIS.

Attachment D

Emission Calculations

Engine Emissions

Engine HAP Emissions

Fugitive Leak Emissions

Engine Emissions

Engine No. 1407 EPN: 008

NOx Emissions: (Based on Vendor Data)

lb NOx/hr = 10.17

tons NOx/yr = (lb NOx/hr)(hr/yr)(1 ton/2000 lb)
= (10.17 lb NOx/hr)(8760 hr/yr)(1 ton/2000 lb)
= 44.54

CO Emissions: (Based on Vendor Data)

lb CO/hr = 12.38

tons CO/yr = (lb CO/hr)(hr/yr)(1 ton/2000 lb)
= (12.38 lb CO/hr)(8760 hr/yr)(1 ton/2000 lb)
= 54.24

VOC Emissions: (Based on Vendor Data)

lb VOC/hr = 0.354

tons VOC/yr = (lb VOC/hr)(hr/yr)(1 ton/2000 lb)
= (0.354 lb VOC/hr)(8760 hr/yr)(1 ton/2000 lb)
= 1.55

SO2 Emissions: (Based on FERC Limits)

lb S/hr = (gr S/100 scf)(MMscf/hr)(1 lb/7000 gr)
= (10 gr S/100 scf)(0.1085 MMscf/hr)(1 lb/7000 gr)
= 1.55

lb SO2/hr = (lb S/hr)(2 lb SO2/lb S)
= (1.55 lb S/hr)(2 lb SO2/lb S)
= 3.10

tons SO2/yr = (lb SO2/hr)(hr/yr)(1 ton/2000 lb)
= (3.10 lb SO2/hr)(8760 hr/yr)(1 ton/2000 lb)
= 13.57

PM Emissions: (Based on AP-42 Table 3.1-2a, 4/00)

lb PM/hr = (lb PM/MMBtu)(MMBtu/hr)
= (0.0066 MMBtu/hr)(112.36 MMBtu/hr)
= 0.74

tons PM/yr = (lb PM/hr)(hr/yr)(1 ton/2000 lb)
= (0.74 lb PM/hr)(8760 hr/yr)(1 ton/2000 lb)
= 3.2

Engine No. 1408 EPN: 010

CO Emissions: (Based on Vendor Data)

A lb CO/hr = 5.14@ 100% load
B lb CO/hr = 17.34@ 60% load
C lb CO/hr = 22.5@ 50% load

A 75% of year = 6570 hours
B 15% of year = 1314 hours
C 10% of year = 876 hours

tons CO =(lb CO/hr)(hr/yr)(1 ton/2000 lb)
=(5.14 lb CO/hr)(6570 hr/yr)(1 ton/2000 lb)
=16.88

tons CO =(lb CO/hr)(hr/yr)(1 ton/2000 lb)
=(17.34 lb CO/hr)(1314 hr/yr)(1 ton/2000 lb)
=11.39

tons CO =(lb CO/hr)(hr/yr)(1 ton/2000 lb)
=(22.5 CO/hr)(876 hr/yr)(1 ton/2000 lb)
=9.86

tons CO/yr =(16.88 tons/yr) + (11.39 tons/yr) + (9.86 tons/yr)
=38.13

VOC Emissions: (Based on Vendor Data)

A lb VOC/hr = 0.29@ 100% load
B lb VOC/hr = 1.15@ 60% load
C lb VOC/hr = 1.46@ 50% load

A 75% of year = 6570 hours
B 15% of year = 1314 hours
C 10% of year = 876 hours

tons VOC/yr =(lb VOC/hr)(hr/yr)(1 ton/2000 lb)
=(0.29 lb VOC/hr)(6570 hr/yr)(1 ton/2000 lb)
=0.95

tons VOC/yr =(lb VOC/hr)(hr/yr)(1 ton/2000 lb)
=(1.15 lb VOC/hr)(1314 hr/yr)(1 ton/2000 lb)
=0.76

tons VOC/yr =(lb VOC/hr)(hr/yr)(1 ton/2000 lb)
=(1.46 lb VOC/hr)(876 hr/yr)(1 ton/2000 lb)
=0.64

tons CO/yr =(0.95 tons/yr) + (0.76 tons/yr) + (0.64 tons/yr)
=2.35

NOx Emissions: (Based on Vendor Data)

lb NOx/hr =14.10

tons NOx/yr =(lb NOx/hr)(hr/yr)(1 ton/2000 lb)
=(14.10 lb NOx/hr)(8760 hr/yr)(1 ton/2000 lb)
=61.76

SO2 Emissions: (Based on FERC Limits)

lb S/hr =(gr S/100 scf)(MMscf/hr)(1 lb/7000 gr)
=(10 gr S/100 scf)(0.1296 MMscf/hr)(1 lb/7000 gr)
=1.85

lb SO2/hr =(lb S/hr)(2 lb SO2/lb S)
=(1.85 lb S/hr)(2 lb SO2/lb S)
=3.70

tons SO2/yr =(lb SO2/hr)(hr/yr)(1 ton/2000 lb)
=(3.70 lb SO2/hr)(8760 hr/yr)(1 ton/2000 lb)
=16.22

PM Emissions: (Based on AP-42 Table 3.1-2a, 4/00)

lb PM/hr =(lb PM/MMBtu)(MMBtu/hr)
=(0.066 MMBtu/hr)(0.1296 MMBtu/hr)
=0.89

tons PM/yr =(lb PM/hr)(hr/yr)(1 ton/2000 lb)
=(0.89 lb PM/hr)(8760 hr/yr)(1 ton/2000 lb)
=3.90

Engine No. 1404 EPN: 007

NOx Emissions: (Based on Test Data for Similar Unit)

lb NOx/hr = (9.2 g/bhp-hr)(2000 bhp)(1 lb/453.59 g)
= 40.56

tons NOx/yr = (lb NOx/hr)(hr/yr)(1 ton/2000 lb)
= (40.6 lb NOx/hr)(8760 hr/yr)(1 ton/2000 lb)
= 177.67

CO Emissions: (Based on Test Data for Similar Unit)

lb CO/hr = (0.8 g/bhp-hr)(2000 bhp)(1 lb/453.59 g)
= 3.53

tons CO/yr = (lb CO/hr)(hr/yr)(1 ton/2000 lb)
= (3.53 lb CO/hr)(8760 hr/yr)(1 ton/2000 lb)
= 15.45

VOC Emissions: (Based on Test Data for Similar Unit)

lb VOC/hr = (0.1 g/bhp-hr)(2000 bhp)(1 lb/453.59 g)
= 0.441

tons VOC/yr = (lb VOC/hr)(hr/yr)(1 ton/2000 lb)
= (0.44 lb VOC/hr)(8760 hr/yr)(1 ton/2000 lb)
= 1.93

SO2 Emissions: (Based on FERC Limits)

lb S/hr = (gr S/100 scf)(MMscf/hr)(1 lb/7000 gr)
= (10 gr S/100 scf)(0.0159 MMscf/hr)(1 lb/7000 gr)
= 0.23

lb SO2/hr = (lb S/hr)(2 lb SO2/lb S)
= (0.23 lb S/hr)(2 lb SO2/lb S)
= 0.45

tons SO2/yr = (lb SO2/hr)(hr/yr)(1 ton/2000 lb)
= (0.45 lb SO2/hr)(8760 hr/yr)(1 ton/2000 lb)
= 1.99

PM Emissions: (Based on AP-42 Table 3.2-2, 4/00)

lb PM/hr = (lb PM/MMBtu)(MMBtu/hr)
= (0.0 MMBtu/hr)(0.0159 MMBtu/hr)
= 0.16

tons PM/yr = (lb PM/hr)(hr/yr)(1 ton/2000 lb)
= (0.16 lb PM/hr)(8760 hr/yr)(1 ton/2000 lb)
= 0.72

Engine HAP Emissions

GRI-HAPCalc Version 3.0 is a personal computer-based database program that estimates emissions of hazardous air pollutants (HAPs) and criteria pollutants from natural gas industry operations. HAPCalc 3.0 estimates emissions from the following point sources: amine sweetening units, sulfur recovery units, reciprocating engines, combustion turbines, small external combustion devices, flares, liquid hydrocarbon storage tanks, truck loading, miscellaneous process vents, and fugitives.

Emissions are estimated with factors derived from data collected during various GRI Environment and Safety research programs or by the U.S. Environmental Protection Agency (EPA). The GRI Literature database, developed during Phase I of the Air Toxics Program (1990 to 1992), compiled available emission test results from 40 reciprocating engines, 2 gas turbines, and 1 steam generator. The GRI Field Test database, developed from 1994 to 1997, contains GRI test data from 26 engines, 9 gas turbines, and 8 external combustion devices operating at several natural gas transmission, storage, and processing facilities. EPA emission factors are obtained from AP-42, 5th Edition [U.S. Environmental Protection Agency].

Since data are not available for all pollutants for some of the emission factor sets, a hierarchical combination of EPA > GRI Field > GRI Literature was used. Emission factors are prioritized in the listed order.

Turbine 1408 HAP Emission Factors and Emissions

Chemical	g/bhp-hr	tpy	lbs/hour	Factor set
Formaldehyde	0.0146323	2.22	0.5060	EPA
Acetaldehyde	0.0003443	0.05	0.0119	EPA
1,3-Butadiene	0.0000019	0.00	0.0001	EPA
Acrolein	0.000034	0.01	0.0012	EPA
Propional	0.000865	0.13	0.0299	GRI Field
Propylene Oxide	0.0001248	0.02	0.0043	EPA
n-Nitrosodimethylamine	0.000001	0.00	0.0000	EPA
Benzene	0.0006025	0.09	0.0208	EPA
Toluene	0.0005595	0.08	0.0193	EPA
Ethylbenzene	0.0001033	0.02	0.0036	EPA
Xylenes(m,p,o)	0.0001162	0.02	0.0040	EPA
2,2,4-Trimethylpentane	0.0016053	0.24	0.0555	GRI Field
n-Hexane	0.0015058	0.23	0.0521	GRI Field
Phenol	0.0001101	0.02	0.0038	GRI Field
n-Nitrosomorpholine	0.000001	0.00	0.0000	EPA
Naphthalene	0.0006025	0.09	0.0208	EPA
2-Methylnaphthalene	0.0000013	0.00	0.0000	GRI Field
Biphenyl	0.0003305	0.05	0.0114	GRI Field
Phenanthrene	0.0000005	0.00	0.0000	GRI Field
Chrysene	0.000001	0.00	0.0000	GRI Field
Beryllium	0.0000001	0.00	0.0000	GRI Field
Phosphorous	0.0000652	0.01	0.0023	GRI Field
Chromium	0.0000056	0.00	0.0002	EPA
Chromium	0.0000082	0.00	0.0003	GRI Field
Manganese	0.0000069	0.00	0.0002	EPA
Nickel	0.0000061	0.00	0.0002	GRI Field
Cobalt	0.0000016	0.00	0.0001	GRI Field
Arsenic	0.0000002	0.00	0.0000	EPA
Selenium	0.0000003	0.00	0.0000	GRI Field
Cadmium	0.0000036	0.00	0.0001	EPA
Mercury	0.0000019	0.00	0.0001	EPA
Lead	0.0000689	0.01	0.0024	EPA
TOTALS:	**0.0217114**	**3.29**	**0.7508**	

Turbine 1407 HAP Emission Factors and Emissions

Chemical	g/bhp-hr	tpy	Lbs/hour	Factor set
Formaldehyde	0.0146323	1.84	0.4198	EPA
Acetaldehyde	0.0003443	0.04	0.0099	EPA
1,3-Butadiene	0.0000019	0.00	0.0001	EPA
Acrolein	0.000034	0.00	0.0010	EPA
Propional	0.000865	0.11	0.0248	GRI Field
Propylene Oxide	0.0001248	0.02	0.0036	EPA
n-Nitrosodimethylamine	0.000001	0.00	0.0000	EPA
Benzene	0.0006025	0.08	0.0173	EPA
Toluene	0.0005595	0.07	0.0161	EPA
Ethylbenzene	0.0001033	0.01	0.0030	EPA
Xylenes(m,p,o)	0.0001162	0.01	0.0033	EPA
2,2,4-Trimethylpentane	0.0016053	0.20	0.0461	GRI Field
n-Hexane	0.0015058	0.19	0.0432	GRI Field
Phenol	0.0001101	0.01	0.0032	GRI Field
n-Nitrosomorpholine	0.000001	0.00	0.0000	EPA
Naphthalene	0.0006025	0.08	0.0173	EPA
2-Methylnaphthalene	0.0000013	0.00	0.0000	GRI Field
Biphenyl	0.0003305	0.04	0.0095	GRI Field
Phenanthrene	0.0000005	0.00	0.0000	GRI Field
Chrysene	0.000001	0.00	0.0000	GRI Field
Beryllium	0.0000001	0.00	0.0000	GRI Field
Phosphorous	0.0000652	0.01	0.0019	GRI Field
Chromium	0.0000056	0.00	0.0002	EPA
Chromium	0.0000082	0.00	0.0002	GRI Field
Manganese	0.0000069	0.00	0.0002	EPA
Nickel	0.0000061	0.00	0.0002	GRI Field
Cobalt	0.0000016	0.00	0.0000	GRI Field
Arsenic	0.0000002	0.00	0.0000	EPA
Selenium	0.0000003	0.00	0.0000	GRI Field
Cadmium	0.0000036	0.00	0.0001	EPA
Mercury	0.0000019	0.00	0.0001	EPA
Lead	0.0000689	0.01	0.0020	EPA
TOTALS:	**0.0217114**	**2.73**	**0.6229**	

Engine 1404 HAP Emission Factors and Emissions

Chemical	g/bhp-hr	tpy	Lbs/hour	Factor set
Formaldehyde	0.127006	2.45	0.5595	EPA
Methanol	0.0044452	0.09	0.0196	EPA
Acetaldehyde	0.0163293	0.32	0.0719	EPA
Acrolein	0.0074	0.14	0.0326	GRI Literature
Benzene	0.0034927	0.07	0.0154	EPA
Toluene	0.0036287	0.07	0.0160	EPA
Ethylbenzene	0.0003221	0.01	0.0014	EPA
Xylenes(m,p,o)	0.0012701	0.02	0.0056	EPA
2,2,4-Trimethylpentane	0.0013154	0.03	0.0058	EPA
n-Hexane	0.0032205	0.06	0.0142	EPA
Phenol	0.0000907	0.00	0.0004	EPA
Styrene	0.0001724	0.00	0.0008	EPA
Naphthalene	0.0000381	0.00	0.0002	EPA
Biphenyl	0.0007711	0.01	0.0034	EPA
Fluorene	0.0000367	0.00	0.0002	EPA
Ethylene Dibromide	0.0003629	0.01	0.0016	EPA
Vinyl Chloride	0.0001225	0.00	0.0005	EPA
Methylene Chloride	0.000313	0.01	0.0014	EPA
1,1-Dichloroethane	0.0001905	0.00	0.0008	EPA
1,3-Dichloropropene	0.0002177	0.00	0.0010	EPA
Chlorobenzene	0.0002177	0.00	0.0010	EPA
Chloroform	0.0002313	0.00	0.0010	EPA
1,1,2-Trichloroethane	0.0002087	0.00	0.0009	EPA
1,1,2,2-Tetrachloroethane	0.0004082	0.01	0.0018	EPA
Carbon Tetrachloride	0.0002994	0.01	0.0013	EPA
TOTALS:	**0.1721109**	**3.32**	**0.7582**	

Fugitive Leak Emissions

Fugitive Leak Emissions - FGT Compressor Station No. 14

Fugitive Emissions Factors					
Component		Service	Emissions *		
			Factor tpy	Factor lb/hr	Factor kg/hr
Valves		Gas	0.0434606	0.00992251	0.00450085
Connector		Gas	0.0019316	0.00044100	0.00020004
Flanges		Gas	0.0037666	0.00085995	0.00039008
Open-Ended Line		Gas	0.0193158	0.00441000	0.00200038
Pumps		Gas	0.023179	0.00529201	0.00240046
Other		Gas	0.0849895	0.01940400	0.00880165
Valves		Light Oil	0.0241448	0.00551251	0.00250048
Connector		Light Oil	0.0020282	0.00046306	0.00021004
Flanges		Light Oil	0.0010624	0.00024256	0.00011002
Open-Ended Line		Light Oil	0.0135211	0.00308701	0.00140027
Pumps		Light Oil	0.1255527	0.02866500	0.01300244
Other		Light Oil	0.0724343	0.01653751	0.00750142
Valves		Heavy Oil	0.0000811	0.00001852	0.00000840
Connector		Heavy Oil	0.0000724	0.00001653	0.00000750
Flanges		Heavy Oil	0.0000038	0.00000087	0.00000039
Open-Ended Line		Heavy Oil	0.0013521	0.00030870	0.00014003
Pumps		Heavy Oil	NA	0.00529	NA
Other		Heavy Oil	0.0002994	0.00006836	0.00003101

*"EPA publication EPA-453/R-95-017, November 1995, "Protocol for Equipment Leak EmissionEstimates"

New Component Emissions					
Component	Service	Component	Emissions *	NM/NE	Emissions
	2	Count	Factor (ton/yr)	Fraction	(ton/yr)
Valves	Gas	54	0.0434606	0.05	0.12
Connector	8Gas	0	0.0019316	0.05	0.00
Flanges	Gas	90	0.0037666	0.05	0.02
Open-Ended Line	Gas	15	0.0193158	0.05	0.01
Pumps	Gas	1	0.023179	0.05	0.00
Other	Gas	088	0.0849895	0.05	0.00
Valves	Light Oil	7	0.0241448	1.00	0.17
Connector	Light Oil	0	0.0020282	1.00	0.00
Flanges	Light Oil	18	0.0010624	1.00	0.02
Open-Ended Line	Light Oil	2	0.0135211	1.00	0.03
Pumps	Light Oil	0	0.1255527	1.00	0.00
Other	Light Oil	0	0.0724343	1.00	0.00
Valves	Heavy Oil	3	0.0000811	1.00	0.00
Connector	Heavy Oil	0	0.0000724	1.00	0.00
Flanges	Heavy Oil	11	0.0000038	1.00	0.00
Open-Ended Line	Heavy Oil	0	0.0013521	1.00	0.00
Other	Heavy Oil	0	0.0002994	1.00	0.00
				TOTAL:	0.37

Attachment E

Test Reports

Engine 1404 Pre-modification Report
Test Report Summary of Modified Engine 1504

Engine 1404 Pre-modification Report

TEST REPORT
ON
EXHAUST EMISSIONS

FROM
TWO WORTHINGTON SEHG-8
COMPRESSOR ENGINES
AT
COMPRESSOR STATION NO. 14
NEAR
QUINCY, FLORIDA

PREPARED FOR

FLORIDA GAS TRANSMISSION COMPANY

MAY, 2000

CUBIX JOB NO. 5825

PREPARED BY

Cubix Corporation
http://www.cubixcorp.com

CORPORATE HEADQUARTERS
9225 US Hwy. 183 South, Austin, TX 78747
(512) 243-0202 TEL (512) 243-0222 FAX

TABLE OF CONTENTS

INTRODUCTION

Emission testing was conducted on two reciprocating engines in service at Florida Gas Transmission Station 14 located eight miles southwest of Quincy, Florida. Nitrogen oxides (NO_X), carbon monoxide (CO), and other combustion products were measured in the exhaust of the engine. Cubix Corporation's Southeast Regional Office of Gainesville, Florida conducted these tests April 27, 2000.

The purpose of this testing was to provide baseline mass emission rates for two Worthington SEHG-8 engines (Units 1404 and 1405). For each source, three one-hour test runs were conducted documenting engine operational data, emission concentrations, and mass emission rates.

The tests followed the procedures set forth in the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1, 2, 3a, 4, 7e, 9, 10, 19 and 25a. Table 1 summarizes the background information pertinent to these tests.

This report has been reviewed and is approved for submittal by the following representatives:

Cubix Corporation

Florida Gas Transmission Co.

TABLE 1:
Background Data

Source Owner:	**Florida Gas Transmission Company** 601 South Lake Destiny Drive Maitland, Florida 32751 (407) 875-5865 TEL (407) 875-5896 FAX Attn: Clay Roesler, D.E.S.
Test Contractor:	**Cubix Corporation, SE Regional Office** 4536 NW 20th Drive Gainesville, Florida 32605 (352) 378-0332 TEL (352) 378-0354 FAX Attn: Leonard Brenner
Process Description:	Reciprocating compressor engines are used to compress natural gas for pipeline transmission.
Test Dates:	April 27, 2000
Locations:	8 miles southwest of Quincy, Florida
Emission Sampling Points:	Sampling on each reciprocating engine occurred from appropriately positioned sample ports on the exhaust stack of each source. Please see Appendix A for stack diagrams.
Test Participants:	**Florida Gas Transmission** George Gardener William Rogers **Enron Construction & Engineering** Marcello Minotti V. Duane Pierce (AQMcs)

Cubix Corporation
Leonard Brenner
Roger Paul Osier

Test Methods:

Environmental Protection Agency (EPA) Method 1 was used for selection of velocity traverse point locations.

EPA Method 2 was used for conducting stack gas velocity, i.e., pitot tube, measurements.

EPA Method 3a was used for determination of oxygen (O_2) and carbon dioxide (CO_2) concentrations.

EPA Method 4 was used for determination of stack gas moisture content.

Stoichiometric calculations were also used for moisture content determination.

EPA Method 7e was used for determination of oxides of nitrogen (NO_X) concentrations.

EPA Method 9 was used for determination of visual emission observations.

EPA Method 10 was used for determination of carbon monoxide (CO) concentrations.

EPA Method 19 was used for verification of volumetric flow rates by stoichiometric calculations based on O_2 and CO_2 "F Factors".

EPA Method 25a was used for determination of total hydrocarbon (THC) concentrations. VOC is calculated from THC and fuel analysis (see Appendix B, *Example Calculations*)
Measurements were conducted on a methane basis.

SUMMARY OF RESULTS

FGT owns and operates Compressor Station 12 approximately 8 miles southwest of Quincy, Florida. At this station, a number of reciprocating compressor engines are utilized for the compression of natural gas for transport in an underground pipeline. The following units were tested to establish baseline emission rates for a specific engine type:

Unit 1404	Worthington SEHG-8
Unit 1405	Worthington SEHG-8

The tests on these sources are the subject of this report.

For each source, three one-hour test runs were conducted for each required EPA test method. NO_X, CO, THC, O_2, and CO_2 emissions were continuously monitored during each of these runs. Moisture content was determined gravimetrically during each test run using a chilled water impingement system. Stack velocity measurements were performed concurrently with each test run. Each unit was operating at greater than 90% of site rated torque and horsepower during each test run

Tables 2-3 are summaries of the testing results. Each summary table contains operating data recorded during the test from the engine's control panels (supplied by FGT personnel), ambient conditions, the measured emissions, and calculated mass emission rates. The emission rates for NO_X and CO are reported in terms of parts per million by volume (ppmv) on a dry basis, pounds per hour (lbs/hr), tons per year (tons/yr), and grams per brake horsepower hour (g/bhp-hr). Emission rates for Volatile Organic Compounds (VOC) (as derived from measured THC concentrations and the non methane, non ethane fraction of the fuel gas) are presented in terms of lbs/hr and g/bhp-hr.

Volumetric flow and mass emission rates were determined by two different techniques. The first technique employed a physical measurement of exhaust flow (EPA Methods 1-4), which included measurements of stack gas molecular weight, stack gas moisture, stack gas temperature, atmospheric pressure, and stack gas static and differential pressures (i.e., velocity). The field data sheets, used for collection of data specific to stack gas moisture and velocity, are in Appendix A.

The second technique employed a stoichiometric calculation (EPA Method 19) based on measurements of diluent gas (O_2 or CO_2) concentration, "F Factors" determined from fuel composition, and the engine's fuel consumption rate. This technique is performed to verify the accuracy of the physical measurement technique. Sometimes measuring engine exhaust flow with a pitot tube in a location with turbulent, pulsating flow (i.e., before a silencer) can produce inaccurate flow rate values.

Pollutant mass emission rates were calculated using the volumetric flow rates determined by EPA Methods 1-4. Examples of mass emission rate calculations and other calculations necessary for the presentation of the results of this section are contained in Appendix B. FGT determined and supplied the engine brake-specific horsepower data used in the determination of the emission rate units of g/bhp-hr.

Operational data obtained during the testing is presented in Appendix D. Records of quality assurance activities are in Appendix E. Certifications of calibration gases and equipment used to conduct tests at this facility are in Appendix F. Appendix G contains a copy of the strip chart records of the analyzer monitored emission concentrations

TABLE 2: Unit 1404
Baseline

Florida Gas Transmission
Compressor Station No. 14
8 miles SW of Quincy, FL on SR 65
Worthington SEHG-8 Compressor Engine — **2050 bhp @ 345 rpm**
Technicians: LJB, RPO

Test Run No.	1404-C-1	1404-C-2	1404-C-3	
Date	4/27/00	4/27/00	4/27/00	
Start Time	14:10	15:30	16:48	
Stop Time	15:10	16:30	17:48	
Engine/Compressor Operation				**Averages**
Engine Load (bhp, measured at the compressor)	1942	1927	1927	**1932**
Fuel Horsepower (bhp, based upon fuel torque)	1876	1862	1857	**1865**
Engine Speed (rpm)	344	343	343	**343**
Torque (%, full load = 2050 bhp at 345 rpm)	91.9	91.3	91.0	**91.4**
Ignition Timing (° BTDC)	18.0	18.0	18.0	**18.0**
Air Manifold Pressure ("Hg)	6.5	6.5	6.4	**6.4**
Air Manifold Temperature (°F)	95	95	94	**95**
Fuel Manifold Pressure (psig)	17.3	17.2	17.2	**17.3**
Station Suction Pressure (psig)	695	696	696	**696**
Station Suction Temperature (°F)	73.0	73.0	73.0	**73**
Station Discharge Pressure (psig)	928	926	925	**926**
Station Discharge Temperature (°F)	116.0	115.3	115.0	**115.4**
Compressor Flow Rate (MMSCFD)	112	113	113	**112.7**
Loading Step Number	1	1	1	-
Engine Fuel Data (Natural Gas)				
Fuel Heating Value (Btu/SCF, HHV)	1040.1	1040.1	1040.1	**1040.1**
Fuel Specific Gravity	0.5870	0.5870	0.5870	**0.5870**
O_2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	8640	8640	8640	**8640**
CO_2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	1027	1027	1027	**1027**
Fuel Flow (SCFH)	13,931	13,856	13,822	**13,870**
Heat Input (MMBtu/hr)	14.49	14.41	14.38	**14.43**
Brake-specific Fuel Consumption (Btu/bhp-hr)	7,461	7,479	7,461	**7467**
Ambient Conditions				
Atmospheric Pressure ("Hg)	29.67	29.63	29.64	**29.65**
Temperature (°F) : Dry bulb	83.0	81.0	79.8	**81.3**
(°F): Wet bulb	65.1	61.2	61.0	**62.4**
Humidity (lbs moisture/lb air)	0.0090	0.0069	0.0070	**0.0076**
Measured Emissions				
NO_x (ppmv, dry basis)	2015.5	1900.5	1941.0	**1952.3**
CO (ppmv, dry basis)	172.6	177.7	177.7	**176.0**
THC (ppmv, wet basis)	992.2	1057.9	1064.2	**1038.1**
Fuel VOC Fraction (% non-methane/non-ethane)	2.60	2.60	2.60	**2.60**
VOC (ppmv, wet basis)	25.8	27.5	27.7	**27.0**
O_2 (% volume, dry basis)	11.06	11.04	11.03	**11.04**
CO_2 (% volume, dry basis)	5.60	5.54	5.56	**5.57**
F_O (fuel factor, range = 1.600-1.836 for NG)	1.76	1.78	1.78	**1.77**
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	2.93E+05	2.92E+05	2.92E+05	**2.92E+05**
via O_2 "F_d-factor" (SCFH, dry basis)	2.66E+05	2.64E+05	2.63E+05	**2.64E+05**
via CO_2 "F_c-factor" (SCFH, dry basis)	2.66E+05	2.67E+05	2.66E+05	**2.66E+05**
Calculated Emission Rates (via pitot tube)				
NO_x (lbs/hr)	70.6	66.3	67.7	**68.2**
CO (lbs/hr)	3.68	3.77	3.77	**3.74**
VOC (lbs/hr, based on THC emissions and fuel VOC)	0.355	0.373	0.376	**0.368**
NO_x (tons/yr)	309	290	296	**299**
CO (tons/yr)	16.1	16.5	16.5	**16.4**
VOC (tons/yr)	1.55	1.64	1.65	**1.61**
NO_x (g/bhp-hr)	17.1	16.2	16.6	**16.6**
CO (g/bhp-hr)	0.890	0.919	0.922	**0.910**
VOC (g/bhp-hr)	0.086	0.091	0.092	**0.090**

TABLE 3: Unit 1405
Baseline

Florida Gas Transmission
Compressor Station No. 14
8 miles SW of Quincy, FL on SR 65
Worthington SEHG-8 Compressor Engine
Technicians: LJB, RPO

2050 bhp @ 345 rpm

Test Run No.	1405-C-1	1405-C-2	1405-C-3	
Date	4/27/00	4/27/00	4/27/00	
Start Time	09:21	10:40	11:57	
Stop Time	10:21	11:40	12:57	
Engine/Compressor Operation				**Averages**
Engine Load (bhp, measured at the compressor)	1944	1913	1938	**1932**
Fuel Horsepower (bhp, based upon fuel torque)	1953	1923	1956	**1944**
Engine Speed (rpm)	345	345	345	**345**
Torque (%, full load = 2050 bhp at 345 rpm)	95.3	93.8	95.3	**94.8**
Ignition Timing (° BTDC)	18.0	18.0	18.0	**18.0**
Air Manifold Pressure ("Hg)	6.7	6.7	6.8	**6.7**
Air Manifold Temperature (°F)	95	96	91	**94**
Fuel Manifold Pressure (psig)	13.5	13.5	13.6	**13.5**
Station Suction Pressure (psig)	698	695	694	**696**
Station Suction Temperature (°F)	73.0	73.0	73.0	**73**
Station Discharge Pressure (psig)	927	921	927	**925**
Station Discharge Temperature (°F)	115.0	114.7	116.0	**115.2**
Compressor Flow Rate (MMSCFD)	118	118	116	**117.2**
Loading Step Number	6	6	6	-
Engine Fuel Data (Natural Gas)				
Fuel Heating Value (Btu/SCF, HHV)	1040.1	1040.1	1040.1	**1040.1**
Fuel Specific Gravity	0.5870	0.5870	0.5870	**0.5870**
O_2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	8640	8640	8640	**8640**
CO_2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	1027	1027	1027	**1027**
Fuel Flow (SCFH)	14,533	14,427	14,542	**14,500**
Heat Input (MMBtu/hr)	15.12	15.01	15.12	**15.08**
Brake-specific Fuel Consumption (Btu/bhp-hr)	7,775	7,844	7,804	**7808**
Ambient Conditions				
Atmospheric Pressure ("Hg)	29.76	29.75	29.73	**29.75**
Temperature (°F) : Dry bulb	68.1	73.0	77.3	**72.8**
(°F): Wet bulb	57.0	56.5	59.9	**57.8**
Humidity (lbs moisture/lb air)	0.0073	0.0058	0.0069	**0.0067**
Measured Emissions				
NO_x (ppmv, dry basis)	1985.0	1839.8	1811.1	**1878.6**
CO (ppmv, dry basis)	170.7	177.8	167.0	**171.8**
THC (ppmv, wet basis)	991.9	1028.6	1134.7	**1051.7**
Fuel VOC Fraction (% non-methane/non-ethane)	2.60	2.60	2.60	**2.60**
VOC (ppmv, wet basis)	25.8	26.7	29.5	**27.3**
O_2 (% volume, dry basis)	11.04	11.11	11.11	**11.09**
CO_2 (% volume, dry basis)	5.50	5.50	5.49	**5.50**
F_O (fuel factor, range = 1.600-1.836 for NG)	1.79	1.78	1.78	**1.79**
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	2.94E+05	2.88E+05	3.01E+05	**2.94E+05**
via O_2 "F_d-factor" (SCFH, dry basis)	2.77E+05	2.77E+05	2.79E+05	**2.78E+05**
via CO_2 "F_c-factor" (SCFH, dry basis)	2.82E+05	2.80E+05	2.83E+05	**2.82E+05**
Calculated Emission Rates (via pitot tube)				
NO_x (lbs/hr)	69.7	63.4	65.1	**66.1**
CO (lbs/hr)	3.65	3.73	3.65	**3.68**
VOC (lbs/hr, based on THC emissions and fuel VOC)	0.357	0.360	0.413	**0.377**
NO_x (tons/yr)	305	278	285	**289**
CO (tons/yr)	16.0	16.3	16.0	**16.1**
VOC (tons/yr)	1.56	1.58	1.81	**1.65**
NO_x (g/bhp-hr)	16.2	15.0	15.1	**15.4**
CO (g/bhp-hr)	0.848	0.880	0.848	**0.859**
VOC (g/bhp-hr)	0.083	0.085	0.096	**0.088**

ANALYTICAL TECHNIQUE

The emissions from two Worthington compressor engines were measured to determine the quantity of emissions being emitted to the atmosphere under full load operating conditions. The sampling and analysis procedures used during these tests conformed with those outlined in The Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1, 2, 3a, 4, 7e, 9, 10, 19, and 25a. This section of the report describes the analytical techniques and procedures used during the testing.

The test matrix for each engine consisted of three-one hour test runs following each required test method. The stack gas was analyzed for NO_X, CO, THC, O2, and CO_2 by continuous instrumental monitors. THC analysis was on a wet basis; all other exhaust gas analyses were performed on a dry basis. Table 4 lists the instruments and detection principles used for these analyses.

Provisions were made to introduce the calibration gases to the instrumental monitors via two paths: 1) directly to the instruments via the sample manifold quick-connects and rotameters, and 2) through the complete sampling system including the sample probe, filter, heat trace, condenser, sample line, manifold, and rotameters. The former method was used for quick, convenient calibration checks. The latter method was used to demonstrate that the sample was not altered due to leakage, reactions, or adsorption within the sampling system (sample system bias check). A NO_X standard calibration gas was introduced into the NO_X analyzer directly. Then the response from the NO_X analyzer was noted as the calibration gas was introduced at the probe. Any difference between the two responses in the instrument was attributed to the bias of the sample system. Following the span gas bias check, a zero gas bias check was performed on the NO_X analyzer using nitrogen, or another calibration gas as a zero for NO_X, to check for any zero gas bias of the sample system. In accordance with EPA Method 3a, this span and zero bias check procedure was repeated for the O_2 and CO_2 analyzers. This procedure was also used for the CO analyzer (although not required by EPA Method 10). All calibrations for the THC analyzer were performed through the entire system as required by EPA Method 25a. While not required the more stringent bias and drift corrections of EPA Method 6c were applied to reported concentrations of THC.

As shown in Figure 1, a $^1/_2$-inch diameter stainless steel probe was inserted into the sample port of the stack. The gas sample was continuously pulled through the probe and transported via a 100-foot long $^3/_8$-inch diameter heat-traced Teflon® line into the mobile laboratory using a stainless steel/Teflon®

diaphragm pump. At the pump exit the pressurized sample was pushed into a heated sample manifold. A portion of this hot, wet sample was delivered to the THC analyzer. The bulk of the gas stream then passed into a stainless steel minimum contact condenser to dry the sample stream and into the (dry) sample manifold. From the manifold, the sample was partitioned to the analyzers through glass and stainless steel rotameters for flow control of the sample.

Instrumental monitors were housed in an air-conditioned trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e., NO_X calibration gases).

EPA Method 1 was used to determine the velocity traverse point locations. Prior to conducting the tests, a cyclonic flow check was conducted. No significant cyclonic flow was encountered. The stack met the minimum criteria set forth in the method. The location of the sample ports and the pitot tube traverse point distances for the engine are denoted in the "Circular Stack Sampling Traverse Point Layout" data sheet, see Appendix A.

EPA Method 2 was used for determination of stack gas velocity during each run. Pitot tubes and either an inclined gauge oil manometer or NIST-traceable digital electronic manometer were used to measure the differential pressure at each traverse point. The stack temperature was determined with a K-type thermocouple and digital thermometer.

Stack volumetric flow rates were also determined using EPA Method 19 O_2 and CO_2 "F Factors". These "F Factors" and the heating value of the fuel were based on a fuel analysis provided by FGT's in-house laboratory. The fuel analysis and Cubix's fuel calculation table can be found in Appendix C of this report.

The stack gas analyses for CO_2 and O_2 concentrations were performed in accordance with procedures set forth in EPA Method 3a. Instrumental analyses were used in lieu of an Orsat or Fyrite procedure due to the greater accuracy and precision provided by the instruments. The CO_2 analyzer was based on the principle of infrared absorption; and, the O_2 analyzer operated using a current generating micro-fuel cell.

The F_O calculation of EPA Method 3b (Section 4.1.1) was used to verify that the ratios of O_2 to CO_2 combustion byproducts were within an acceptable range during each test run. In each case the F_O fell within the expected values for natural gas.

EPA Method 4 was used to measure the moisture content of the stack gas. A chilled liquid impingement system was used in conjunction with a calibrated dry gas meter to pull a sample greater than 21 scf coincident with each test run. A K-type (chromel-alumel) thermocouple was used in conjunction with a digital thermometer to determine the last impinger temperature in the chilled liquid impingement sampling train. This parameter is measured to ensure that the gas stream is cooled to a minimum of 68 degrees Fahrenheit as required by sampling methodology.

EPA Method 7e procedures were used to determine concentrations of NO_X (via chemiluminescence). NO_X mass emission rates were calculated as if the NO_X emissions were only in the form of NO_2. This approach corresponds to EPA's convention; however, it tends to overestimate the actual NO_X mass emission rates since the majority of NO_X is in the form of NO. NO has less mass per unit volume (i.e., lbs. of emissions per ppmv concentration) than NO_2.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous non-dispersive infrared (NDIR) analyzer was used for this purpose. This reference method analyzer was equipped with a gas correlation filter that removes most interference from moisture, CO_2, and other combustion products.

THC measurements were made via EPA Method 25a. Measurements were made and reported on a methane basis. A flame ionization detector (FID) analyzer was used for this purpose. VOC concentrations were calculated based on the percentage by weight of non-methane/non-ethane hydrocarbons present in the fuel gas. This calculation assumes a proportionate burn ratio, and presents a "worst case" VOC concentration.

Electronic data logs were used to provide a record of the testing on Units 1404 and 1405. These data may also be found in Appendix G.

Cubix personnel collected ambient absolute pressure, temperature and humidity data. A wet/dry bulb sling psychrometer was used to determine ambient temperature and humidity conditions. An aircraft-type aneroid barometer (altimeter) was used to measure absolute atmospheric pressure.

FGT personnel also collected key operational data during each of the test runs and supplied it to Cubix. Key operational data collected included a current fuel analysis, fuel flow, fuel and air manifold pressures/temperatures, suction and discharge pressures, brake horsepower, engine torque, and engine speed. Horsepower measurements presented in the summary tables are those recorded by

an engine analyst at or near the start of each test run. Grams per brake horsepower-hour calculations are on this basis.

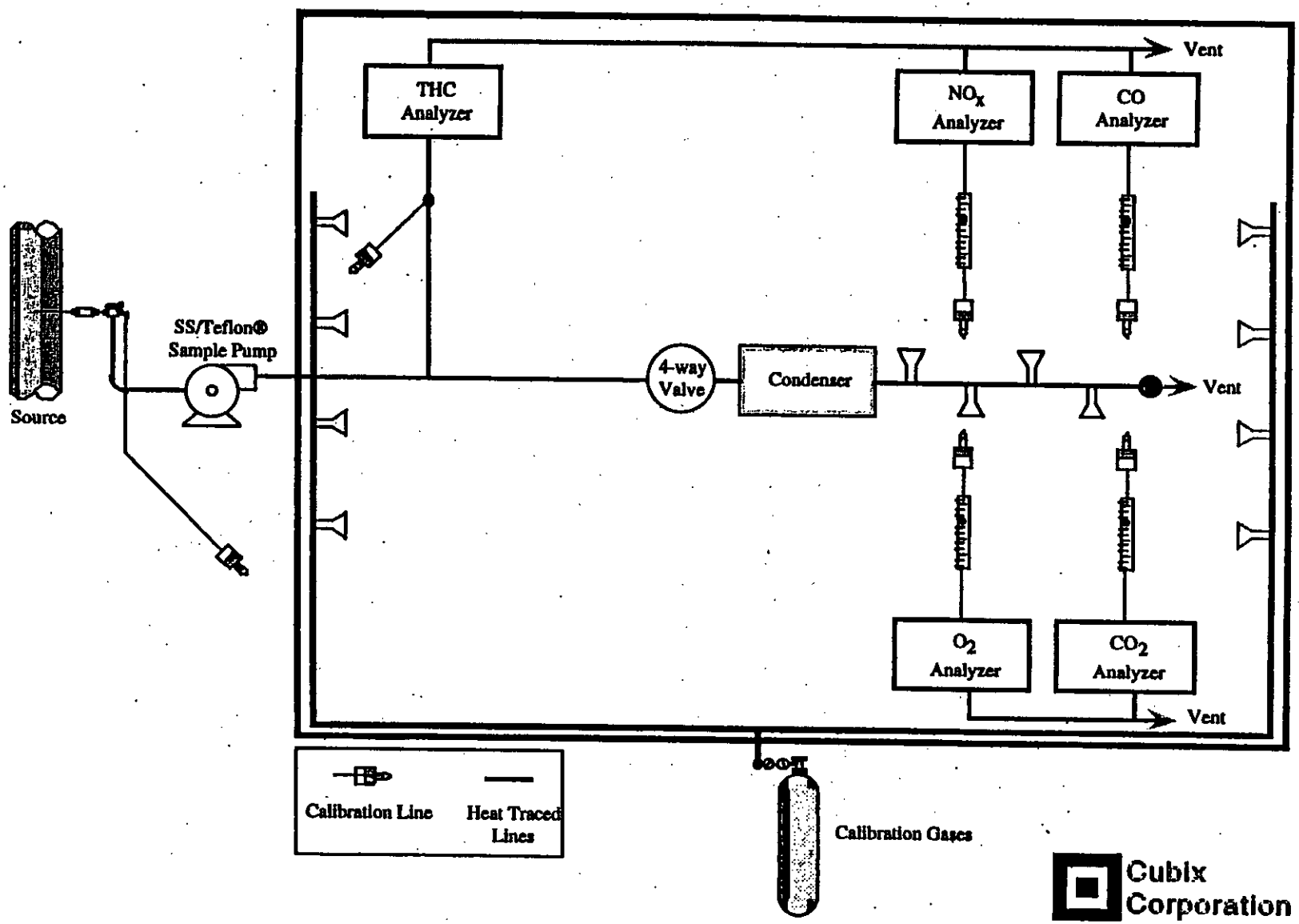
Emission calculations were conducted by a computer spreadsheet as shown in Tables 2-3 of this report. Example calculations were performed manually using a hand-held calculator in order to verify the formulas used in the spreadsheet. Example calculations are in Appendix B of this report.

TABLE 4
ANALYTICAL INSTRUMENTATION

Parameter	Model and Manufacturer	Common Use Ranges	Sensitivity	Response Time (sec.)	Detection Principle
NOx	TECO 10	0-10 ppm 0-100 ppm 0-200 ppm 0-500 ppm 0-1,000 ppm	0.1 ppm	1.7	Thermal reduction of NO to NO_2 Chemiluminescence of reaction of NO with O_3. Detection by PMT. Inherently linear for listed ranges.
CO	TECO 48H	0-10 ppm 0-100 ppm 0-500 ppm 0-1,000 ppm	1 ppm	10.0	Infrared absorption, gas filter correlation detector, microprocessor based linearization.
CO_2	Servomex 1400	0-20% 0-4%	0.02%	10.0	Infrared absorption, solid state detector
O_2	Teledyne Model 320	0-10% 0-23%	0.10%	15.0	Paramagnetic, inherently linear
THC	JUM Model 3-300	0-10, 0-100, 0-1000, 0-10000 0-100000 ppm	0.2 ppm	5.0	Flame ionization of hydrocarbons inherently linear over 2 orders of magnitude.
Temperature	Omega HH-26K	-120 to 2000 °F	0.1 °F	n/a	Chromel-alumel, K-type thermocouple with digital thermometer. Response time based on thermocouple design.

NOTE: Higher ranges available by sample dilution
Other ranges available via signal attenuation.

FIGURE 1
SAMPLE SYSTEM DIAGRAM



QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities were undertaken before, during and after this testing project. This section of the report in conjunction with the documentation in Appendix E describes each of those activities.

Each instrument's response was checked and adjusted in the field prior to the collection of data via a multi-point calibration. The instrument's linearity was checked by first adjusting the instrument's zero and span responses to zero nitrogen and an upscale calibration gas in the range of the expected concentrations. The instrument response was then challenged with other calibration gases of known concentration. For NO_X, CO, THC, O_2, and CO_2, the instrument's response was accepted as being linear if the response of the other calibration gases agreed within _2% span of the predicted values. The response of the infrared absorption type CO and CO_2 analyzers is made linear through electronic suppression.

The efficiency of the NO_2 to NO converter in the NO_X analyzer was checked by monitoring a mixture of NO in N_2 standard gas and zero grade air from a Tedlar® bag. When this bag is mixed and exposed to sunlight, the NO is oxidized to NO_2. If the NO_X instrument's converter is 100% efficient, then the total NO_X response does not decrease as the NO in the bag is converted to NO_2. The criterion for acceptability is demonstrable NO_X converter efficiency greater than 90%; this is demonstrated if the concentration of NO_X does not decrease by more than 2% of the highest read value over a 30-minute period. The strip chart and data log excerpts that demonstrate the converter efficiency test are available in Appendix G. Quality assurance worksheets, found in Appendix E, also summarize the results of each converter efficiency test.

System bias checks were performed both before and after the sampling system was used for emissions testing. The sampling system's integrity was tested by comparing the responses of the NO_X analyzer to a calibration gas (and a zero gas) introduced via two paths as previously described in the *Analytical Techniques* section of this report. This system bias test was performed to assure that no alteration of the sample had occurred during the test due to leakage, reactions, or absorption. Similarly, system bias checks were performed with CO, O_2, and CO_2 for added assurance of sample system integrity. Examination of the strip chart excerpts and Instrumental Analysis Quality Assurance Data worksheet

in Appendix E shows that the analyzer response via both sample paths agreed within ±5%.

The residence time of the sampling and measurement system was estimated using the pump flow rate and the sampling system volume. The pump's rated flow rate is 0.8 scf per minute (scfm) at 5 psig. The sampling system volume was approximately 0.39 scf. Therefore, the minimum sample residence time was approximately 29 seconds.

Cubix Corporation and instrument vendors conducted interference response tests on the NO_X, CO, and O_2 analyzers. The sum of the interference responses for H_2O, C_3H_8, CO, CO_2 and O_2 is less than 2 percent of the applicable full-scale span value. The instruments used for the tests meet the performance specifications for EPA Methods 3a, 7e, 10, and 20. The results of the interference tests are available in Appendix E of this report.

The sampling system was leak checked by demonstrating that it could hold a vacuum greater than 10 inches of mercury (Hg) for at least 1 minute with a decline of less than 1 inch Hg. A leak test was conducted after the sample system was set up (i.e., before testing began) and before the system was dismantled (i.e., after testing was completed). These tests were conducted to insure that ambient air was not diluting the sampling system. The actual vacuum was greater than 25 inches Hg in each case with no leakage detected.

Prior to and following each test run, the analyzers were checked for zero and span drift using the calibration gas line attached to the sample probe. This brackets each test run by calibrations and documents the precision of the data just collected. Based on the applicable test method, the criterion for acceptable data is that each instrument drift no more than ±3% or ±5% of the full-scale response. Appendix E contains quality assurance tables summarizing all calibration error checks and the zero and span checks that were performed for each test run. These worksheets (as prepared from the strip chart records) show that no drift in excess of each gas constituent's calibration requirement was found. The worksheets also contain data used to correct gas concentrations for drift (Method 6c, equation 6c-1).

The control gases used to calibrate the instruments were analyzed and certified by the compressed gas vendors to ±1% accuracy for each calibration gas. EPA Protocol No. 1 was used, where applicable (i.e., NO_X gases), to assign the concentration values traceable to the National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM's). The gas calibration sheets as prepared by the vendor are contained in Appendix F.

The pitot tube tips used during the testing were visually inspected to insure that they met the criteria of EPA Method 2. The pitot tube lines were leak checked in the field in accordance with EPA Method 2 guidelines each time connection to a manometer was made.

The dry gas meters used for the moisture trains were calibrated prior to testing in accordance with EPA Method 4. A NIST reference instrument, a bell prover, was used for these calibrations. Calibration certification documentation of the dry gas meters can be found in Appendix F.

Appendix F also contains calibration data on the altimeter and thermocouples used during this testing.

Cubix collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Cubix makes no warranty as to the suitability of the test methods. Cubix assumes no liability relating to the interpretation and use of the test data.

APPENDIX A:
FIELD DATA SHEETS

Cubix Corporation

FIELD TEST PARTICIPANTS

SIGN IN SHEET

Job Name FGT, Station 14, Quincy, FL NOx Study **DATE(S):** 4-27 00

Job Number 5825 **PERMIT #** 0390029-001-AV

Plant Name/Location Station #14, Quincy, FL

Emission Source(s) Units 1405 & 1404, Worthington Compressor Gaging SEHG-8's Compressor Engines

PARTICIPANTS:

CUBIX CORPORATION — Test Contractor

FGT — Owner/Operator

FDEP (not present) — Regulatory Agency

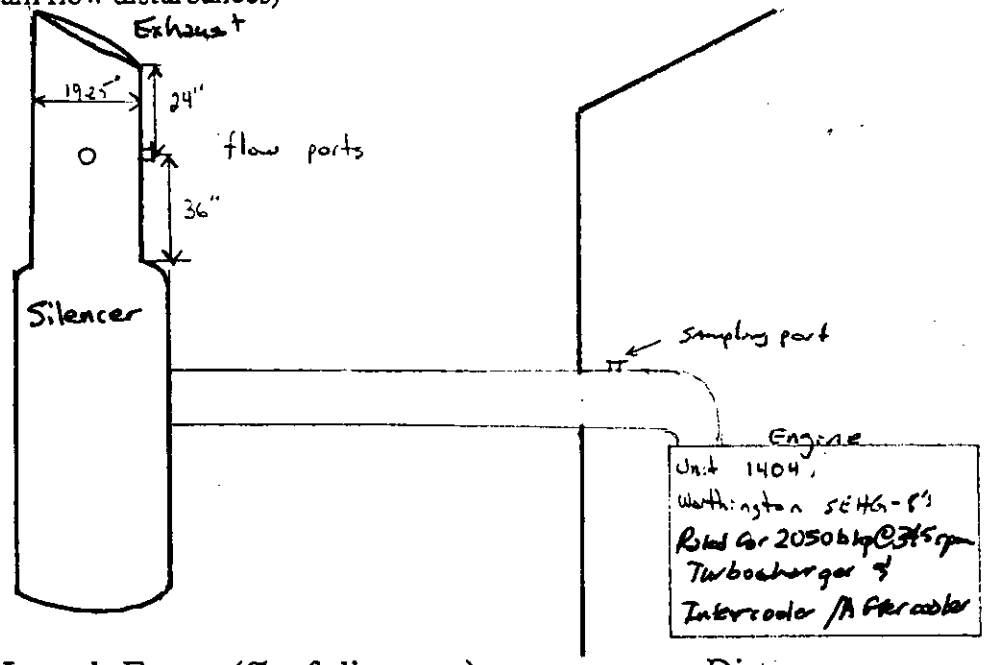
Name:	Affliation:	Position:	Phone Number	Job Safety Review (Y/N)
Leonard Brenner	Cubix Corporation	Project Manager	352 378-0332	Y
Roger Paul Osier	Cubix Corporation	Field Tech	352-378-0332	Y
V Duane Pierce	FGT / AGMC2	Consultant	281 373 5365	Y
William Rogers	Florida Gas	Engine specialist	850-350-5120	Y

Circular Stack Sampling Traverse Point Layout
(EPA Method 1)

Date: 4-27-00
Plant: FGT, Station 14 Quincy, FL
Source: Unit 1404, Worthington 5EHG-8 Compressor Engine
Technician(s): RJO, CSB

Port + Stack ID: 20.75 in.
Port Extension: 1.50 in.
Stack ID: 19.25 in.
Stack Area: 2.02 ft²
Total Req'd Traverse Pts: 16
No. of Traverse Pts: 8 /diam
No. of Traverse Pts: 8 /port

Stack Diagram (Side View showing major unit components, dimensions and nearest upstream & downstream flow disturbances)



Traverse Point Number	Length Factor (% of diameter) Number of Points per Diameter				Distance from Reference Point (inches)
	4	6	(8)	12	
1	6.7	4.4	3.2	2.1	2.12
2	25.0	14.6	10.5	6.7	3.52
3	75.0	29.6	19.4	11.8	5.23
4	93.3	70.4	32.3	17.7	7.72
5		85.4	67.7	25.0	14.53
6		95.6	80.6	35.6	17.02
7			89.5	64.4	19.73
8			96.8	75.0	20.13
9				82.3	
10				88.2	
11				93.3	
12 -				97.9	

EPA Methods 1-4: Velocity, Moisture Content, Molecular Weight, and Volumetric Flow Rates

Test Run No.	**1404-C-1**	**1404-C-2**	**1404-C-3**
Date	4/27/2000	4/27/2000	4/27/2000
Start Time (Moisture Run Times)	14:11	15:26	16:46
Stop Time (Moisture Run Times)	14:48	16:15	17:21
Stack Moisture & Molecular Wt. via EPA Methods 3a & 4			
O_2 (% volume, dry basis)	11.06	11.04	11.03
CO_2 (% volume, dry basis)	5.60	5.54	5.56
Beginning Meter Reading (ft^3)	461.722	486.472	520.417
Ending Meter Reading (ft^3)	486.128	520.053	543.687
Beginning Impingers Weight (g)	2579.3	2557.4	2633.4
Ending Impingers Weight (g)	2639.1	2633.4	2687.2
Dry Gas Meter Factor (K_d)	1.0050	1.0050	1.0050
Dry Gas Meter Temperature (°F begin)	110	117	105
Dry Gas Meter Temperature (°F end)	116	113	110
Atmospheric Pressure ("Hg, absolute)	29.67	29.63	29.64
Volume of Water Vapor Collected (SCF)	2.820	3.583	2.537
Volume of Air Metered (SCF)	22.404	30.678	21.546
Stack Gas Moisture (% volume)	11.18	10.46	10.53
Dry Gas Fraction	0.8882	0.8954	0.8947
Stack Gas Molecular Wt. (lbs/lb-mole)	28.07	28.14	28.14
Stack Moisture via Stoichiometry			
Combustion Moisture (% volume @ 0% excess air)	18.77	18.77	18.77
Moisture Content (% volume, stoichiometric)	10.28	9.98	10.09
Stack Flow Rate via Pitot Tube			
ΔP #1	1.47	1.47	1.39
ΔP #2	1.61	1.52	1.58
ΔP #3	1.66	1.59	1.67
ΔP #4	1.59	1.78	1.77
ΔP #5	1.58	1.59	1.58
ΔP #6	1.48	1.48	1.44
ΔP #7	1.37	1.33	1.35
ΔP #8	1.28	1.12	1.27
ΔP #9	1.56	1.48	1.38
ΔP #10	1.62	1.62	1.52
ΔP #11	1.70	1.66	1.58
ΔP #12	1.63	1.62	1.53
ΔP #13	1.56	1.49	1.68
ΔP #14	1.43	1.44	1.47
ΔP #15	1.38	1.29	1.32
ΔP #16	1.26	1.22	1.13
Pitot Tube Factor	0.84	0.84	0.84
Sum of Square Root of ΔP's	19.6504	19.4410	19.4265
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	1.2282	1.2151	1.2142
Average Temperature (°F)	781.9	780.1	777.1
Static Pressure ("H_2O)	-0.95	-1.18	-1.03
Stack Diameter (inches)	19.25	19.25	19.25
Stack Area (ft^2)	2.0211	2.0211	2.0211
Stack Velocity (ft/min)	6470	6394	6380
Stack Flow, wet (ACFM)	13076	12922	12894
Average Stack Flow, dry (SCFH)	**2.93E+05**	**2.92E+05**	**2.92E+05**

Testing By Cubix Corporation - Austin, Texas - Gainesville, Florida

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 4-27-00
Plant: FGT, Station 14, Quincy, FL
Source: Unit 1404 a Worthington SEHG-8 Compressor Engine
Technicians: RJO, LTB
Atm. Pressure: 29.67 "Hg (Pb)
Test Run No.: 1404-C-1

Dry Gas Meter ID: T-10 Equipment
Dry Gas Meter Factor: 1.0050 (Kd)
Pitot Tube No/Type: 4/010/1/4"S.S. S-Type
Pitot Tube Factor: 0.84
Static Pressure: -0.95 "H_2O (Pg)
Ave. Stack Temp. 781.9 °F (Ts)

Collection Data

Sample Box	T-10 Moisture	
Leak Check ≤ 0.02 ft^3/min		
Pre-Test Leak Check	0.000 ft^3/min 24.5 "Hg Vac.	
Post-Test Leak Check	0.000 ft^3/min 24.5 "Hg Vac.	
	Initial	Final
Time	14:11	14:48
DGM Reading (ft^3 or L)	461.722	486.128
DGM Average Temp (°F)	110	116
Last Impinger Temp. (°F)	65	64.5
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	D.H_2O	683.1	732.3
2	D.H_2O	712.9	717.7
3	MT	531.1	531.4
4	S.Gel	652.2	657.7
5			
6			
Totals		2579.3	2639.1

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O	+	−	
Pre-Test Leak Check	0.0 6.0	0.0 5.5	"H_2O/min "H_2O Pres.
Post-Test Leak Check	0.0 3.9	0.0 4.1	"H_2O/min "H_2O Pres.

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	1.47	777	5	2-1	1.56	778	4
1-2	1.61	783	3	2-2	1.62	781	2
1-3	1.66	785	2	2-3	1.70	783	3
1-4	1.59	787	6	2-4	1.63	785	6
1-5	1.58	788	7	2-5	1.56	787	7
1-6	1.48	788	5	2-6	1.43	787	7
1-7	1.37	781	2	2-7	1.38	783	2
1-8	1.28	773	1	2-8	1.26	765	5

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 4-27-00
Plant: FGT, Station 14, Quincy, FL
Source: Unit 1404 @ Worthington 5GH6-8 Compressor Exhaust
Technicians: RPO, LFB
Atm. Pressure: 29.63 "Hg (Pb)
Test Run No.: 1404-C-2

Dry Gas Meter ID: T-10 Equimeter
Dry Gas Meter Factor: 1.0050 (Kd)
Pitot Tube No/Type: RAIO/¼" S.S. S-TYPE
Pitot Tube Factor: 0.84
Static Pressure: -1.18 "H_2O (Pg)
Ave. Stack Temp. 780.1 °F (Ts)

Collection Data

Sample Box	T-10 Moisture	
Leak Check ≤ 0.02 ft^3/min		
Pre-Test Leak Check	0.000 ft^3/min 25.0 "Hg Vac.	
Post-Test Leak Check	0.000 ft^3/min 25.0 "Hg Vac.	
	Initial	Final
Time	15:26	16:15
DGM Reading (ft^3 or L)	486.472	520.053
DGM Average Temp (°F)	117	113
Last Impinger Temp. (°F)	66	64
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	D.H_2O	650.6	713.1
2	D.H_2O	717.7	224.6
3	MT	531.4	531.5
4	S.G.1	657.7	664.2
5			
6			
Totals		2557.4	2633.4

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	1.47	776	na	2-1	1.48	776	na
1-2	1.52	779		2-2	1.62	779	
1-3	1.59	782		2-3	1.66	782	
1-4	1.78	784		2-4	1.62	784	
1-5	1.59	786		2-5	1.49	785	
1-6	1.48	786		2-6	1.44	785	
1-7	1.33	779		2-7	1.29	780	
1-8	1.12	765	↓	2-8	1.22	773	↓

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O		
Pre-Test Leak Check	+ 0.0	− 0.0 "H_2O/min 7.1 "H_2O Pres.
Post-Test Leak Check	+ 0.0 3.5	− 0.0 "H_2O/min 4.9 "H_2O Pres.

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 4-27-00
Plant: FGT Station 14, Quincy, FL
Source: Unit 1404 @ Worthington SEHG-8 Compressor Engine
Technicians: RPO, LJB
Atm. Pressure: 29.64 "Hg (Pb)
Test Run No.: 1404-C-3

Dry Gas Meter ID: F10 Equimeter
Dry Gas Meter Factor: 1.0050 (Kd)
Pitot Tube No/Type: #1010 / 1/4" S.S. S-Type
Pitot Tube Factor: 0.84
Static Pressure: -1.03 "H_2O (Pg)
Ave. Stack Temp. 772.1 °F (Ts)

Collection Data

Sample Box	T-10 Moisture	
Leak Check ≤ 0.02 ft^3/min		
Pre-Test Leak Check	0.000 ft^3/min 25 "Hg Vac.	
Post-Test Leak Check	0.000 ft^3/min 25 "Hg Vac.	
	Initial	Final
Time	16:46	17:21
DGM Reading (ft^3 or L)	520.417	543.687
DGM Average Temp (°F)	105	110
Last Impinger Temp. (°F)	66	58
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O		
Pre-Test Leak Check	+ 0.0	− 0.0 "H_2O/min 3.6 / 4.1 "H_2O Pres.
Post-Test Leak Check	+ 0.0	− 0.0 "H_2O/min 4.7 / 6.2 "H_2O Pres.

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	D. H_2O	713.1...	757.8
2	D. H_2O	724.6	728.9
3	MT	531.5	531.9
4	Silica Gel	664.2	668.6
5			
6			
Totals		2633.4	2687.2

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

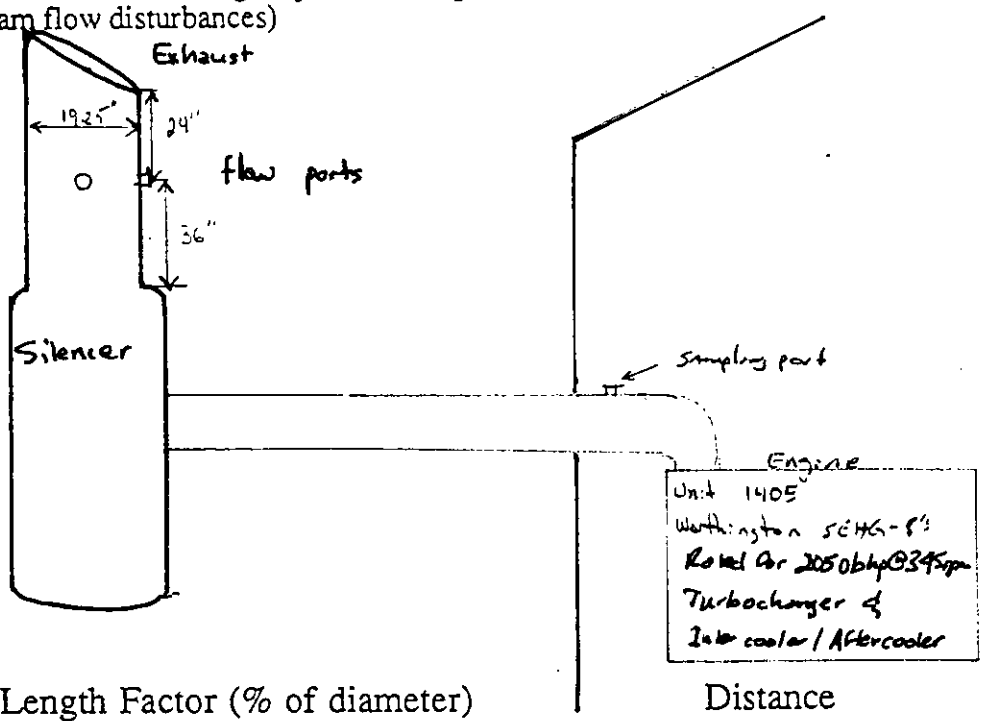
Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	1.39	773	na	2-1	1.38	771	na
1-2	1.58	777	↓	2-2	1.52	775	↓
1-3	1.67	779		2-3	1.58	777	
1-4	1.77	781		2-4	1.53	778	
1-5	1.58	782		2-5	1.68	781	
1-6	1.44	781		2-6	1.47	782	
1-7	1.35	778		2-7	1.32	781	
1-8	1.27	765	↓	2-8	1.13	771	↓

Circular Stack Sampling Traverse Point Layout
(EPA Method 1)

Date: 4-27-00
Plant: FGT, Station 14, Quincy, FL
Source: Unit 1405, Worthington 5GTHG-8 (compressor engine)
Technician(s): RJO, CSB

Port + Stack ID: 20.75 in.
Port Extension: 1.50 in.
Stack ID: 19.25 in.
Stack Area: 2.02 ft²
Total Req'd Traverse Pts: 16
No. of Traverse Pts: 8 /diam
No. of Traverse Pts: 8 /port

Stack Diagram (Side View showing major unit components, dimensions and nearest upstream & downstream flow disturbances)



Traverse Point Number	Length Factor (% of diameter) Number of Points per Diameter				Distance from Reference Point (inches)
	4	6	(8)	12	
1	6.7	4.4	3.2	2.1	2.12
2	25.0	14.6	10.5	6.7	3.52
3	75.0	29.6	19.4	11.8	5.23
4	93.3	70.4	32.3	17.7	7.72
5		85.4	67.7	25.0	14.53
6		95.6	80.6	35.6	17.02
7			89.5	64.4	18.73
8			96.8	75.0	20.13
9				82.3	
10				88.2	
11				93.3	
12				97.9	

EPA Methods 1-4: Velocity, Moisture Content, Molecular Weight, and Volumetric Flow Rates

Test Run No.	**1405-C-1**	**1405-C-2**	**1405-C-3**
Date	4/27/2000	4/27/2000	4/27/2000
Start Time (Moisture Run Times)	09:32	10:39	11:56
Stop Time (Moisture Run Times)	10:10	11:20	12:38
Stack Moisture & Molecular Wt. via EPA Methods 3a & 4			
O_2 (% volume, dry basis)	11.04	11.11	11.11
CO_2 (% volume, dry basis)	5.50	5.50	5.49
Beginning Meter Reading (ft^3)	377.028	403.247	431.604
Ending Meter Reading (ft^3)	402.973	431.345	461.440
Beginning Impingers Weight (g)	2486.5	2556.7	2514
Ending Impingers Weight (g)	2556.7	2625.4	2582.9
Dry Gas Meter Factor (K_d)	1.0050	1.0050	1.0050
Dry Gas Meter Temperature (°F begin)	75	84	92
Dry Gas Meter Temperature (°F end)	85	102	110
Atmospheric Pressure ("Hg, absolute)	29.76	29.75	29.73
Volume of Water Vapor Collected (SCF)	3.310	3.239	3.249
Volume of Air Metered (SCF)	25.349	26.798	28.031
Stack Gas Moisture (% volume)	11.55	10.79	10.39
Dry Gas Fraction	0.8845	0.8921	0.8961
Stack Gas Molecular Wt. (lbs/lb-mole)	28.01	28.10	28.15
Stack Moisture via Stoichiometry			
Combustion Moisture (% volume @ 0% excess air)	18.77	18.77	18.77
Moisture Content (% volume, stoichiometric)	10.02	9.90	9.86
Stack Flow Rate via Pitot Tube			
ΔP #1	1.40	1.32	1.67
ΔP #2	1.70	1.51	1.81
ΔP #3	1.65	1.61	1.67
ΔP #4	1.70	1.65	1.69
ΔP #5	1.72	1.63	1.62
ΔP #6	1.50	1.47	1.41
ΔP #7	1.40	1.22	1.31
ΔP #8	1.20	0.96	1.17
ΔP #9	1.40	1.44	1.53
ΔP #10	1.70	1.49	1.61
ΔP #11	1.75	1.68	1.69
ΔP #12	1.80	1.70	1.80
ΔP #13	1.60	1.63	1.67
ΔP #14	1.55	1.52	1.57
ΔP #15	1.30	1.29	1.36
ΔP #16	0.93	0.94	1.19
Pitot Tube Factor	0.84	0.84	0.84
Sum of Square Root of ΔP's	19.6563	19.1402	19.8661
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	1.2285	1.1963	1.2416
Average Temperature (°F)	770.2	769.0	764.0
Static Pressure ("H_2O)	-1.20	-1.2	-1.45
Stack Diameter (inches)	19.25	19.25	19.25
Stack Area (ft^2)	2.0211	2.0211	2.0211
Stack Velocity (ft/min)	6440	6259	6482
Stack Flow, wet (ACFM)	13015	12649	13101
Average Stack Flow, dry (SCFH)	**2.94E+05**	**2.88E+05**	**3.01E+05**

Testing By Cubix Corporation - Austin, Texas - Gainesville, Florida

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 4-27-00
Plant: FGT, Station 14, Quincy, FL
Source: Unit 1405
Technicians: RIO, CJB
Atm. Pressure: 29.76 " Hg (Pb)
Test Run No.: 1405-C-1

Dry Gas Meter ID: T-10 Equimeter
Dry Gas Meter Factor: 1.0050 (Kd)
Pitot Tube No/Type: #1010 / 1/4" S.S. S-Type
Pitot Tube Factor: 0.84
Static Pressure: -1.2 "H_2O (Ps)
Ave. Stack Temp. 1770.2 °F (Ts)

Collection Data

Sample Box	T-10 Moisture	
Leak Check ≤ 0.02 ft^3/min		
Pre-Test Leak Check	0.000 ft^3/min 24.5 "Hg Vac.	
Post-Test Leak Check	0.000 ft^3/min 24.5 "Hg Vac.	
	Initial	Final
Time	9:32	10:10
DGM Reading (ft^3 or L)	377.028	402.973
DGM Average Temp (°F)	75	85
Last Impinger Temp. (°F)	52.9 ~~67~~	56.5
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	D.H2O	617.2	678.3
2	D.H2O	699.0	702.4
3	mt	529.7	530.2
4	Silica	640.6	645.8
5			
6			
Totals		2486.5	2556.7

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O		
Pre-Test Leak Check	+ / −	"H_2O/min
	0.0 / 0.0	
	4.7 / 3.2	"H_2O Pres.
Post-Test Leak Check	+ / −	"H_2O/min
	0.0 / 0.0	
	4.9 / 5.3	"H_2O Pres.

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	1.4	772	2	2-1	1.4	775	4
1-2	1.7	775	3	2-2	1.7	774	0
1-3	1.65	776	7	2-3	1.75	775	3
1-4	1.7	776	1	2-4	1.8	777	2
1-5	1.72	776	5	2-5	1.6	771	5
1-6	1.5	774	6	2-6	1.55	774	7
1-7	1.4	768	10	2-7	1.3	769	8
1-8	1.2	745	8	2-8	0.93	740	3

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 4-27-00
Plant: FGT, Station 14, Quincy, FL
Source: Unit 1405, a Worthington SEHG-8 Compressor Engine
Technicians: BJO, LJB
Atm. Pressure: 29.75 "Hg (Pb)
Test Run No.: 1405-C-2

Dry Gas Meter ID: T-10 Equimeter
Dry Gas Meter Factor: 1.0050 (Kd)
Pitot Tube No/Type: #1010 / 1/4" S.S. S-Type
Pitot Tube Factor: 0.84
Static Pressure: -1.2 "H_2O (Pg)
Ave. Stack Temp. 769.0 °F (Ts)

Collection Data

Sample Box	T-10 Moisture	
Leak Check ≤ 0.02 ft^3/min		
Pre-Test Leak Check	0.006 ft^3/min 25 "Hg Vac.	
Post-Test Leak Check	0.002 ft^3/min 24.5 "Hg Vac.	
	Initial	Final
Time	10:39	11:20
DGM Reading (ft^3 or L)	403.247	431.345
DGM Average Temp (°F)	84	102
Last Impinger Temp. (°F)	65	60
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	$D.H_2O$	678.3	736.9
2	$D.H_2O$	702.4	706.7
3	MT	530.2	530.6
4	Silica	645.8	651.2
5			
6			
Totals		2556.7	2625.4

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O	+	−	
Pre-Test Leak Check	0.0	0.0	"H_2O/min
	3.6	4.3	"H_2O Pres.
Post-Test Leak Check	0.0	0.0	"H_2O/min
	5.2	6.3	"H_2O Pres.

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	1.32	770	NA	2-1	1.44	767	N/A
1-2	1.51	772		2-2	1.49	771	
1-3	1.61	776		2-3	1.68	772	
1-4	1.65	778		2-4	1.70	775	
1-5	1.63	778		2-5	1.63	775	
1-6	1.47	778		2-6	1.52	776	
1-7	1.22	769		2-7	1.29	770	
1-8	0.96	740	↓	2-8	0.94	737	↓

MOISTURE & VELOCITY FIELD DATA SHEET

Date: 4-27-00
Plant: FGT, Station 14, Quincy, FL
Source: Unit 1405, a Worthington 38H6-8 Compressor Engine
Technicians: RPO, CJB
Atm. Pressure: 29.73 "Hg (Pb)
Test Run No.: 1405-C-3

Dry Gas Meter ID: T-10 Equimeter
Dry Gas Meter Factor: 1.0050 (Kd)
Pitot Tube No/Type: #1010/1/4" S.S. S-Type
Pitot Tube Factor: 0.84
Static Pressure: - - 1.45 "H_2O (Pg)
Ave. Stack Temp. 764.0 °F (Ts)

Collection Data

Sample Box	T-10 Moisture	
Leak Check ≤ 0.02 ft^3/min		
Pre-Test Leak Check	0.000 ft^3/min 25 "Hg Vac.	
Post-Test Leak Check	0.000 ft^3/min 240 "Hg Vac.	
	Initial	Final
Time	11:56	12:38
DGM Reading (ft^3 or L)	431.604	461.440
DGM Average Temp (°F)	92	110
Last Impinger Temp. (°F)	66	60.4
DGM Flow Rate	40	40
O_2 (% vol.)		
CO_2 (% vol.)		

Impingment System

Impinger	Contents	Initial Weight	Final Weight
1	D; H_2O	625.5	683.1
2	D; H_2O	706.7	712.9
3	mT	530.6	531.1
4	S; Gel	651.2	655.8
5			
6			
Totals		2514	2582.9

Velocity System Leak Check

Leak Check ≤ 0.1 "H_2O/min at a pressure ≥ 3.0 "H_2O	+	−
Pre-Test Leak Check	0.0 4.6	0.0 "H_2O/min 3.9 "H_2O Pres.
Post-Test Leak Check	0.0 5.7	0.0 "H_2O/min 3.6 "H_2O Pres.

Velocity Traverse Data
with Stack Temperature and Cyclonic Flow Check

Point	ΔP ("H_2O)	°F	α	Point	ΔP ("H_2O)	°F	α
1-1	1.67	763	na	2-1	1.53	762	na
1-2	1.81	766	↓	2-2	1.61	766	↓
1-3	1.67	768		2-3	1.69	768	
1-4	1.69	769		2-4	1.80	770	
1-5	1.62	770		2-5	1.67	771	
1-6	1.41	769		2-6	1.57	771	
1-7	1.31	762		2-7	1.36	766	
1-8	1.17	734	↓	2-8	1.19	749	↓

APPENDIX B:
EXAMPLE CALCULATIONS

Example Calculations

(Note: Any differences between these calculations and the computer generated field summaries are attributed to numerical rounding and truncating.)

Corrected Emission Concentrations

Refers to test run 1404-C-1 (Eq. 6c-1)

$$Cgas = (Ç - C_o) \times \frac{C_{ma}}{C_m - C_o} = \text{equation 6c-1}$$

ÇNOx = concentration of NOx (uncorrected) = 2048.4 ppmv
C_o = avg. of initial and final cal. bias checks, zero gas = 61.5 ppmv
C_m = avg. of initial and final cal. bias checks, drift check gas = 3504.0 ppmv
C_{ma} = actual concentration of upscale cal. gas = 3492 ppmv

$$\textbf{CNOx} = (2048.4 - 61.5) \times \frac{3492}{3504.0 - 61.5} = \textbf{2015.5 ppmv}$$

ÇCO = concentration of CO (uncorrected) = 169.4 ppmv
C_o = avg. of initial and final cal. bias checks, zero gas = (-0.35) ppmv
C_m = avg. of initial and final cal. bias checks, drift check gas = 439.1 ppmv
C_{ma} = actual concentration of upscale cal. gas = 447.0 ppmv

$$\textbf{CCO} = (169.4 - (-035) \times \frac{447.0}{439.1 - (-0.35)} = \textbf{172.7 ppmv}$$

$ÇO_2$ = concentration of O_2 (uncorrected) = 11.26%
C_o = avg. of initial and final cal. bias checks, zero gas = 0.21%
C_m = avg. of initial and final cal. bias checks, drift check gas = 12.11%
C_{ma} = actual concentration of upscale cal. gas = 11.91%

$$\textbf{CO}_2 = (11.26 - 0.21) \times \frac{11.91}{12.11 - 0.21} = \textbf{11.06\%}$$

$ÇCO_2$ = concentration of CO_2 (uncorrected) = 5.58%
C_o = avg. of initial and final cal. bias checks, zero gas = 0.16%
C_m = avg. of initial and final cal. bias checks, drift check gas = 7.91%
C_{ma} = actual concentration of upscale cal. gas = 8.00%

$$\textbf{CCO}_2 = (5.58 - 0.16) \times \frac{8.00}{7.91 - 0.16} = \textbf{5.60\%}$$

ÇTHC = concentration of THC (uncorrected) = 978.0 ppmv
C_o = avg. of initial and final cal. bias checks, zero gas = (-3.5) ppmv
C_m = avg. of initial and final cal. bias checks, drift check gas = 1788.0 ppmv

C_{ma} = actual concentration of upscale cal. gas = 1811.0 ppmv

CTHC = (978.0 - (-3.5)) x $\frac{1811}{1788.0 - (-3.5)}$ = **992.2 ppmv**

Calculation of VOC from THC ppmv and fuel analysis

Refers to test run 1404-C-1

CTHC = 992.2 ppmv
%NM,NE = 2.60% (from fuel analysis)

CVOC = CTHC x %NM, NE
= 992.2 x 0.026

CVOC = 25.8 ppmv

F_o Calculation to Verify O2/CO2 Measurements

Refers to test run 1404-C-1

C_{CO2} = concentration of cabon dioxide = 5.60% (from analyzer)
C_{O2} = concentration of oxygen = 11.06% (from analyzer)

$$F_o = \frac{20.9 - \%\ O_2}{\%\ CO_2}$$

$$F_o = \frac{20.9 - 11.06}{5.60}$$

F_o = 1.757 *(acceptable F_O values for natural gas = 1.600 to 1.836)*

Moisture Content via EPA Method 4

Refers to test run 1404-C-1 (eq. 4-4)

V_1 = initial dry gas meter reading = 461.722 ft^3

V_2 = final dry gas meter reading = 486.128 ft^3

V_M = total gas sample volume collected

= $V_2 - V_1$ = 24.406 ft^3

Y = dry gas meter factor (unitless) = 1.005

$V_{Mcorrected}$ = V_M x Y = 24.406 x 1.005

= 24.528 ft^3

W_i = initial weight of impinger train = 2579.3 g

W_f = final weight of impinger train = 2639.1 g

W_{tot} = total weight gain of all impingers (g)

= $W_f - W_i$ = 59.80 g

K_2 = 1.335 liters /1.0 gram @ EPA STP

K_3 = $\left(\frac{528°R}{29.92"Hg}\right)$ x 28.3 l/ft^3= 499.4 @ EPA STP

P_{atm} = atmospheric pressure (in Hg), ground level = 29.67

T = average temperature of Dry Gas Meter (°F) = 113

$$V_{M(std)} = \left(\frac{V_{Mcorrected} \times P_{atm} \times K_3}{T + 460}\right)$$

$$= \left(\frac{24.528 \times 29.67 \times 499.4}{113 + 460}\right) = 634.269$$

B_{WS} = moisture fraction by volume

$$= \left(\frac{W_{tot} \times K_2}{(W_{tot} \times K_2) + V_{M(std)}}\right)$$

$$= \left(\frac{59.8 \times 1.335}{(59.8 \times 1.335) + 634.269}\right)$$

B_{WS} = 0.1118 = 11.18% moisture

Stack Gas Molecular Weight

Refers to test run 1404-C-1 (eq. 3-1 and eq. 2-5)

M_S	= wet molecular weight of stack gas (lb/lb-mole)	
M_d	= dry molecular weight of stack gas (lb/lb-mole)	
B_{WS}	= moisture fraction by volume = 0.1118	
MW_{H_2O}	= molecular wt of H_2O	= 18 lb/lb-mole
MW_{CO_2}	= molecular wt of CO_2	= 44 lb/lb-mole
MW_{O_2}	= molecular wt of O_2	= 32 lb/lb-mole
MW_{N_2}	= molecular wt of N_2	= 28 lb/lb-mole
C_{CO_2}	= vol. fraction dry CO_2	= 0.0560 (from analyzer)
C_{O_2}	= vol. fraction dry O_2	= 0.1106 (from analyzer)
C_{N_2}	= vol. fraction dry = $1-(C_{CO_2} + C_{O_2}) = 0.8334$	
$1 - B_{WS}$	= dry gas fraction	= 0.8882

M_S = wt. of CO_2 + wt. of O_2 + wt. of N_2 (Eq. 3-1)

$= ((MW_{CO_2} \times C_{CO_2}) + (MW_{O_2} \times C_{O_2}) + (MW_{N_2} \times C_{N_2}))$

$= ((44 \times 0.0560) + (32 \times 0.1106) + (28 \times 0.8334))$

M_S = 29.338 lb/lb-mole

M_d = $(18 \times B_{WS}) + ((1-B_{WS}) \times M_d)$ (Eq 2-5)

$= (18 \times 0.1118) + (0.8882 \times 29.338)$

M_d = 28.07

Stack Gas Flow Rate via Pitot Tube

Refers to test run 1404-C-1 (eq. 2-6, 2-8, 2-9, 2-10)

C_p = pitot tube coefficient, dimensionless = 0.84

ΔP = pressure difference in stack as measured (in. H_2O)

$(\sqrt{\Delta P})_{avg}$ = average of square root of ΔP's =1.2282 (from pitot readings)

t_s = stack temperature = 781.9°F

T_s = absolute stack temperature, °R

$= t_s + 460 = 1241.9$ °R (eq. 2-8)

K_p = pitot tube constant = 85.49 ft/sec $\sqrt{\left(\frac{\text{lb/lb mole x in. Hg}}{\text{°R x in. } H_2O}\right)}$

= pitot tube constant =5129 ft/min $\sqrt{\left(\frac{\text{lb/lb mole x in. Hg}}{\text{°R x in. } H_2O}\right)}$

K_y = standard temperature/pressure constant

$$= \frac{528°R}{29.92\ "Hg} \times \frac{60\ \text{minutes}}{\text{hour}} = 1059$$

P_b = atmospheric pressure (in Hg) = 29.67

P_g = stack static pressure (in. H_2O) = (-0.95)

P_s = absolute stack pressure (eq. 2-6)

$= P_b + (P_g \times .0735\ \text{in.Hg / in.}H_2O) = 29.60$ in. Hg

A = area of stack (ft^2) $= \dfrac{\frac{\text{diameter}^2}{4} \times \Pi}{144\ in^2/ft^2}$

$$= \frac{\frac{19.25^2}{4} \times 3.1416}{144\ in^2/ft^2} = 2.0211\ ft^2$$

v_s = stack velocity (ft/min)

$= K_p \times C_p \times (\sqrt{\Delta P})_{avg} \times \sqrt{\frac{T_s}{P_s \times M_s}}$ (eq. 2-9)

$= 5129 \times 0.84 \times 1.2282 \times \sqrt{\frac{1241.9}{29.60 \times 28.07}}$

= 6,469.3 ft/min at stack conditions

Q_a = stack flow rate (ft^3/min)

$= v_s \times A$, where A= area of stack = 2.0211 ft^2

= 6,469.3 x 2.0211 = 13,075.1 ft^3/min at stack conditions

Qd = stack flow rate on dry basis at standard conditions (DSCFH)

$$= Q_a \times K_y \times \frac{P_S}{T_S} \times 1 - B_{WS} \text{ (eq. 2-10)}$$

$$= 13{,}075.1 \times 1059 \times \frac{29.60}{1241.9} \times 0.8882$$

Qd = 293,128 DSCFH = 2.93E+05 DSCFH

Qw = stack flow rate on wet basis at standard conditions (DSCFH)

$$= Q_a \times K_y \times \frac{P_S}{T_S}$$

$$= 13{,}075.1 \times 1059 \times \frac{29.60}{1241.9}$$

Qw = 330,024 DSCFH = 3.30E+05 DSCFH

Mass Emission Rates using EPA Methods 1-4, lb/hr

Refers to test run 1404-C-1

CNOx	=2015.5 ppmv (corrected)
CCO	= 172.2 ppmv (corrected)
CVOC	= 25.8 PPMV (calculated from corrected THC)
Qd	= 2.93E+05 (from pitot tube data)
Qw	= 3.30E+05 (from pitot tube data)
MW of NOx	= 46.01 lb/lb-mole
MW of CO	= 28.00 lb/lb-mole
MW of VOC (as CH_4)	= 16.01 lb/lb-mole

for ideal gas, 385.15 SCF = 1.0 lb/mole @ EPA STP

E_X = mass emission rate of x, (lb/hr)

$$=C_X \times Qd \times 10^{-6} \times \frac{MW}{385.15}$$

$$E_{NOx} = 2015.5 \times 2.93E+05 \times 10^{-6} \times \frac{46.01}{385.15}$$

E_{NOx} = 70.55 lb/hr

$$E_{CO} = 172.2 \times 2.93E+05 \times 10^{-6} \times \frac{28.00}{385.15}$$

E_{CO} = 3.67 lb/hr

$$E_{voc} = 25.8 \times 3.30E+05 \times 10^{-6} \times \frac{16.01}{385.15}$$

E_{voc} = 0.354 lb/hr

Mass Emission Rates using EPA Methods 1-4, g/BHp-H

Refers to test run 1404-C-1

ENOx	= 70.55 lb/hr
ECO	= 3.67 lb/hr
CVOC	= 0.354 lb/hr
BHp	= 1942
g/lb	= 454

$$\text{g/BHp-H} = \frac{E_X \times \text{g/lb}}{\text{BHp}}$$

$$\text{NOx g/Hp-H} = \frac{70.55 \times 454}{1942}$$

NOx g/Hp-H = 9.71

$$\text{CO g/Hp-H} = \frac{3.67 \times 454}{1942}$$

CO g/Hp-H = 0.84

$$\text{VOC g/Hp-H} = \frac{0.354 \times 454}{1942}$$

VOC g/Hp-H = 0.083

APPENDIX C:
FUEL ANALYSIS AND CALCULATIONS

Enron Corp
Houston, Texas
CHROMATOGRAPH REPORT
for 04/00

04/27/00 08:20:32
PAGE 1

Chromatograph ID: 8031
Chromatograph Name: PERRY STREAM #2
Chromatograph Code: S

Check Limits	Lower	Upper
BTU:	0	9999
Sp. Gravity:	0.0000	3.2767

POI Number: 0

Dy	N2	CO2	Grav	BTU	Methane	Ethane	Propane	Ibutane	Nbutane	Ipentan	Npentan	C6	C7	H2	Helium	Oxygen
1	0.4023	0.6265	0.5844	1038.1638	95.6249	2.6881	0.3741	0.0887	0.0812	0.0331	0.0214	0.0298	0.0298	0.0000	0.0000	0.0000
2	0.3942	0.6419	0.5841	1037.4976	95.6773	2.6368	0.3728	0.0862	0.0792	0.0317	0.0204	0.0297	0.0298	0.0000	0.0000	0.0000
3	0.4099	0.6662	0.5848	1037.7128	95.6045	2.6298	0.3988	0.0930	0.0865	0.0330	0.0214	0.0284	0.0284	0.0000	0.0000	0.0000
4	0.4154	0.6509	0.5865	1040.6236	95.3409	2.8503	0.4274	0.1020	0.0925	0.0356	0.0228	0.0311	0.0311	0.0000	0.0000	0.0000
5	0.4006	0.6546	0.5850	1038.4141	95.5754	2.6839	0.3901	0.0941	0.0831	0.0345	0.0221	0.0307	0.0308	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.4068	0.6669	0.5873	1041.5866	95.2628	2.8520	0.4826	0.1078	0.1099	0.0326	0.0214	0.0285	0.0286	0.0000	0.0000	0.0000
8	0.4261	0.6786	0.5877	1041.6417	95.2346	2.8438	0.4684	0.1096	0.1118	0.0371	0.0256	0.0322	0.0323	0.0000	0.0000	0.0000
9	0.4254	0.7037	0.5873	1040.3099	95.2593	2.8316	0.4599	0.1063	0.1046	0.0321	0.0202	0.0285	0.0286	0.0000	0.0000	0.0000
10	0.4159	0.7169	0.5870	1039.6824	95.3010	2.8075	0.4477	0.1025	0.1007	0.0311	0.0196	0.0285	0.0285	0.0000	0.0000	0.0000
11	0.4242	0.7385	0.5875	1039.8057	95.2264	2.8476	0.4498	0.1020	0.1016	0.0316	0.0200	0.0291	0.0292	0.0000	0.0000	0.0000
12	0.4239	0.7454	0.5885	1041.1900	95.1180	2.8975	0.4774	0.1108	0.1097	0.0340	0.0218	0.0308	0.0308	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.4185	0.7454	0.5885	1041.3553	95.1569	2.8336	0.4958	0.1135	0.1150	0.0354	0.0226	0.0316	0.0317	0.0000	0.0000	0.0000
15	0.4074	0.7495	0.5892	1042.4002	95.0852	2.8805	0.5161	0.1174	0.1186	0.0371	0.0237	0.0322	0.0323	0.0000	0.0000	0.0000
16	0.4068	0.7577	0.5890	1041.9814	95.1218	2.8486	0.5031	0.1158	0.1161	0.0372	0.0238	0.0345	0.0346	0.0000	0.0000	0.0000
17	0.4063	0.7723	0.5885	1040.8428	95.1627	2.8292	0.4862	0.1128	0.1122	0.0345	0.0217	0.0310	0.0311	0.0000	0.0000	0.0000
18	0.4182	0.7644	0.5877	1039.5228	95.2814	2.7479	0.4537	0.1080	0.1042	0.0359	0.0229	0.0316	0.0317	0.0000	0.0000	0.0000
[illegible]	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.4176	0.6685	0.5869	1040.7150	95.3224	2.8140	0.4532	0.1034	0.1031	0.0339	0.0224	0.0307	0.0307	0.0000	0.0000	0.0000
21	0.4323	0.6595	0.5882	1042.6927	95.0999	2.9870	0.4864	0.1085	0.1110	0.0337	0.0220	0.0298	0.0298	0.0000	0.0000	0.0000
22	0.4220	0.7402	0.5892	1042.4987	95.0320	2.9576	0.4957	0.1122	0.1109	0.0373	0.0240	0.0340	0.0341	0.0000	0.0000	0.0000
23	0.4101	0.7078	0.5874	1040.6677	95.2600	2.8276	0.4741	0.1045	0.1022	0.0335	0.0214	0.0294	0.0294	0.0000	0.0000	0.0000
24	0.4038	0.7048	0.5873	1040.6496	95.2866	2.8095	0.4724	0.1053	0.1059	0.0318	0.0203	0.0298	0.0298	0.0000	0.0000	0.0000
25	0.4141	0.6962	0.5882	1042.0750	95.1286	2.9368	0.4938	0.1085	0.1119	0.0316	0.0203	0.0290	0.0291	0.0000	0.0000	0.0000
26	0.3947	0.6874	0.5874	1041.4406	95.2576	2.8498	0.4837	0.1081	0.1100	0.0312	0.0199	0.0288	0.0288	0.0000	0.0000	0.0000
27	0.4000	0.6872	0.5871	1040.9130	95.2838	2.8412	0.4682	0.1053	0.1061	0.0314	0.0198	0.0284	0.0285	0.0000	0.0000	0.0000
28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Avg: 0.3299 0.5610 0.4698 832.4794

Remarks: DAY 9 EST'D FROM DAY 8.

04/01-04/30: 8031

Gas Fuel F Factor & Heating Value Caculation

Florida Gas Transmission
Sample ID: Perry Lab, Stream #2
Time: Daily Average
Date: April 27, 1999

CALCULATION OF DENSITY AND HEATING VALUE @ 60°F and 30 in Hg

Component	% Volume	Molecular Wt.	Density (lb/ft3)	% volume x Density	weight %	Component Gross Btu/lb	Weight Fract. Btu	Gross Heat Value (Btu/SCF)	Volume Fract. Btu
Hydrogen		2.016	0.0053	0.00000	0.0000	61100	0.00	325.0	0
Oxygen		32.000	0.0846	0.00000	0.0000	0	0.00	0.0	0
Nitrogen	0.4000	28.016	0.0744	0.00030	0.6627	0	0.00	0.0	0
Carbon dioxide	0.6872	44.010	0.1170	0.00080	1.7905	0	0.00	0.0	0
Carbon monoxide		28.010	0.0740	0.00000	0.0000	4347	0.00	322.0	0
Methane	95.2838	16.041	0.0424	0.04040	89.9690	23879	21483.70	1013.0	965.225
Ethane	2.8412	30.067	0.0803	0.00228	5.0807	22320	1134.02	1792.0	50.9143
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614.0	0
Propane	0.4682	44.092	0.1196	0.00056	1.2470	21661	270.12	2590.0	12.1264
propylene		42.077	0.1110	0.00000	0.0000	21041	0.00	2336.0	0
Isobutane	0.1053	58.118	0.1582	0.00017	0.3710	21308	79.05	3363.0	3.54124
n-butane	0.1061	58.118	0.1582	0.00017	0.3738	21257	79.46	3370.0	3.57557
Isobutene		56.102	0.1480	0.00000	0.0000	20840	0.00	3068.0	0
Isopentane	0.0314	72.144	0.1904	0.00006	0.1331	21091	28.08	4008.0	1.25851
n-pentane	0.0198	72.144	0.1904	0.00004	0.0840	21052	17.67	4016.0	0.79517
n-hexane +	0.0569	86.169	0.2274	0.00013	0.2881	20940	60.34	4762.0	2.70958
Hydrogen sulfide		34.076	0.0911	0.00000	0.0000	7100	0.00	647.0	0
total	100.00	Average Density		0.04490	100.0000	**Gross Heating Value**		**Gross Heating Value**	
		Specific Gravity		0.58699		**Btu/lb**	**23152**	**Btu/SCF**	**1040.1**

CALCULATION OF F FACTORS

Component	Mol. Wt.	C Factor	H Factor	% volume	Fract. Wt.	Weight Percents Carbon	Hydrogen	Nitrogen	Oxygen
Hydrogen	2.016	0	1	0.00	0.0000		0		
Oxygen	32.000	0	0	0.00	0.0000				0
Nitrogen	28.016	0	0	0.40	11.2064			0.660423463	
Carbon dioxide	44.010	0.272273	0	0.69	30.2437	0.485283438			1.29576
Carbon monoxide	28.010	0.42587	0	0.00	0.0000	0			0
Methane	16.041	0.75	0.25	95.28	1528.4474	67.55665614	22.5188854		
Ethane	30.067	0.8	0.2	2.84	85.4264	4.027525183	1.0068813		
Ethylene	28.051	0.85714	0.14286	0.00	0.0000	0	0		
Propane	44.092	0.81818	0.181818	0.47	20.6439	0.995397261	0.22119966		
Propene	42.077	0.85714	0.14286	0.00	0.0000	0	0		
Isobutane	58.118	0.82759	0.17247	0.11	6.1198	0.298476841	0.06220266		
n-butane	58.118	0.82759	0.17247	0.11	6.1663	0.300744472	0.06267524		
Isobutene	56.102	0.85714	0.14286	0.00	0.0000	0	0		
Isopentane	72.144	0.83333	0.16667	0.03	2.2653	0.111250829	0.0222507		
n-pentane	72.144	0.83333	0.16667	0.02	1.4285	0.070151797	0.0140307		
n-hexane	86.169	0.83721	0.16279	0.06	4.9030	0.241910155	0.04703784		
Hydrogen sulfide	34.076	0	0.058692	0.00	0.0000	0	0		
Totals				99.99990	1696.8507	74.08739612	23.96	0.660423463	1.29576

CALCULATED VALUES		
O_2 F Factor (dry)	**8640**	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O_2 F Factor (wet)	**10637**	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	**1997**	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	**18.77**	volume % water in flue gas @ 0% excess air
CO_2 F Factor	**1027**	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air
Fuel VOC % (non-C1)	**7.67%**	
Fuel VOC % (non-C1,C2)	**2.60%**	

1404

24-Apr-00

	AS FOUND		AS LEFT
	test	actual	
FUEL TEMP.	69	69	69
MANIFOLD TEMP.			
MANIFOLD RESS.			
RUNNING TEST			
FUEL STATIC PRESS.	0	0	0
	50	50	50
	100	100	100
RUNNING TEST	77.4	77.4	77.4
FUEL HEADER PRESS.			
FUEL DIFF.	0	0	0
	10	10	10
	20	20	20
ORIFICE PLATE	2 X 1.125		

1405

24-Apr-00

	AS FOUND		AS LEFT
	test	actual	
FUEL TEMP.	69	69	69
MANIFOLD TEMP.			
MANIFOLD RESS.			
RUNNING TEST			
FUEL STATIC PRESS.	0	0	0
	50	50	50
	100	100	100
RUNNING TEST	78.5	78.5	78.5
FUEL HEADER PRESS.			
FUEL DIFF.	0	0	0
	25	25	25
	45	45	45
ORIFICE PLATE	2 x 1.125		

APPENDIX D:
OPERATIONAL DATA

1404-C-1

Compressor Health Report
FloridaGas
Unit 1404 Worthington BDC-1

Name: 1404-C ~~1404-C~~ Model: BDC-1 Date: 4/27/00 1:36:05 PM
Location: Quincy Compressor St Unit Mfr: Worthington Serial No.:

Mechanical Efficiency, %	95	Marker Correction Angle, deg	88.0	Periods Collected (PT)	10
Overall Efficiency, %	85	Stroke, (ins)	15.000		
Atmospheric Pressure, psia	14.7	Speed, RPM	345	Specific Gravity	0.554
Load Step	1				

Cyl End	Stg	Clr Set (%)	Bore (ins)	Rod Diam (ins)	ConRod Length (ins)	Pressure Ps (psig)	Pressure Pd (psig)	Temp. Ts	Temp. Td	Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (ihp)	Suction Loss (ihp)	Disch. Loss (ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
1H	1	199	16.500	N/A	40.000	691	926	67F	111F	1.33	31.06	432.8	23.0	22.5	1.00	11	116C	65	53
1C	1	126	16.500	4.000	40.000	690	923	67F	111F	1.33	35.00	493.2	23.5	32.9	1.02	11	45T	79	64
2H	1	202	16.500	N/A	40.000	694	923	67F	111F	1.32	30.60	420.3	25.6	25.6	1.00	12	118C	64	53
2C	1	127	16.500	4.000	40.000	688	920	67F	111F	1.33	34.98	498.5	24.1	41.5	1.00	11	44T	79	64

Notes:
1. Rod loading is based on maximum differential pressure across the rings. C - Compression, T - Tension. Forces due to inertia are not accounted for in this table.
2. Flow Balance = capacity from suction VE / capacity from discharge VE.
3. If the flow balance is much greater than 1.0 suspect leaking suction valves or rings. If the flow balance is much less than 1.0 suspect leaking discharge valves or rings.
4. Discharge Temp. Delta = actual discharge temp - theoretical.
5. If Suction or Discharge Temperatures are not found, some calculations may not be available as indicated by a "–".
6. Gas power = Total indicated power for all cylinders / Mechanical Efficiency.
7. Compressor total brake power = Gas power + Auxiliary brake power * RPM / Rated RPM.
8. Derated power is obtained by derating the rated power to actual run speed.
9. Compressor efficiency is the total indicated power - suction and discharge losses as a percentage of the total indicated power.
10. Marker Type: Encoder (ENC) and Trap Type: 9002.
11. Channel Resonance Correction (CRC) applied: 1C 1H 2H 2C
12. Corrected VE applied, PS and PD values Corrected: None

Total Indicated Power, (ihp)	1845	@	345	RPM	Rated Power, (bhp)	2030	@ 345	RPM
Gas Power, (ghp)	1942	@	345	RPM	Derated Power, (bhp)	2029	@ 345	RPM
Auxiliary Power, (bhp)	0	@	345	RPM	Percent Torque Load, %	96	%	
Compressor Total Power, (bhp)	1942	@	345	RPM	Compressor Efficiency, %	88	%	

Observations and Recommendations	Machine Condition Notes

Analyst Signature: 4/27/00 1:48:00 PM

1404-C-1c

1404 UNIT OPERATING DATA

2:14:51 | 4/27/00

TEST # 1404-C-12

ENGINE SPEED	343	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.6	"Hg
AIR MANIFOLD TEMP.	95	°F
TURBOCHARGER VIBRATION	0.58	IN/SEC
FUEL STATIC PRESS.	75.2	PSIG
FUEL DIFF. PRESS.	17.8	"H20
FUEL GAS HEADER PRESS.	17.4	PSIG
FUEL TEMP.	76	°F
COMPUTER FUEL FLOW SCF	13966	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	815	°F
CYLINDER #2 TEMP.	835	°F
CYLINDER #3 TEMP.	816	°F
CYLINDER #4 TEMP.	797	°F
CYLINDER #5 TEMP.	852	°F
CYLINDER #6 TEMP.	806	°F
CYLINDER #7 TEMP.	833	°F
CYLINDER #8 TEMP.	798	°F
MODE	AUTO	

AMBIENT TEMPERATURE	89	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	928	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	112	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1885	BHP
TORQUE	93	%
GEO. HP	1928	BHP
GEO. HP - FUEL TORQUE HP	-47	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404-C-19

1404 UNIT OPERATING DATA

2:45:05 | 4/27/00

TEST # 1404-C-16

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.3	"Hg
AIR MANIFOLD TEMP.	95	°F
TURBOCHARGER VIBRATION	0.55	IN/SEC
FUEL STATIC PRESS.	75.0	PSIG
FUEL DIFF. PRESS.	17.4	"H20
FUEL GAS HEADER PRESS.	17.2	PSIG
FUEL TEMP.	77	°F
COMPUTER FUEL FLOW SCF	13926	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	814	°F
CYLINDER #2 TEMP.	829	°F
CYLINDER #3 TEMP.	816	°F
CYLINDER #4 TEMP.	795	°F
CYLINDER #5 TEMP.	850	°F
CYLINDER #6 TEMP.	806	°F
CYLINDER #7 TEMP.	832	°F
CYLINDER #8 TEMP.	799	°F
MODE	AUTO	

AMBIENT TEMPERATURE	88	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	928	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	112	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1873	BHP
TORQUE	93	%
GEO. HP	1936	BHP
GEO. HP - FUEL TORQUE HP	-35	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404-C-16

1404 UNIT OPERATING DATA

3:14:58 | 4/27/00

TEST # 1404-C-1c

ENGINE SPEED	343	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.5	"Hg
AIR MANIFOLD TEMP.	94	°F
TURBOCHARGER VIBRATION	0.57	IN/SEC
FUEL STATIC PRESS.	75.0	PSIG
FUEL DIFF. PRESS.	17.4	"H20
FUEL GAS HEADER PRESS.	17.3	PSIG
FUEL TEMP.	77	°F
COMPUTER FUEL FLOW SCF	13902	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	814	°F
CYLINDER #2 TEMP.	831	°F
CYLINDER #3 TEMP.	815	°F
CYLINDER #4 TEMP.	797	°F
CYLINDER #5 TEMP.	852	°F
CYLINDER #6 TEMP.	806	°F
CYLINDER #7 TEMP.	833	°F
CYLINDER #8 TEMP.	798	°F
MODE	AUTO	

AMBIENT TEMPERATURE	87	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	927	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	112	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1871	BHP
TORQUE	93	%
GEO. HP	1931	BHP
GEO. HP - FUEL TORQUE HP	-49	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404-C-1c

1404 UNIT OPERATING DATA

3:31:36 | 4/27/00

TEST # 1404-C-2a

ENGINE SPEED	343	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.5	"Hg
AIR MANIFOLD TEMP.	94	°F
TURBOCHARGER VIBRATION	0.57	IN/SEC
FUEL STATIC PRESS.	75.1	PSIG
FUEL DIFF. PRESS.	17.6	"H20
FUEL GAS HEADER PRESS.	17.3	PSIG
FUEL TEMP.	78	°F
COMPUTER FUEL FLOW SCF	13913	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	815	°F
CYLINDER #2 TEMP.	834	°F
CYLINDER #3 TEMP.	818	°F
CYLINDER #4 TEMP.	795	°F
CYLINDER #5 TEMP.	852	°F
CYLINDER #6 TEMP.	804	°F
CYLINDER #7 TEMP.	832	°F
CYLINDER #8 TEMP.	798	°F
MODE	AUTO	

AMBIENT TEMPERATURE	88	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	926	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	112	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	81	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	66	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1874	BHP
TORQUE	93	%
GEO. HP	1929	BHP
GEO. HP - FUEL TORQUE HP	-47	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404-C-2a

1404 UNIT OPERATING DATA

4:02:16 | 4/27/00

TEST # 1404-C-26

ENGINE SPEED	343	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.5	"Hg
AIR MANIFOLD TEMP.	94	°F
TURBOCHARGER VIBRATION	0.58	IN/SEC
FUEL STATIC PRESS.	75.1	PSIG
FUEL DIFF. PRESS.	17.3	"H20
FUEL GAS HEADER PRESS.	17.2	PSIG
FUEL TEMP.	78	°F
COMPUTER FUEL FLOW SCF	13844	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	815	°F
CYLINDER #2 TEMP.	832	°F
CYLINDER #3 TEMP.	815	°F
CYLINDER #4 TEMP.	796	°F
CYLINDER #5 TEMP.	851	°F
CYLINDER #6 TEMP.	804	°F
CYLINDER #7 TEMP.	833	°F
CYLINDER #8 TEMP.	796	°F
MODE	AUTO	

AMBIENT TEMPERATURE	92	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	926	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	112	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1860	BHP
TORQUE	92	%
GEO. HP	1931	BHP
GEO. HP - FUEL TORQUE HP	-64	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404-C-26

1404 UNIT OPERATING DATA

4:33:54 | 4/27/00

TEST # 1404-C-2c

ENGINE SPEED	344	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.4	"Hg
AIR MANIFOLD TEMP.	96	°F
TURBOCHARGER VIBRATION	0.52	IN/SEC
FUEL STATIC PRESS.	75.2	PSIG
FUEL DIFF. PRESS.	17.2	"H20
FUEL GAS HEADER PRESS.	17.2	PSIG
FUEL TEMP.	78	°F
COMPUTER FUEL FLOW SCF	13812	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	817	°F
CYLINDER #2 TEMP.	834	°F
CYLINDER #3 TEMP.	815	°F
CYLINDER #4 TEMP.	798	°F
CYLINDER #5 TEMP.	853	°F
CYLINDER #6 TEMP.	806	°F
CYLINDER #7 TEMP.	833	°F
CYLINDER #8 TEMP.	800	°F
MODE	AUTO	

AMBIENT TEMPERATURE	87	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	698	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	925	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	114	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	110	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1852	BHP
TORQUE	92	%
GEO. HP	1939	BHP
GEO. HP - FUEL TORQUE HP	-56	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404-C-2c

1404 UNIT OPERATING DATA

4:56:49 | 4/27/00

TEST # 1404-C-3a

ENGINE SPEED	343	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.4	"Hg
AIR MANIFOLD TEMP.	94	°F
TURBOCHARGER VIBRATION	0.56	IN/SEC
FUEL STATIC PRESS.	75.2	PSIG
FUEL DIFF. PRESS.	17.3	"H20
FUEL GAS HEADER PRESS.	17.3	PSIG
FUEL TEMP.	77	°F
COMPUTER FUEL FLOW SCF	13826	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	817	°F
CYLINDER #2 TEMP.	835	°F
CYLINDER #3 TEMP.	818	°F
CYLINDER #4 TEMP.	798	°F
CYLINDER #5 TEMP.	852	°F
CYLINDER #6 TEMP.	805	°F
CYLINDER #7 TEMP.	832	°F
CYLINDER #8 TEMP.	798	°F
MODE	AUTO	

AMBIENT TEMPERATURE	88	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	697	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	925	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	113	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	66	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	110	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1859	BHP
TORQUE	92	%
GEO. HP	1929	BHP
GEO. HP - FUEL TORQUE HP	-55	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404 - C-3a

1404 UNIT OPERATING DATA

5:27:06 | 4/27/00

TEST # 1404 C-36

ENGINE SPEED	344	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.4	"Hg
AIR MANIFOLD TEMP.	95	°F
TURBOCHARGER VIBRATION	0.60	IN/SEC
FUEL STATIC PRESS.	75.1	PSIG
FUEL DIFF. PRESS.	17.4	"H20
FUEL GAS HEADER PRESS.	17.3	PSIG
FUEL TEMP.	78	°F
COMPUTER FUEL FLOW SCF	13886	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	815	°F
CYLINDER #2 TEMP.	834	°F
CYLINDER #3 TEMP.	819	°F
CYLINDER #4 TEMP.	798	°F
CYLINDER #5 TEMP.	851	°F
CYLINDER #6 TEMP.	806	°F
CYLINDER #7 TEMP.	833	°F
CYLINDER #8 TEMP.	797	°F
MODE	AUTO	

AMBIENT TEMPERATURE	87	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	696	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	925	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	114	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	110	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1863	BHP
TORQUE	92	%
GEO. HP	1938	BHP
GEO. HP - FUEL TORQUE HP	-70	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1404 - C-36

1404 UNIT OPERATING DATA

5:55:14 | 4/27/00

TEST # 1404C-3c

ENGINE SPEED	343	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.4	"Hg
AIR MANIFOLD TEMP.	94	°F
TURBOCHARGER VIBRATION	0.60	IN/SEC
FUEL STATIC PRESS.	75.2	PSIG
FUEL DIFF. PRESS.	17.2	"H20
FUEL GAS HEADER PRESS.	17.1	PSIG
FUEL TEMP.	78	°F
COMPUTER FUEL FLOW SCF	13755	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	812	°F
CYLINDER #2 TEMP.	829	°F
CYLINDER #3 TEMP.	817	°F
CYLINDER #4 TEMP.	797	°F
CYLINDER #5 TEMP.	851	°F
CYLINDER #6 TEMP.	805	°F
CYLINDER #7 TEMP.	832	°F
CYLINDER #8 TEMP.	796	°F
MODE	AUTO	

AMBIENT TEMPERATURE	84	°F
LOAD STEP NUMBER	1	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	924	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	113	MMSCFD
"A" COMP. EFFICIENCY	80	%
"B" COMP. EFFICIENCY	82	%
AVERAGE COMP. EFFICIENCY	81	%
"A" COMP. SUCTION TEMP.	67	°F
"B" COMP. SUCTION TEMP.	67	°F
"A" COMP. DISCHARGE TEMP.	110	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1848	BHP
TORQUE	92	%
GEO. HP	1925	BHP
GEO. HP - FUEL TORQUE HP	-68	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PSI

1404-C-3c

1405-C-1

Compressor Health Report
FloridaGas
Unit 1401 Worthington BDC-1

Central Time

Unit Name:	1405-C	Model:	BDC-1	Date:	4/27/00 8:43:16 AM
Location:	Quincy Compressor St	Unit Mfr:	Worthington	Serial No.:	

Mechanical Efficiency, %	95	Marker Correction Angle, deg	87.0	Periods Collected (PT)	10
Overall Efficiency, %	85	Stroke, (ins)	15.000		
Atmospheric Pressure, psia	14.7	Speed, RPM	346	Specific Gravity	0.554
Load Step	1				

Cyl End	Stg	Clr Set (%)	Bore (ins)	Rod Diam (ins)	ConRod Length (ins)	Pressure Ps (psig)	Pressure Pd (psig)	Temp. Ts	Temp. Td	Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (ihp)	Suction Loss (ihp)	Disch. Loss (ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
1H	1	160	16.500	N/A	40.000	689	923	69F	112F	1.33	31.12	442.7	22.9	27.6	1.03	10	115C	68	54
1C	1	97	16.500	4.000	40.000	690	922	69F	112F	1.33	34.33	480.7	22.3	34.9	0.99	10	45T	77	64
2H	1	155	16.500	N/A	40.000	695	921	69F	111F	1.32	31.80	443.7	30.1	30.9	1.04	10	116C	69	55
2C	1	95	16.500	4.000	40.000	692	925	69F	111F	1.33	34.54	479.6	24.9	29.8	1.01	8	44T	77	63

Notes:

1. Rod loading is based on maximum differential pressure across the rings. C - Compression, T - Tension. Forces due to inertia are not accounted for in this table.
2. Flow Balance = capacity from suction VE / capacity from discharge VE.
3. If the flow balance is much greater than 1.0 suspect leaking suction valves or rings. If the flow balance is much less than 1.0 suspect leaking discharge valves or rings.
4. Discharge Temp. Delta = actual discharge temp - theoretical.
5. If Suction or Discharge Temperatures are not found, some calculations may not be available as indicated by a "--".
6. Gas power = Total indicated power for all cylinders / Mechanical Efficiency.
7. Compressor total brake power = Gas power + Auxiliary brake power * RPM / Rated RPM.
8. Derated power is obtained by derating the rated power to actual run speed.
9. Compressor efficiency is the total indicated power - suction and discharge losses as a percentage of the total indicated power.
10. Marker Type: Encoder (ENC) and Trap Type: 9002.
11. Channel Resonance Correction (CRC) applied: 1H 1C 2H 2C
12. Corrected VE applied, PS and PD values Corrected: None

Total Indicated Power, (ihp)	1847	@	346	RPM	Rated Power, (bhp)	2030	@ 345	RPM
Gas Power, (ghp)	1944	@	346	RPM	Derated Power, (bhp)	2034	@ 346	RPM
Auxiliary Power, (bhp)	0	@	345	RPM	Percent Torque Load, %	96	%	
Compressor Total Power, (bhp)	1944	@	346	RPM	Compressor Efficiency, %	88	%	

Observations and Recommendations	Machine Condition Notes

Analyst Signature: 4/27/00 8:55:54 AM

1405-C-1d

Cubit Time is 5min behind.

1405 UNIT OPERATING DATA

9:30:45 | 4/27/00

TEST # 1405-C-1a

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.8	"Hg
AIR MANIFOLD TEMP.	93	°F
TURBOCHARGER VIBRATION	0.42	IN/SEC
FUEL STATIC PRESS.	75.7	PSIG
FUEL DIFF. PRESS.	18.5	"H20
FUEL GAS HEADER PRESS.	13.5	PSIG
FUEL TEMP.	70	°F
COMPUTER FUEL FLOW SCF	14533	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	801	°F
CYLINDER #2 TEMP.	762	°F
CYLINDER #3 TEMP.	769	°F
CYLINDER #4 TEMP.	800	°F
CYLINDER #5 TEMP.	727	°F
CYLINDER #6 TEMP.	816	°F
CYLINDER #7 TEMP.	770	°F
CYLINDER #8 TEMP.	825	°F
MODE	AUTO	

AMBIENT TEMPERATURE	70	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	698	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	928	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	118	MMSCFD
"A" COMP. EFFICIENCY	82	%
"B" COMP. EFFICIENCY	84	%
AVERAGE COMP. EFFICIENCY	83	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	112	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1953	BHP
TORQUE	96	%
GEO. HP	2001	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-1a

1405 UNIT OPERATING DATA

10:01:33 | 4/27/00

TEST # 1405-C-16

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.7	"Hg
AIR MANIFOLD TEMP.	96	°F
TURBOCHARGER VIBRATION	0.45	IN/SEC
FUEL STATIC PRESS.	75.3	PSIG
FUEL DIFF. PRESS.	18.5	"H20
FUEL GAS HEADER PRESS.	13.6	PSIG
FUEL TEMP.	71	°F
COMPUTER FUEL FLOW SCF	14554	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	803	°F
CYLINDER #2 TEMP.	765	°F
CYLINDER #3 TEMP.	770	°F
CYLINDER #4 TEMP.	803	°F
CYLINDER #5 TEMP.	733	°F
CYLINDER #6 TEMP.	823	°F
CYLINDER #7 TEMP.	776	°F
CYLINDER #8 TEMP.	827	°F
MODE	AUTO	

AMBIENT TEMPERATURE	73	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	698	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	929	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	118	MMSCFD
"A" COMP. EFFICIENCY	81	%
"B" COMP. EFFICIENCY	83	%
AVERAGE COMP. EFFICIENCY	82	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	112	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1960	BHP
TORQUE	97	%
GEO. HP	2000	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-16

1405 UNIT OPERATING DATA

10:34:58 | 4/27/00

TEST # 1405-C-1c

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.6	"Hg
AIR MANIFOLD TEMP.	96	°F
TURBOCHARGER VIBRATION	0.47	IN/SEC
FUEL STATIC PRESS.	75.3	PSIG
FUEL DIFF. PRESS.	18.4	"H20
FUEL GAS HEADER PRESS.	13.5	PSIG
FUEL TEMP.	72	°F
COMPUTER FUEL FLOW SCF	14511	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	806	°F
CYLINDER #2 TEMP.	770	°F
CYLINDER #3 TEMP.	775	°F
CYLINDER #4 TEMP.	803	°F
CYLINDER #5 TEMP.	735	°F
CYLINDER #6 TEMP.	825	°F
CYLINDER #7 TEMP.	779	°F
CYLINDER #8 TEMP.	831	°F
MODE	AUTO	

AMBIENT TEMPERATURE	75	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	697	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	924	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	118	MMSCFD
"A" COMP. EFFICIENCY	81	%
"B" COMP. EFFICIENCY	83	%
AVERAGE COMP. EFFICIENCY	82	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	112	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1946	BHP
TORQUE	96	%
GEO. HP	1999	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

N | PS

Test Run
1405-C-2

Compressor Health Report
FloridaGas
Unit 1401 Worthington BDC-1

Central Time

Unit Name:	1405-C	Model:	BDC-1	Date:	4/27/00 9:58:42 AM
Location:	Quincy Compressor St	Unit Mfr:	Worthington	Serial No.:	

Mechanical Efficiency, %	95	Marker Correction Angle, deg	87.0	Periods Collected (PT)	10
Overall Efficiency, %	85	Stroke, (ins)	15.000		
Atmospheric Pressure, psia	14.7	Speed, RPM	346	Specific Gravity	0.554
Load Step	1				

Cyl End	Stg	Clr Set (%)	Bore (ins)	Rod Diam (ins)	ConRod Length (ins)	Pressure Ps (psig)	Pressure Pd (psig)	Temp. Ts	Temp. Td	Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (ihp)	Suction Loss (ihp)	Disch. Loss (ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
1H	1	160	16.500	N/A	40.000	687	918	69F	111F	1.33	31.43	433.0	19.2	21.8	1.02	9	112C	68	54
1C	1	97	16.500	4.000	40.000	689	916	69F	111F	1.32	34.52	469.9	18.7	33.4	0.99	9	43T	77	64
2H	1	155	16.500	N/A	40.000	686	912	69F	110F	1.32	31.91	440.8	19.1	32.8	1.00	8	114C	68	56
2C	1	95	16.500	4.000	40.000	688	916	69F	110F	1.32	34.64	473.9	22.7	34.7	1.00	8	44T	78	63

Notes:

1. Rod loading is based on maximum differential pressure across the rings. C - Compression, T - Tension. Forces due to inertia are not accounted for in this table.
2. Flow Balance = capacity from suction VE / capacity from discharge VE.
3. If the flow balance is much greater than 1.0 suspect leaking suction valves or rings. If the flow balance is much less than 1.0 suspect leaking discharge valves or rings.
4. Discharge Temp. Delta = actual discharge temp - theoretical.
5. If Suction or Discharge Temperatures are not found, some calculations may not be available as indicated by a "-".
6. Gas power = Total indicated power for all cylinders / Mechanical Efficiency.
7. Compressor total brake power = Gas power + Auxiliary brake power * RPM / Rated RPM.
8. Derated power is obtained by derating the rated power to actual run speed.
9. Compressor efficiency is the total indicated power - suction and discharge losses as a percentage of the total indicated power.
10. Marker Type: Encoder (ENC) and Trap Type: 9002.
11. Channel Resonance Correction (CRC) applied: 1C 1H 2H 2C
12. Corrected VE applied, PS and PD values Corrected: None

Total Indicated Power, (ihp)	1818	@	346	RPM	Rated Power, (bhp)	2030	@ 345	RPM
Gas Power, (ghp)	1913	@	346	RPM	Derated Power, (bhp)	2034	@ 346	RPM
Auxiliary Power, (bhp)	0	@	345	RPM	Percent Torque Load, %	94	%	
Compressor Total Power, (bhp)	1913	@	346	RPM	Compressor Efficiency, %	89	%	

Observations and Recommendations	Machine Condition Notes

Analyst Signature: 4/27/00 10:10:49 AM

Contract 1

1405-C-2d

1405 UNIT OPERATING DATA

10:46:33 | 4/27/00

TEST # 1405C-2a

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.7	"Hg
AIR MANIFOLD TEMP.	97	°F
TURBOCHARGER VIBRATION	0.44	IN/SEC
FUEL STATIC PRESS.	75.4	PSIG
FUEL DIFF. PRESS.	18.5	"H20
FUEL GAS HEADER PRESS.	13.6	PSIG
FUEL TEMP.	72	°F
COMPUTER FUEL FLOW SCF	14483	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	805	°F
CYLINDER #2 TEMP.	769	°F
CYLINDER #3 TEMP.	774	°F
CYLINDER #4 TEMP.	804	°F
CYLINDER #5 TEMP.	737	°F
CYLINDER #6 TEMP.	829	°F
CYLINDER #7 TEMP.	780	°F
CYLINDER #8 TEMP.	832	°F
MODE	AUTO	

AMBIENT TEMPERATURE	77	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	696	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	923	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	118	MMSCFD
"A" COMP. EFFICIENCY	81	%
"B" COMP. EFFICIENCY	84	%
AVERAGE COMP. EFFICIENCY	82	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1939	BHP
TORQUE	96	%
GEO. HP	1988	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-2a

1405 UNIT OPERATING DATA

11:18:18 | 4/27/00

TEST # 1405C26

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.6	"Hg
AIR MANIFOLD TEMP.	100	°F
TURBOCHARGER VIBRATION	0.44	IN/SEC
FUEL STATIC PRESS.	75.3	PSIG
FUEL DIFF. PRESS.	18.2	"H20
FUEL GAS HEADER PRESS.	13.4	PSIG
FUEL TEMP.	73	°F
COMPUTER FUEL FLOW SCF	14378	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	803	°F
CYLINDER #2 TEMP.	767	°F
CYLINDER #3 TEMP.	773	°F
CYLINDER #4 TEMP.	804	°F
CYLINDER #5 TEMP.	736	°F
CYLINDER #6 TEMP.	825	°F
CYLINDER #7 TEMP.	777	°F
CYLINDER #8 TEMP.	828	°F
MODE	AUTO	

AMBIENT TEMPERATURE	78	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	695	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	920	PSIG
STATION DISCH. TEMP.	114	°F
COMPRESSOR FLOW RATE	118	MMSCFD
"A" COMP. EFFICIENCY	81	%
"B" COMP. EFFICIENCY	83	%
AVERAGE COMP. EFFICIENCY	82	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1911	BHP
TORQUE	94	%
GEO. HP	1984	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-26

1405 UNIT OPERATING DATA

11:45:36 | 4/27/00

TEST # 1405-C-2c

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.7	"Hg
AIR MANIFOLD TEMP.	91	°F
TURBOCHARGER VIBRATION	0.47	IN/SEC
FUEL STATIC PRESS.	75.0	PSIG
FUEL DIFF. PRESS.	18.4	"H20
FUEL GAS HEADER PRESS.	13.4	PSIG
FUEL TEMP.	74	°F
COMPUTER FUEL FLOW SCF	14419	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	797	°F
CYLINDER #2 TEMP.	760	°F
CYLINDER #3 TEMP.	761	°F
CYLINDER #4 TEMP.	794	°F
CYLINDER #5 TEMP.	724	°F
CYLINDER #6 TEMP.	817	°F
CYLINDER #7 TEMP.	768	°F
CYLINDER #8 TEMP.	819	°F
MODE	AUTO	

AMBIENT TEMPERATURE	82	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	694	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	921	PSIG
STATION DISCH. TEMP.	115	°F
COMPRESSOR FLOW RATE	117	MMSCFD
"A" COMP. EFFICIENCY	82	%
"B" COMP. EFFICIENCY	84	%
AVERAGE COMP. EFFICIENCY	83	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	111	°F
"B" COMP. DISCHARGE TEMP.	110	°F
FUEL TORQUE HP	1920	BHP
TORQUE	95	%
GEO. HP	1989	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-2c

Test Run
1405-C-3

Compressor Health Report
FloridaGas
Unit 1401 Worthington BDC-1

Unit Name:	1405-C	Model:	BDC-1	Date:	4/27/00 11:02:40 AM
Location:	Quincy Compressor St	Unit Mfr:	Worthington	Serial No.:	

Mechanical Efficiency, %	95	Marker Correction Angle, deg	87.0	Periods Collected (PT)	10
Overall Efficiency, %	85	Stroke, (ins)	15.000		
Atmospheric Pressure, psia	14.7	Speed, RPM	346	Specific Gravity	0.554
Load Step	1				

Cyl End	Stg	Clr Set (%)	Bore (ins)	Rod Diam (ins)	ConRod Length (ins)	Pressure Ps (psig)	Pressure Pd (psig)	Temp. Ts	Temp. Td	Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (ihp)	Suction Loss (ihp)	Disch. Loss (ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
1H	1	160	16.500	N/A	40.000	688	924	69F	113F	1.34	30.75	439.2	23.8	23.4	1.05	11	116C	68	53
1C	1	97	16.500	4.000	40.000	687	922	69F	113F	1.34	33.88	480.7	20.5	34.5	0.99	11	45T	76	63
2H	1	155	16.500	N/A	40.000	687	922	69F	111F	1.33	31.22	439.2	19.4	27.7	1.02	8	117C	67	54
2C	1	95	16.500	4.000	40.000	687	921	69F	111F	1.33	34.01	482.2	24.5	36.0	1.01	8	44T	77	62

Notes:

1. Rod loading is based on maximum differential pressure across the rings. C - Compression, T - Tension. Forces due to inertia are not accounted for in this table.
2. Flow Balance = capacity from suction VE / capacity from discharge VE.
3. If the flow balance is much greater than 1.0 suspect leaking suction valves or rings. If the flow balance is much less than 1.0 suspect leaking discharge valves or rings.
4. Discharge Temp. Delta = actual discharge temp - theoretical.
5. If Suction or Discharge Temperatures are not found, some calculations may not be available as indicated by a "–".
6. Gas power = Total indicated power for all cylinders / Mechanical Efficiency.
7. Compressor total brake power = Gas power + Auxiliary brake power * RPM / Rated RPM.
8. Derated power is obtained by derating the rated power to actual run speed.
9. Compressor efficiency is the total indicated power - suction and discharge losses as a percentage of the total indicated power.
10. Marker Type: Encoder (ENC) and Trap Type: 9002.
11. Channel Resonance Correction (CRC) applied: 1H 1C 2H 2C
12. Corrected VE applied, PS and PD values Corrected: None

Total Indicated Power, (ihp)	1841	@ 346	RPM	Rated Power, (bhp)	2030	@ 345	RPM
Gas Power, (ghp)	1938	@ 346	RPM	Derated Power, (bhp)	2035	@ 346	RPM
Auxiliary Power, (bhp)	0	@ 345	RPM	Percent Torque Load, %	95	%	
Compressor Total Power, (bhp)	1938	@ 346	RPM	Compressor Efficiency, %	89	%	

Observations and Recommendations	Machine Condition Notes

Analyst Signature: 4/27/00 11:16:13 AM

1405-C-3d

1405 UNIT OPERATING DATA

12:00:32 | 4/27/00

TEST # 1405-C-3a

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.8	"Hg
AIR MANIFOLD TEMP.	91	°F
TURBOCHARGER VIBRATION	0.46	IN/SEC
FUEL STATIC PRESS.	75.0	PSIG
FUEL DIFF. PRESS.	18.7	"H20
FUEL GAS HEADER PRESS.	13.7	PSIG
FUEL TEMP.	74	°F
COMPUTER FUEL FLOW SCF	14529	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	797	°F
CYLINDER #2 TEMP.	759	°F
CYLINDER #3 TEMP.	765	°F
CYLINDER #4 TEMP.	795	°F
CYLINDER #5 TEMP.	724	°F
CYLINDER #6 TEMP.	821	°F
CYLINDER #7 TEMP.	769	°F
CYLINDER #8 TEMP.	822	°F
MODE	AUTO	

AMBIENT TEMPERATURE	85	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	694	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	927	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	116	MMSCFD
"A" COMP. EFFICIENCY	82	%
"B" COMP. EFFICIENCY	84	%
AVERAGE COMP. EFFICIENCY	83	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	68	°F
"A" COMP. DISCHARGE TEMP.	112	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1953	BHP
TORQUE	96	%
GEO. HP	1996	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-3a

1405 UNIT OPERATING DATA

12:30:39 | 4/27/00

TEST # 1405-C-36

ENGINE SPEED	345	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.8	"Hg
AIR MANIFOLD TEMP.	91	°F
TURBOCHARGER VIBRATION	0.45	IN/SEC
FUEL STATIC PRESS.	75.0	PSIG
FUEL DIFF. PRESS.	18.6	"H20
FUEL GAS HEADER PRESS.	13.6	PSIG
FUEL TEMP.	75	°F
COMPUTER FUEL FLOW SCF	14522	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	794	°F
CYLINDER #2 TEMP.	758	°F
CYLINDER #3 TEMP.	765	°F
CYLINDER #4 TEMP.	794	°F
CYLINDER #5 TEMP.	722	°F
CYLINDER #6 TEMP.	820	°F
CYLINDER #7 TEMP.	768	°F
CYLINDER #8 TEMP.	821	°F
MODE	AUTO	

AMBIENT TEMPERATURE	84	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	694	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	927	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	116	MMSCFD
"A" COMP. EFFICIENCY	82	%
"B" COMP. EFFICIENCY	84	%
AVERAGE COMP. EFFICIENCY	83	%
"A" COMP. SUCTION TEMP.	69	°F
"B" COMP. SUCTION TEMP.	69	°F
"A" COMP. DISCHARGE TEMP.	112	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1950	BHP
TORQUE	96	%
GEO. HP	1999	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M PS

1405-C-36

1405 UNIT OPERATING DATA

1:01:27 | 4/27/00

TEST # 1405-C-3c

ENGINE SPEED	346	RPM
IGNITION TIMING OUTPUT	18.0	°BTDC
IGNITION TIMING w\LIGHT		
GOVERNOR SETTING		
AIR MANIFOLD PRESS.	6.7	"Hg
AIR MANIFOLD TEMP.	92	°F
TURBOCHARGER VIBRATION	0.48	IN/SEC
FUEL STATIC PRESS.	75.1	PSIG
FUEL DIFF. PRESS.	18.8	"H20
FUEL GAS HEADER PRESS.	13.6	PSIG
FUEL TEMP.	76	°F
COMPUTER FUEL FLOW SCF	14574	
AGA3 CAL. FUEL FLOW SCF		
CYLINDER #1 TEMP.	797	°F
CYLINDER #2 TEMP.	758	°F
CYLINDER #3 TEMP.	765	°F
CYLINDER #4 TEMP.	795	°F
CYLINDER #5 TEMP.	726	°F
CYLINDER #6 TEMP.	819	°F
CYLINDER #7 TEMP.	770	°F
CYLINDER #8 TEMP.	822	°F
MODE	AUTO	

AMBIENT TEMPERATURE	83	°F
LOAD STEP NUMBER	6	
STATION SUCTION PRESSURE	694	PSIG
STATION SUCTION TEMP.	73	°F
STATION DISCH. PRESSURE	928	PSIG
STATION DISCH. TEMP.	116	°F
COMPRESSOR FLOW RATE	116	MMSCFD
"A" COMP. EFFICIENCY	82	%
"B" COMP. EFFICIENCY	84	%
AVERAGE COMP. EFFICIENCY	83	%
"A" COMP. SUCTION TEMP.	68	°F
"B" COMP. SUCTION TEMP.	68	°F
"A" COMP. DISCHARGE TEMP.	112	°F
"B" COMP. DISCHARGE TEMP.	111	°F
FUEL TORQUE HP	1965	BHP
TORQUE	97	%
GEO. HP	2006	BHP
GEO. HP - FUEL TORQUE HP	0	BHP
PFM 2000 BHP		
PFM 2000 %TORQUE		

M RS

1405-C-3c

APPENDIX E:
QUALITY ASSURANCE ACTIVITIES

Unit 1404, Logged QA Calibration Data

Quality Assurance Log File 3/12/1999
Run 1404-C-1 4/27/2000 2:10:10 PM 3:10:10 PM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
NOx (ppmv)	0	1232	1831	3484	-0.57	-0.2	0.2
CO (ppmv)	0.15	89.05	184.7	445.65	0.13	-0.62	0.27
O2 (%)	0.09	4.71	20.75	12.05	-0.7	-0.01	-0.57
CO2 (%)	0.01	4.62	12.62	8.07	0.03	-0.02	-0.44
THC (ppmv)	0	447	901	1808	0	0.55	0.15

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
NOx (ppmv)	58	3486	65	3522	1.62	0.95	-0.18	-0.9
CO (ppmv)	-0.35	432	-0.35	446.2	-0.1	0.11	0	-2.84
O2 (%)	0.2	12.05	0.22	12.17	0.5	0.48	-0.07	-0.48
CO2 (%)	0.12	7.86	0.2	7.95	1.27	-0.81	-0.48	-0.56
THC (ppmv)	-4	1794	-3	1782	-0.15	-1.3	-0.05	0.6

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
NOx (ppmv)	2048.4	2015.5	4000	1209	1823	3492
CO (ppmv)	169.4	172.6	500	89.69	181.6	447
O2 (%)	11.26	11.06	25	4.53	20.75	11.91
CO2 (%)	5.58	5.60	15	4.62	12.62	8
THC (ppmv)	978.0	992.2	2000	447	912	1811

Unit 1404, Logged QA Calibration Data

Run 1404-C-2 4/27/2000 3:30:14 PM 4:30:14 PM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
NOx (ppmv)	0	1232	1831	3484	-0.57	-0.2	0.2
CO (ppmv)	0.15	89.05	184.7	445.65	0.13	-0.62	0.27
O2 (%)	0.09	4.71	20.75	12.05	-0.7	-0.01	-0.57
CO2 (%)	0.01	4.62	12.62	8.07	0.03	-0.02	-0.44
THC (ppmv)	0	447	901	1808	0	0.55	0.15

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
NOx (ppmv)	65	3522	75	3562	1.88	1.95	-0.25	-1
CO (ppmv)	-0.35	446.2	-0.35	443.65	-0.1	-0.4	0	0.51
O2 (%)	0.22	12.17	0.2	12.15	0.43	0.39	0.07	0.09
CO2 (%)	0.2	7.95	0.29	8.07	1.89	-0.01	-0.62	-0.8
THC (ppmv)	-3	1782	-3	1841	-0.15	1.65	0	-2.95

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
NOx (ppmv)	1959.6	1900.5	4000	1209	1823	3492
CO (ppmv)	176.7	177.7	500	89.69	181.6	447
O2 (%)	11.29	11.04	25	4.53	20.75	11.91
CO2 (%)	5.62	5.54	15	4.62	12.62	8
THC (ppmv)	1056.9	1057.9	2000	447	912	1811

Unit 1404, Logged QA Calibration Data

Run 1404-C-3 4/27/2000 4:48:01 PM 5:48:01 PM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
NOx (ppmv)	0	1232	1831	3484	-0.57	-0.2	0.2
CO (ppmv)	0.15	89.05	184.7	445.65	0.13	-0.62	0.27
O2 (%)	0.09	4.71	20.75	12.05	-0.7	-0.01	-0.57
CO2 (%)	0.01	4.62	12.62	8.07	0.03	-0.02	-0.44
THC (ppmv)	0	447	901	1808	0	0.55	0.15

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
NOx (ppmv)	75	3562	71	3528	1.77	1.1	0.1	0.85
CO (ppmv)	-0.35	443.65	-0.35	444.7	-0.1	-0.19	0	-0.21
O2 (%)	0.2	12.15	0.21	12.11	0.46	0.21	-0.03	0.18
CO2 (%)	0.29	8.07	0.16	7.95	1.02	-0.78	0.87	0.77
THC (ppmv)	-3	1841	0	1817	0	0.45	-0.15	1.2

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
NOx (ppmv)	2002.9	1941.0	4000	1209	1823	3492
CO (ppmv)	176.3	177.7	500	89.69	181.6	447
O2 (%)	11.25	11.03	25	4.53	20.75	11.91
CO2 (%)	5.64	5.56	15	4.62	12.62	8
THC (ppmv)	1074.1	1064.2	2000	447	912	1811

Unit 1405, Logged QA Calibration Data

Quality Assurance Log File 3/12/1999
Run 1405-C-1 4/27/2000 9:21:23 AM 10:21:23 AM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
NOx (ppmv)	0	1232	1831	3484	-0.57	-0.2	0.2
CO (ppmv)	0.15	89.05	184.7	445.65	0.13	-0.62	0.27
O2 (%)	0.09	4.71	20.75	12.05	-0.7	-0.01	-0.57
CO2 (%)	0.01	4.62	12.62	8.07	0.03	-0.02	-0.44
THC (ppmv)	0	447	901	1808	0	0.55	0.15

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
NOx (ppmv)	10	3447	40	3486	1	0.05	-0.75	-0.97
CO (ppmv)	-0.8	445.65	-0.8	437.15	-0.19	-1.7	0	1.7
O2 (%)	0.16	11.96	0.19	12	0.4	-0.21	-0.13	-0.17
CO2 (%)	0.1	8.11	-0.02	7.88	-0.16	-1.26	0.81	1.51
THC (ppmv)	-1	1786	-2	1790	-0.1	-0.9	0.05	-0.2

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
NOx (ppmv)	1981.3	1985.0	4000	1209	1823	3492
CO (ppmv)	168.1	170.7	500	89.69	181.6	447
O2 (%)	11.12	11.04	25	4.53	20.75	11.91
CO2 (%)	5.51	5.50	15	4.62	12.62	8
THC (ppmv)	978.6	991.9	2000	447	912	1811

Unit 1405, Logged QA Calibration Data

Run 1405-C-2 4/27/2000 10:40:00 AM 11:40:00 AM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
NOx (ppmv)	0	1232	1831	3484	-0.57	-0.2	0.2
CO (ppmv)	0.15	89.05	184.7	445.65	0.13	-0.62	0.27
O2 (%)	0.09	4.71	20.75	12.05	-0.7	-0.01	-0.57
CO2 (%)	0.01	4.62	12.62	8.07	0.03	-0.02	-0.44
THC (ppmv)	0	447	901	1808	0	0.55	0.15

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
NOx (ppmv)	40	3486	42	3437	1.05	-1.18	-0.05	1.23
CO (ppmv)	-0.8	437.15	-0.8	431.05	-0.19	-2.92	0	1.22
O2 (%)	0.19	12	0.23	12.11	0.54	0.23	-0.14	-0.44
CO2 (%)	-0.02	7.88	0.29	8.1	1.9	0.23	-2.06	-1.49
THC (ppmv)	-2	1790	-3	1752	-0.15	-2.8	0.05	1.9

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
NOx (ppmv)	1843.1	1839.8	4000	1209	1823	3492
CO (ppmv)	172.2	177.8	500	89.69	181.6	447
O2 (%)	11.26	11.11	25	4.53	20.75	11.91
CO2 (%)	5.54	5.50	15	4.62	12.62	8
THC (ppmv)	1004.8	1028.6	2000	447	912	1811

Unit 1405, Logged QA Calibration Data

Run 1405-C-3 4/27/2000 11:57:02 AM 12:57:02 PM

Initial Linearity Test	Zero	Low	Mid	Span	L-Lin	M-Lin	S-Lin
NOx (ppmv)	0	1232	1831	3484	-0.57	-0.2	0.2
CO (ppmv)	0.15	89.05	184.7	445.65	0.13	-0.62	0.27
O2 (%)	0.09	4.71	20.75	12.05	-0.7	-0.01	-0.57
CO2 (%)	0.01	4.62	12.62	8.07	0.03	-0.02	-0.44
THC (ppmv)	0	447	901	1808	0	0.55	0.15

Initial and Final Bias and Drift	I-Zero	I-Span	F-Zero	F-Span	Z-Bias	S-Bias	Z-Drift	S-Drift
NOx (ppmv)	42	3437	58	3486	1.45	0.05	-0.4	-1.23
CO (ppmv)	-0.8	431.05	-0.35	432	-0.1	-2.73	-0.09	-0.19
O2 (%)	0.23	12.11	0.2	12.05	0.43	0	0.11	0.23
CO2 (%)	0.29	8.1	0.12	7.86	0.79	-1.37	1.11	1.6
THC (ppmv)	-3	1752	-4	1794	-0.2	-0.7	0.05	-2.1

Run Results and Cal Gases Used	Raw	Corrected	Ranges	Low Gas	Mid Gas	Span Gas
NOx (ppmv)	1887.7	1881.1	4000	1209	1823	3492
CO (ppmv)	160.9	167.0	500	89.69	181.6	447
O2 (%)	11.28	11.11	25	4.53	20.75	11.91
CO2 (%)	5.54	5.49	15	4.62	12.62	8
THC (ppmv)	1109.6	1134.7	2000	447	912	1811

Instrumental Analyses
Quality Assurance Data
April 27, 2000

Date: April 27, 2000
Company: Florida Gas Transmission Company
Location: Compressor Station No. 14 in Quincy, FL
Technicians: LJB, RPO

NO_x Analyzer: NO_2 to NO Converter Efficiency Test

NO_x Calibration Gas: 1823.0 ppmv
Diluent Gas: Air
Date: 4/27/2000

	NO_x conc. (ppmv)	% Decrease from Highest conc.	NO conc. (ppmv)
Highest NO_x Concentration:	1369		
Initial Concentration:	1351	1.31	na
10 minute Concentration:	1363	0.44	606
20 minute Concentration:	1362	0.51	410
30 minute Concentration:	1346	1.68	289
Lowest NO_x Concentration:	1343	1.90	

Converter efficiency criteria is less than 2% decrease from highest read value.

Instrumental Sample System Leak Checks

Date	Run Number	Vacuum (inches Hg)	Leak Rate (inches Hg/min)	Pass
4/27/00	pre 1405-C-1	26.7	0.2	yes
4/27/00	post 1405-C-3	26.8	0.0	yes
4/27/00	pre 1404-C-1	26.8	0.0	yes
4/27/00	post 1404-C-1	26.5	0.0	yes

Leak check criteria less than 1.0" Hg Vac. Decline at gretar than 10.0" Hg Vac.

NOx Converter Efficiency Test
April 27, 2000

Run Number	MODE	Date	Time	NOx (ppmv)
START NOx Converter	Total NOx	4/27/2000	7:53:53 AM	1351
NOx Converter	Total NOx	4/27/2000	7:54:53 AM	1349
NOx Converter	Total NOx	4/27/2000	7:55:53 AM	1352
NOx Converter	Total NOx	4/27/2000	7:56:53 AM	1351
NOx Converter	Total NOx	4/27/2000	7:57:53 AM	1358
NOx Converter	Total NOx	4/27/2000	7:58:53 AM	1356
NOx Converter	Total NOx	4/27/2000	7:59:53 AM	1361
NOx Converter	Total NOx	4/27/2000	8:00:53 AM	1359
NOx Converter	Total NOx	4/27/2000	8:01:53 AM	1369
NOx Converter	NO Only	4/27/2000	8:02:53 AM	606
NOx Converter	Total NOx	4/27/2000	8:03:53 AM	1363
NOx Converter	Total NOx	4/27/2000	8:04:53 AM	1365
NOx Converter	Total NOx	4/27/2000	8:05:53 AM	1362
NOx Converter	Total NOx	4/27/2000	8:06:53 AM	1358
NOx Converter	Total NOx	4/27/2000	8:07:53 AM	1367
NOx Converter	Total NOx	4/27/2000	8:08:53 AM	1355
NOx Converter	Total NOx	4/27/2000	8:09:53 AM	1358
NOx Converter	Total NOx	4/27/2000	8:10:53 AM	1358
NOx Converter	Total NOx	4/27/2000	8:11:53 AM	1347
NOx Converter	NO Only	4/27/2000	8:12:53 AM	410
NOx Converter	Total NOx	4/27/2000	8:13:53 AM	1362
NOx Converter	Total NOx	4/27/2000	8:14:53 AM	1360
NOx Converter	Total NOx	4/27/2000	8:15:53 AM	1357
NOx Converter	Total NOx	4/27/2000	8:16:53 AM	1352
NOx Converter	Total NOx	4/27/2000	8:17:53 AM	1357
NOx Converter	Total NOx	4/27/2000	8:18:53 AM	1354
NOx Converter	Total NOx	4/27/2000	8:19:53 AM	1347
NOx Converter	Total NOx	4/27/2000	8:20:53 AM	1348
NOx Converter	Total NOx	4/27/2000	8:21:53 AM	1343
NOx Converter	Total NOx	4/27/2000	8:22:53 AM	1345
NOx Converter	Total NOx	4/27/2000	8:23:53 AM	1346
NOx Converter	NO Only	4/27/2000	8:24:53 AM	289
END NOx Converter	Total NOx	4/27/2000	8:25:53 AM	1350

CONTINUOUS EMISSION ANALYZER
INTERFERENCE RESPONSE TESTS

Date: March 17, 1995
Technicians: LJB, CDC

Analyzer Type: Thermo Environmental Instruments, Inc.
Analyzer Model: Model 10AR Chemiluminescent NO/NOx Analyzer
Serial Number: 10A/R-51539-288
Analyzer Test Range: 0-25 ppmv

Test Gas		Analyzer Response		Response Ratio
Gas Type	Concentration	Concentration	% of Range	
CO/Methane	403.8/397.9	0.1	0.4%	0.0002/0.0003
Propane	243	0.1	0.4%	0.0004
SO_2	4048	0.2	0.8%	0.00005
CO_2/O_2	8%/8%	<0.1	<0.4%	<0.0125/<0.0125
Air	dry, instrument	<0.1	<0.4%	not applicable
Nitrogen	pre-purified	0.0	not applicable	zero gas

ppmv/p

CONTINUOUS EMISSION ANALYZER
INTERFERENCE RESPONSE TESTS

Date: March 17, 1995
Technicians: LJB, CDC

Analyzer Type: Thermo Environmental Instruments, Inc.
Analyzer Model: Model 48 GFC CO Analyzer
Serial Number: 48-51488-289
Analyzer Test Range: 0-50 ppmv

Test Gas		Analyzer Response		Response Ratio	
Gas Type	Concentration	Concentration	% of Range		
Air	UHC, CO free	0.0	not applicable	zero gas	
CO_2/O_2	4.0%/18.0%	-0.2	-0.4%	-0.05/-0.01	ppmv/%
CO_2/O_2	8.0%/8.0%	-0.4	-0.8%	-0.05/-0.05	ppmv/%
CO_2/O_2	12%/4.03%	-0.6	-1.2%	-0.05/-0.15	ppmv/%
Air	Instrument, dry	0.4	0.8%	CO impurity	
NO_x	330 ppmv	0.4	0.8%	0.0001	ppmv/ppm
SO_2	4048 ppmv	-0.3	-0.6%	-0.0001	ppmv/ppm
Propane	243 ppmv	0.4	0.8%	0.0016	

CONTINUOUS EMISSION ANALYZER
INTERFERENCE RESPONSE TESTS

Date: March 17, 1995
Technicians: LJB, CDC

Analyzer Type: Teledyne Brown Engineering
Analyzer Model: Model 320 AR Micro Fuel Cell O_2 Analyzer
Serial Number: 149968
Analyzer Test Range: 0-25%

Test Gas		Analyzer Response		Response Ratio
Gas Type	Concentration	Concentration	% of Range	
Nitrogen	Pre-purified	0.0	not applicable	zero gas
NO_x	3301 ppmv	<0.025%	<0.1%	$<7.6\times10^{-6}$
SO_2	4048 ppmv	<0.025%	<0.1%	$<6.2\times10^{-6}$
CO/Cl	403g/397.9	<0.025%	<0.1%	<0.0001/<0.0001
Propane	243 ppmv	<0.025%	<0.1%	<0.0001

% / ppm

APPENDIX F:
CALIBRATION CERTIFICATIONS

SPECTRA GASES INC.
3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE
PROCEDURE # : G1

CUSTOMER: Quadline C/O Cubix Corporation
SGI ORDER # : 147054
ITEM# : 1
P.O.# : G-1273

CYLINDER # : CC94430
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 660

CERTIFICATION DATE: 10/06/99
EXPIRATION DATE: 10/06/2001

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Nitric Oxide	9/23/98 10/06/99	1209 ppm 1208 ppm	1208 ppm	+/- 1%
NOx			1209 ppm	Reference Value Only

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Nitric Oxide	GMIS-1	CC55762	2976 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Nitric Oxide	Teco 10	10AR-34979-249	Chemi	9/15/99

THIS STANDARD WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: _____ **DATE:** 10/06/99
FRED PIKULA

T-7 T-6

BOC GASES

EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

ORDER NO. 016819

CUSTOMER
CUBIX INTERNATIONAL
9225 HIGHWAY 183 S
AUSTIN, TX 76747

CYLINDER NO: XC003493B
EXPIRATION DATE: 05/19/01
CERTIFICATION DATE: 05/19/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: CUBIX C9006

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY
Nitric Oxide	1816 ppm	+/- 1 %
Total Oxides of Nitrogen	1823 ppm	+/- 1 %
Nitrogen	Balance Gas	

CALIBRATION STANDARDS USED IN ASSAY

TYPE	LOT ID	CYLINDER	CONC.	CAS NO.
NTRM 2630	82630	CC-12776	1414 ppm	10102-43-9
				10102-43-9
				7727-37-9

ANALYZER READINGS

ASSAY LABORATORY: Port Allen

TEST NUMBER: 105457

COMPONENT: Nitric Oxide
Analyzer: THERMO ENVIRONMENTAL Model 42C Chemiluminescence S/N 42CHL-57881-313
Last Multipoint Calibration: 05/10/99

First Triad: 05/12/99 Analyst: F P Kennedy

Zero	Ref.	Sample
0	1369	1765
.1	1384	1773
.11	1389	1779

Mean First Assay: 1819 ppm

Second Triad: 05/19/99 Analyst: F P Kennedy

Zero	Ref.	Sample
.02	1361	1747
.17	1369	1749
.5	1370	1751

Mean Second Assay: 1813 ppm

This Calibration Standard has been certified per the September, 1993 EPA Traceability Protocol, Document EPA-600/R93/224, using Procedure G1.
All values certified to be +/- 1% NIST Traceable. Do not use this cylinder below 1.0 Megapascal, i.e., 150psig

QA APPROVED R. Johnson
A410

Scott Specialty Gases, Inc.

1290 COMBERMERE STREET, TROY, MI 48083 (810) 589-2950 FAX:(810) 589-2134

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
CUBIX CORP
ATTN: LEONARD BRENNER
2106 NW 67TH PLACE
SUITE 7
GAINESVILLE, FL 32653

Assay Laboratory
Scott Specialty Gases, Inc
1290 Combermere
Troy, MI 48083

Purchase Order : G-1134 REPLACE
Scott Project # : 514785

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay and Certification of Gaseous Calibration Standards; Procedure G1; September, 1993.

Cylinder Number : AAL2499 **Certificate Date :** 7/21/97 **Expiration Date :** 7/21/2000
Cylinder Pressure + : 1900 psig **Previous Certificate Date :** None

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon Monoxide	89.69 ppm	±1% NIST Directly Traceable
Methane	84.27 ppm	±1% NIST Directly Traceable

Balance Gas: Air

+Do not use when cylinder presssure is below 150 psig.
*Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1679	5/9/98	ALM059830	98.5 ppm Carbon Monoxide in Nitrogen
NTRM1659	12/17/98	ALM025286	9.82 ppm Methane in Air

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO: Horiba/OPE-135/565607092	7/21/97	Non-dispersive Infrared
CH4: Varian/1400/08982426	7/17/97	Gas Chromatography

ANALYZER READINGS (Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Components

Carbon Monoxide

First Triad Analysis

Date: 7/14/97 Response Units: mv

Z1=0.00	R1=71.00	T1=64.90
R2=71.00	Z2=0.00	T2=64.80
Z3=0.00	T3=64.90	R3=71.00

Avg. Conc. of Cust. Cyl. 89.74 ppm

Second Triad Analysis

Date: 7/21/97 Response Units: mv

Z1=0.00	R1=71.00	T1=64.80
R2=71.00	Z2=0.00	T2=64.80
Z3=0.00	T3=64.80	R3=71.00

Avg. Conc. of Cust. Cyl: 89.65 ppm

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4

r=1.00000	NTRM1679
Constants:	A=0.645566300
B=1.300100000	C=0.001465446
D=-0.000005141	E=0.000000000

Methane

Date: 7/17/97 Response Units: mv

Z1=0.00	R1=47.71	T1=408.50
R2=47.71	Z2=0.00	T2=409.20
Z3=0.00	T3=408.40	R3=47.71

Avg. Conc. of Cust. Cyl. 84.27 ppm

Concentration=A+Bx+Cx^2+Dx^3+Ex^4

r=1.00000	NTRM1659
Constants:	A=-0.019798830
B=0.206241900	C=0.000000000
D=0.000000000	E=0.000000000

Special Notes

Mail

Analyst

SPECTRA GASES INC.
3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 144068
ITEM# : 2
P.O.# : G1254

CYLINDER # : CC88348
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 7/13/99
EXPIRATION DATE: 7/12/2002

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	7/6/99 7/13/99	181.5 ppm 181.7 ppm	181.6 ppm	+/- 1%
Methane	7/12/99	181.3 ppm	181.3 ppm	+/- 1%

BALANCE Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	GMIS-1	CC88505	493.6 ppm
Methane	GMIS-1	CC53310	1000.1 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	6/14/99
Methane	H. Packard 6890	US00001434	GC - FID	7/12/99

THIS STANDARD WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: _____ **DATE:** 7/13/99
FRED PIKULA

SPECTRA GASES INC.
3434 Route 22 West • Branchburg, NJ 08876 USA Tel.: (908) 252-9300 • (800) 932-0624 • Fax: (908) 252-0811
Shipped From: 80 Industrial Drive • Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 145941
ITEM# : 2
P.O.# : G-1270

CYLINDER # : CC90776
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 9/16/99
EXPIRATION DATE: 9/07/2002

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	9/09/99 9/16/99	449.0 ppm 445.4 ppm	447 ppm	+/- 1%
Methane	9/07/99	455 ppm	455 ppm	+/- 1%

BALANCE Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	GMIS-1	CC88505	493.6 ppm
Methane	GMIS-1	CC52976	503.4 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	9/15/99
Methane	H. Packard 6890	US00001434	GC - FID	8/19/99

THIS STANDARD WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: _____
FRED PIKULA

DATE: 9/16/99

SPECTRA GASES
277 Coit St. • Irvington, NJ 07111 USA Tel.: (973) 372-2060 • (800) 932-0624 • Fax: (973) 372-8551
Shipped From: 80 Industrial Drive • Alpha, N.J. 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE
PROCEDURE # : G1

CUSTOMER: Cubix Corporation
SGI ORDER # : 129163
ITEM# : 2
P.O.# : G1179

CYLINDER # : CC85095
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 12/3/97
EXPIRATION DATE: 12/2/2000

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	11/25/97 12/2/97	911.4 ppm 910.9 ppm	911 ppm	+/- 1%
Methane	12/3/97	912.1 ppm	912 ppm	+/- 1%

BALANCE Air

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81681	CC55775	994 ppm
Methane	GMIS-1	CC53310	1000.5 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	12/1/97
Methane	H. Packard 6890	US00001434	GC - FID	12/3/97

THIS STANDARD WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: _____ **DATE:** 12/3/97
TED NEEME

SPECTRA GASES
277 Coit St. • Irvington, NJ 07111 USA Tel.: (973) 372-2060 • (800) 932-0624 • Fax: (973) 372-8551
Shipped From: 80 Industrial Drive • Alpha, N.J. 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE
PROCEDURE # : G2

CUSTOMER: Cubix Corporation
SGI ORDER # : 129163
ITEM# : 4
P.O.# : G1179

CYLINDER # : CC84994
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 12/3/97
EXPIRATION DATE: 12/2/2000

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	11/25/97 12/2/97	1806 ppm 1804 ppm	1805 ppm	+/- 1%
Methane	12/3/97	1811 ppm	1811 ppm	+/- 1.5%

BALANCE Air

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81681	CC55775	994 ppm
Methane	GMIS-1	CC53310	1000.5 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	12/1/97
Methane	H. Packard 6890	US00001434	GC - FID	12/3/97

THIS STANDARD WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: _____ **DATE:** 12/3/97
TED NEEME

Scott Specialty Gases

RATA CLASS

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD,PASADENA,TX 77507 Phone: 281-474-5800 Fax: 281-474-5857

CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

P.O. No.: G-1291
Project No.: 04-85228-003

Customer

CUBIX CORPORATION

4536 NW 20TH DRIVE
GAINESVILLE FL 32605

ORDER ON-LINE • WWW.SCOTTGAS.COM

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1997.

Cylinder Number: ALM013163 **Certification Date:** 4/04/00 **Exp. Date:** 4/04/2003

Cylinder Pressure*:** 1867 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	4.625 %	+/- 1%	Direct NIST and NMi
OXYGEN	20.75 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol procedure G1, September 1997.

Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM5000	7/13/01	ALM048847	5.032 %	CO2/N2
NTRM 2658	12/19/01	ALM031738	9.680 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR System/8220A/AAB9400260	03/28/00	Scott Enhanced FTIR
MTI-A/M200/171109	03/21/00	GAS CHROMATOGRAPHY

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

CARBON DIOXIDE

First Triad Analysis			Second Triad Analysis	Calibration Curve
Date:04/04/00	Response Unit:%			Concentration = A + Bx + Cx2 + Dx3 + Ex4
Z1 = 0.0207	R1 = 5.0312	T1 = 4.6220		r = 0.999990
R2 = 5.0322	Z2 = 0.0226	T2 = 4.6279		Constants: A = 0.000000
Z3 = 0.0210	T3 = 4.6251	R3 = 5.0326		B = 1.000000 C = 0.000000
Avg. Concentration:	4.625	%		D = 0.000000 E = 0.000000

OXYGEN

Date:04/06/00	Response Unit:AREA			Concentration = A + Bx + Cx2 + Dx3 + Ex4
Z1 = 114.00	R1 = 35455.	T1 = 75609.		r = 0.999999418
R2 = 35183.	Z2 = 141.00	T2 = 75405.		Constants: A = -0.03442397
Z3 = 118.00	T3 = 75356.	R3 = 35179.		B = 0.000275952 C =
Avg. Concentration:	20.75	%		D = E =

APPROVED BY: William Morgan

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD,PASADENA,TX 77507 Phone: 281-474-5800 Fax: 281-474-5857

CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

P.O. No.: G-1291
Project No.: 04-85228-001

Customer

CUBIX CORPORATION

4536 NW 20TH DRIVE
GAINESVILLE FL 32605

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1997.

Cylinder Number: AAL17665 **Certification Date:** 4/10/00 **Exp. Date:** 4/10/2003
Cylinder Pressure*:** 1945 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	8.004 %	+/- 1%	Direct NIST and NMi
OXYGEN	11.91 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocal procedure G1, September 1997.
Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM	1/01/03	ALM016777	13.96 %	CO2/N2
NTRM 2658	1/02/01	ALM031728	9.680 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR System/8220A/AAB9400260	03/28/00	Scott Enhanced FTIR
MTI-A/M200/171109	03/21/00	GAS CHROMATOGRAPHY

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

CARBON DIOXIDE

First Triad Analysis			Second Triad Analysis	Calibration Curve
Date:04/10/00	Response Unit:%			Concentration = A + Bx + Cx2 + Dx3 + Ex4
Z1 = 0.0142	R1 = 13.954	T1 = 8.0050		r = 0.999990
R2 = 13.972	Z2 = 0.0301	T2 = 8.0039		Constants: A = 0.000000
Z3 = 0.0231	T3 = 8.0034	R3 = 13.953		B = 1.000000 C = 0.000000
Avg. Concentration:	8.004	%		D = 0.000000 E = 0.000000

OXYGEN

Date:04/12/00	Response Unit:AREA			Concentration = A + Bx + Cx2 + Dx3 + Ex4
Z1 = 43.000	R1 = 35084.	T1 = 43102.		r = 0.999999418
R2 = 34965.	Z2 = 101.00	T2 = 43033.		Constants: A = -0.03442397
Z3 = 91.000	T3 = 43023.	R3 = 35009.		B = 0.000275952 C =
Avg. Concentration:	11.91	%		D = E =

APPROVED BY: John Hunnicutt

RATA CLASS

Scott Specialty Gases

Dual-Analyzed Calibration Standard

9810 BAY AREA BLVD,PASADENA,TX 77507 Phone: 281-474-5800 Fax: 281-474-5857

CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas

Assay Laboratory

SCOTT SPECIALTY GASES
9810 BAY AREA BLVD
PASADENA,TX 77507

P.O. No.: G-1291
Project No.: 04-85228-002

Customer

CUBIX CORPORATION

4536 NW 20TH DRIVE
GAINESVILLE FL 32605

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1997.

Cylinder Number: ALM009152 **Certification Date:** 4/03/00 **Exp. Date:** 4/03/2003

Cylinder Pressure*:** 1883 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	12.62 %	+/- 1%	Direct NIST and NMi
OXYGEN	4.53 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol procedure G1, September 1997.

Product certified as +/- 1% analytical accuracy is directly traceable to NIST or NMI standards.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM	1/01/03	ALM042032	13.96 %	CO2/N2
NTRM 2658	12/19/01	ALM031738	9.680 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR System/8220A/AAB9400260	03/28/00	Scott Enhanced FTIR
MTI-A/M200/171109	03/21/00	GAS CHROMATOGRAPHY

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis | Second Triad Analysis | Calibration Curve

CARBON DIOXIDE

Date:04/03/00	Response Unit:%	
Z1 = 0.0220	R1 = 13.956	T1 = 12.629
R2 = 13.966	Z2 = 0.0178	T2 = 12.617
Z3 = 0.0276	T3 = 12.620	R3 = 13.959
Avg. Concentration:	12.62	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999990
Constants: A = 0.000000
B = 1.000000 C = 0.000000
D = 0.000000 E = 0.000000

OXYGEN

Date:04/06/00	Response Unit:AREA	
Z1 = 114.00	R1 = 35455.	T1 = 16619.
R2 = 35183.	Z2 = 141.00	T2 = 16552.
Z3 = 118.00	T3 = 16573.	R3 = 35179.
Avg. Concentration:	4.530	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999999418
Constants: A = -0.03442397
B = 0.000275952 C =
D = E =

APPROVED BY: _____
John Hunnicutt

Air Products and Chemicals, Inc.
5837 W. Fifth Street
Jacksonville, FL 32254
Telephone (904) 786-2663
FAX (904) 693-9128

AIR PRODUCTS

30 March, 1995

Cubix Corporation
2106 NW 67th Place
Suite 7
Gainesville, FL 32653

CERTIFICATE OF CONFORMANCE

This document certifies that the product listed below is supplied via Air Products and Chemicals, Inc. and complies with the current minimum purity specifications of Air Products and Chemicals, Inc., Specialty Gas Department.

Product	Hydrogen
Product Code	3602
Product	Oxygen
Product Code	1602
Shipper Number	854-C-78428
Product	Compressed Air
Product Code	9197
Product	Nitrogen
Product Code	2602
Shipper Number	854-C-78440

E Edward Henderson
Authorized Signature

Dry Gas Meter Calibration		**Date**	**3/7/2000**
Austin Laboratory		**Technician**	KRH
Meter cleaned / repaired	Yes		

Reference Meter		**Working Meter**	
Manufacturer	Bell Prover	**Manufacturer**	Equimeter 275
Meter No.	# 2130	**Meter No.**	2962152
Previous Calibration Date	7/17/1996	**Previous Calibration Date**	2/5/1999
Previous Calibration Factor	1.0000	**Previous Calibration Factor**	1.0026
Run 1			
Start Time	10:30		10:30
Stop Time	10:38		10:38
Run Time (minutes)	8.00	**Run Time (minutes)**	8.00
Start Temperature °F	80	**Start Temperature °F**	90
Stop Temperature (°F)	80	**Stop Temperature (°F)**	90
Average Temperature (°F)	80	**Average Temperature (°F)**	90
Start Meter Reading (ft3)	54.448	**Start Meter Reading (ft3)**	182.631
Stop Meter Reading (ft3)	59.919	**Stop Meter Reading (ft3)**	188.185
Net Volume (ft3)	5.471	**Net Volume (ft3)**	5.554
Meter Rate (ft3/minute)	0.684	**Meter Rate (ft3/minute)**	0.694
Corrected Volume (ft3 @ STP)	5.349	**Corrected Volume (ft3 @ STP)**	5.332
Calculated Meter Factor	**1.0033**		
Run 2			
Start Time	10:42		10:42
Stop Time	10:50		10:50
Run Time (minutes)	8.00	**Run Time (minutes)**	8.00
Start Temperature °F	80	**Start Temperature °F**	90
Stop Temperature (°F)	80	**Stop Temperature (°F)**	90
Average Temperature (°F)	80	**Average Temperature (°F)**	90
Start Meter Reading (ft3)	59.957	**Start Meter Reading (ft3)**	188.243
Stop Meter Reading (ft3)	65.159	**Stop Meter Reading (ft3)**	193.502
Net Volume (ft3)	5.202	**Net Volume (ft3)**	5.259
Meter Rate (ft3/minute)	0.650	**Meter Rate (ft3/minute)**	0.657
Corrected Volume (ft3 @ STP)	5.086	**Corrected Volume (ft3 @ STP)**	5.049
Calculated Meter Factor	**1.0075**		
Run 3			
Start Time	10:55		10:55
Stop Time	11:03		11:03
Run Time (minutes)	8.00	**Run Time (minutes)**	8.00
Start Temperature °F	80	**Start Temperature °F**	90
Stop Temperature (°F)	80	**Stop Temperature (°F)**	90
Average Temperature (°F)	80	**Average Temperature (°F)**	90
Start Meter Reading (ft3)	65.159	**Start Meter Reading (ft3)**	193.502
Stop Meter Reading (ft3)	70.583	**Stop Meter Reading (ft3)**	199.003
Net Volume (ft3)	5.424	**Net Volume (ft3)**	5.501
Meter Rate (ft3/minute)	0.678	**Meter Rate (ft3/minute)**	0.688
Corrected Volume (ft3 @ STP)	5.303	**Corrected Volume (ft3 @ STP)**	5.281
Calculated Meter Factor	**1.0043**		
AVERAGE DGM FACTOR	**1.0050**		

ALTIMETER TEST RECORD

This unit was tested and inspected IAW FAR Part 43,
Appendix E, and is approved for return to service.

DATE: 1-3-00

WORK ORDER #: 8240

SCALE ERROR

-1000	-5
0	Ø
+ 500	-5
+1000	Ø
+1500	-5
+2000	Ø
+3000	Ø
+4000	-10
+6000	-10
+8000	Ø
+10,000	+10
+12,000	+10
+14,000	+10
+16,000	+5
+18,000	-5
+20,000	-15
+22,000	
+25,000	
+30,000	
+35,000	
+40,000	
+45,000	
+50,000	

START PRESSURE 30.03

FINAL PRESSURE 30.03

BAROMETRIC SCALE ERROR TEST

28.10	+10	30.50	-5
28.50	+5	30.90	Ø
29.00	Ø	30.99	-5
29.50	+5		
29.92	Ø		

FRICTION TEST

1000	25	20,000	50
2000	30	25,000	
3000	35	30,000	
5000	35	35,000	
10,000	35	40,000	
15,000	40		

CASE LEAK TEST @ 18,000 15

CASE LEAK TEST @ 1,200 Ø

HYSTERESIS TEST @ 50% 10

HYSTERESIS TEST @ 40% 10

AFTER EFFECT 5

SERIAL NUMBER J5924

INSPECTOR Dan Mill

TRAILER 10
ALTIMETER/BAROMETER CALIBRATION SHEET

BFG/C 9001

BFGoodrich
Aerospace

Component Overhaul & Repair

817 Dessau Road
Austin, Texas 78753
512-251-3441
FAX 512-990-1271

FAA Repair Station No. UZ2R232L

CASTLEBERRY AERCOR

Serviceable Part Tag

COMPONENT Altimeter
PART NO. 5934P-1A.83
SERIAL NO. J5924
MFG United Instr. WORK ORDER # V2071

☒ Overhaul ☐ Repair ☐ Bench Check & Test ☐ Other _____

The Aircraft Appliance identified above was overhauled, repaired, or bench tested (as per block marked) and inspected, in accordance with current Federal Aviation Administration Regulations, and is approved for return to service. Details of this component are on file at this repair station.

AUTHORIZED SIGNATURE

JAN 16 1995
DATE

ALTIMETER SCALE ERROR					
PART NO. 5934P1A83		SERIAL NO. J5924			
ALTIMETER PRESSURE					
TEST PT (FT)	INDICATOR READINGS AT + 25 °C	TEST PT (FT)	INDICATOR READINGS AT + 25 °C	TEST PT (FT)	INDICATOR READINGS AT + 25 °C
-1000	+5	8,000	+5	30,000	
0 0	0	10,000	+10	35,000	
500	0	12,000	+15	40,000	
1000	0	14,000	+15	45,000	
1500	0	16,000	+5	50,000	
2000	0	18,000	0	55,000	
3000	-5	20,000	-5	60,000	
4000	-10	22,000		70,000	
6000	-10	25,000		80,000	

BFG/C9102

Pitot Tube Calibration Sheet

S-Type Tip Inspection (Method 2, Section 4)

Alignment Inspection

Transverse tube axis pitot-tip angle:

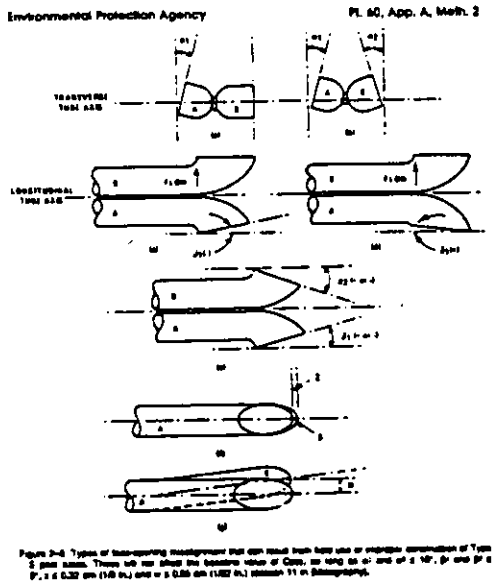
α_1 = 1 ° α_2 = 3 °

Each α must be less than 10° from perpendicular to the transverse tube axis

Longitudinal tube axis pitot-tip angle:

β_1 = 0 ° β_1 = 2 °

Each β must be less than 5° from parrallel to the longitudinal tube axis



Pitot-tip end length alignment:

z = 0.079 (in) or cm)

Z must be ≤ 0.32 cm (1/8 in)

Pitot-tip centriod alignment with respect to transverse axis:

w = 0.017 (in) or cm)

W must be ≤ 0.08 cm (1/32 in)

Pitot Tip Dimension Check

External tubing diameter:

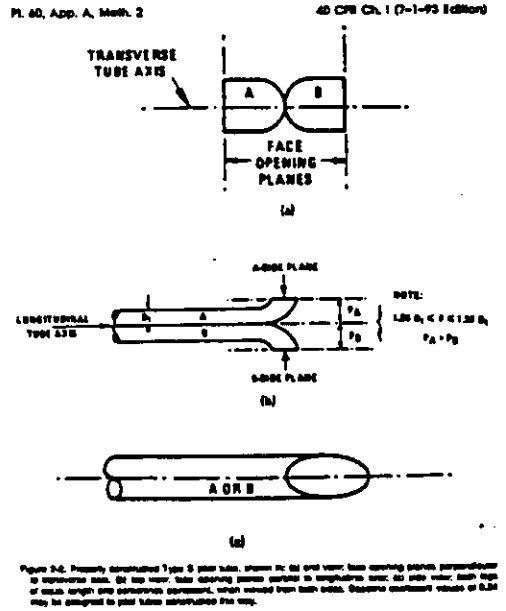
D_t = 1/4 (in) or cm)

D_t must be between 0.48 and 0.95 cm (3/16 and 3/8 in)

Base to opening plane distance:

$P_A = P_B$ = 0.311 (in) or cm)

P_A and P_B must be between 1.05 D_t and 1.50 D_t



Pitot Tube Coefficient

C_p = 0.84 Pitot Tube: # 1010 4' pitot tube Date and Initials: April 24, 2000 JJP

Calibration by Cubix Corporation - Austin, Texas - Gainesville, Florida

T-10 Atkins Cal 1/00

Digital Thermocouple Thermometer Calibration

Date:	1/17/2000
Location:	Cubix Austin Lab
Technician:	KRH
Barometric Presure:	29.50" Hg
Ambient Temp:	73° F

Reference Thermometer / Calibrator

Manufacturer	Omega
Model	CL23A
Seriel #	T-208883
Certificate Date	6/30/1999
Thermocouple Type	K Type
Tested By	RF

(complies with ANSI/Z540-1-1994)

Working Thermometer

Cubix ID	T-10
Manufacturer	Atkins
Model	39658-K
Thermometer:	970834542-83

Reference Thermo./Calib. (°F)	Working Thermometer (°F)	Temperature Difference (°F)	Abs. Temp. % Diff. (°R)
32.0	36.7	-4.7	-0.96
100.0	101.2	-1.2	-0.21
212.0	213	-1.0	-0.15
500.0	502	-2.0	-0.21
1000.0	998	2.0	0.14
1800.0	1798	2.0	0.09
	Average Diff.	-0.8	-0.22

Criteria:

Method 2 Sec 4.3 (in-stack thermometers):
Test within 10% of the observed absolute stack temperature °F+460). Agreement must be less than 1.5% absolute temperature difference between reference and working thermometer.

See also (EMC ALT-011) Emission Mesurement Center, Approved Alternative Method 2 Thermocouple Calibration Procedure.

Method 4 Sec 2.1.4 & M. 5 Sec. 2.1.8 (gas meter thermometers): Thermometers capable of measuring temperature within 3°C (5.4°F).

Method 4 Sec 2.1.2 (last iimpinger thermometers):
Themometer capable of measuring within 1°C (2°F).

Calibration Conducted by CUBIX CORPORATION, Austin, TX

OMEGA ENGINEERING, INC.
One Omega Drive, Box 4047, Stamford, CN 06907
(203) 359-1660 – http://www.omega.com – e-mail: info@omega.com

CERTIFICATE OF CALIBRATION

Model CL23A Serial Number T-208883

Omega Engineering, Inc., certifies that the above listed instrument has been calibrated using standards whose accuracy is traceable to the U.S. National Institute of Standards and Technology, and meets or exceeds its published specifications. Calibration traceability of the above listed instrument is in full compliance with ANSI/Z540-1-1994 standards and requirements.

6-30-99
DATE

RF
TESTED BY

MCK
AUTHORIZED SIGNATURE

OMEGA ENGINEERING, INC.
An OMEGA Technologies Company

Certificate of Conformance

for

CUBIX

9225 U S HIGHWAY 183 S

AUSTIN TX 78747

Cust. P.O. #: 99161 OMEGA W.O. # 906933875

#2210 7' pitot tube thermocouples of 7' and 13'
#1010 4' pitot tube thermouple

CAL-1

OMEGA Engineering, Inc. certifies that the items comprising the above order have been manufactured in accordance with all applicable instructions and specifications as published in the OMEGA TEMPERATURE MEASUREMENT HANDBOOK AND ENCYCLOPEDIA®. OMEGA Engineering Inc. further certifies that all thermocouple base and noble metal materials conform to **ANSI Limits of Error** (ANSI Standard MC96.1)

Certified by: _____ Date: 061699

Quality Assurance Inspector

Omega Engineering, Inc., One Omega Drive, Box 4047, Stamford, CT 06907
Telephone: (203) 359-1660 · FAX: (203) 359-7811
Internet Address: http://www.omega.com E-Mail: info@omega.com

APPENDIX G:
LOGGED DATA

Unit 1404, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
START Run 1404-C-1	4/27/2000	2:10:10 PM	1970	167.1	11.33	5.68	969	1970.0	167.1	11.33	5.68	969.0
Run 1404-C-1	4/27/2000	2:11:10 PM	2035	173.1	11.28	5.71	999	2002.5	170.1	11.31	5.69	984.0
Run 1404-C-1	4/27/2000	2:12:10 PM	2013	169.5	11.27	5.72	968	2006.0	169.9	11.30	5.70	978.7
Run 1404-C-1	4/27/2000	2:13:10 PM	2075	169.1	11.23	5.73	961	2023.3	169.7	11.28	5.71	974.3
Run 1404-C-1	4/27/2000	2:14:10 PM	2010	168.0	11.27	5.71	932	2020.6	169.3	11.28	5.71	965.8
Run 1404-C-1	4/27/2000	2:15:10 PM	2057	168.6	11.25	5.72	969	2026.7	169.2	11.27	5.71	966.3
Run 1404-C-1	4/27/2000	2:16:10 PM	2072	168.0	11.25	5.72	978	2033.1	169.0	11.27	5.71	968.0
Run 1404-C-1	4/27/2000	2:17:10 PM	1942	170.6	11.31	5.68	928	2021.8	169.2	11.27	5.71	963.0
Run 1404-C-1	4/27/2000	2:18:10 PM	2025	172.0	11.26	5.71	957	2022.1	169.5	11.27	5.71	962.3
Run 1404-C-1	4/27/2000	2:19:10 PM	2034	170.6	11.25	5.71	957	2023.3	169.6	11.27	5.71	961.8
Run 1404-C-1	4/27/2000	2:20:10 PM	2031	168.0	11.24	5.71	941	2024.0	169.5	11.27	5.71	959.9
Run 1404-C-1	4/27/2000	2:21:10 PM	1998	168.6	11.26	5.69	959	2021.8	169.4	11.27	5.71	959.8
Run 1404-C-1	4/27/2000	2:22:10 PM	2056	170.6	11.25	5.69	963	2024.5	169.5	11.26	5.71	960.1
Run 1404-C-1	4/27/2000	2:23:10 PM	2014	170.6	11.25	5.68	960	2023.7	169.6	11.26	5.70	960.1
Run 1404-C-1	4/27/2000	2:24:10 PM	2086	168.6	11.23	5.68	988	2027.9	169.5	11.26	5.70	961.9
Run 1404-C-1	4/27/2000	2:25:10 PM	2076	167.1	11.24	5.67	954	2030.9	169.4	11.26	5.70	961.4
Run 1404-C-1	4/27/2000	2:26:10 PM	2110	166.0	11.23	5.67	956	2035.5	169.2	11.26	5.70	961.1
Run 1404-C-1	4/27/2000	2:27:10 PM	1959	171.1	11.30	5.61	971	2031.3	169.3	11.26	5.69	961.7
Run 1404-C-1	4/27/2000	2:28:10 PM	2090	171.1	11.23	5.66	966	2034.4	169.4	11.26	5.69	961.9
Run 1404-C-1	4/27/2000	2:29:10 PM	2015	172.0	11.29	5.63	954	2033.4	169.5	11.26	5.69	961.5
Run 1404-C-1	4/27/2000	2:30:10 PM	2009	170.6	11.26	5.63	969	2032.2	169.5	11.26	5.69	961.9
Run 1404-C-1	4/27/2000	2:31:10 PM	2026	169.1	11.28	5.61	975	2032.0	169.5	11.26	5.68	962.5
Run 1404-C-1	4/27/2000	2:32:10 PM	2055	169.1	11.25	5.62	985	2033.0	169.5	11.26	5.68	963.4
Run 1404-C-1	4/27/2000	2:33:10 PM	2086	170.0	11.24	5.62	981	2035.2	169.5	11.26	5.68	964.2
Run 1404-C-1	4/27/2000	2:34:10 PM	2029	167.5	11.28	5.59	981	2034.9	169.4	11.26	5.67	964.8
Run 1404-C-1	4/27/2000	2:35:01 PM	2004	170.1	11.30	5.57	993	2033.7	169.5	11.26	5.67	965.9
Run 1404-C-1	4/27/2000	2:36:01 PM	1995	172.6	11.29	5.58	984	2032.3	169.6	11.26	5.67	966.6
Run 1404-C-1	4/27/2000	2:37:01 PM	2003	170.6	11.27	5.58	1009	2031.3	169.6	11.26	5.66	968.1
Run 1404-C-1	4/27/2000	2:38:01 PM	2058	168.0	11.27	5.57	992	2032.2	169.6	11.26	5.66	968.9
Run 1404-C-1	4/27/2000	2:39:01 PM	2050	169.1	11.27	5.57	997	2032.8	169.5	11.26	5.66	969.9
Run 1404-C-1	4/27/2000	2:40:01 PM	2063	166.6	11.27	5.56	971	2033.7	169.4	11.26	5.65	969.9
Run 1404-C-1	4/27/2000	2:41:01 PM	2123	168.6	11.22	5.59	948	2036.5	169.4	11.26	5.65	969.2
Run 1404-C-1	4/27/2000	2:42:01 PM	2169	164.6	11.20	5.59	969	2040.5	169.3	11.26	5.65	969.2
Run 1404-C-1	4/27/2000	2:43:01 PM	2129	166.6	11.25	5.55	967	2043.1	169.2	11.26	5.65	969.1
Run 1404-C-1	4/27/2000	2:44:01 PM	2126	166.6	11.25	5.55	984	2045.5	169.1	11.26	5.64	969.6
Run 1404-C-1	4/27/2000	2:45:01 PM	2071	168.6	11.27	5.52	1014	2046.2	169.1	11.26	5.64	970.8

Unit 1404, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
Run 1404-C-1	4/27/2000	2:46:01 PM	2045	170.1	11.27	5.52	1007	2046.2	169.1	11.26	5.64	971.8
Run 1404-C-1	4/27/2000	2:47:01 PM	2059	170.1	11.28	5.50	983	2046.5	169.1	11.26	5.63	972.1
Run 1404-C-1	4/27/2000	2:48:01 PM	2048	170.6	11.28	5.49	985	2046.6	169.2	11.26	5.63	972.4
Run 1404-C-1	4/27/2000	2:49:01 PM	2111	169.1	11.26	5.51	979	2048.2	169.2	11.26	5.63	972.6
Run 1404-C-1	4/27/2000	2:50:01 PM	2090	167.5	11.29	5.50	1014	2049.2	169.1	11.26	5.62	973.6
Run 1404-C-1	4/27/2000	2:51:01 PM	2056	168.0	11.27	5.49	994	2049.4	169.1	11.26	5.62	974.1
Run 1404-C-1	4/27/2000	2:52:01 PM	2042	170.6	11.29	5.48	1007	2049.2	169.1	11.26	5.62	974.8
Run 1404-C-1	4/27/2000	2:53:01 PM	2069	171.1	11.25	5.50	975	2049.6	169.2	11.26	5.61	974.8
Run 1404-C-1	4/27/2000	2:54:01 PM	2102	167.1	11.24	5.49	967	2050.8	169.1	11.26	5.61	974.7
Run 1404-C-1	4/27/2000	2:55:01 PM	2060	169.6	11.27	5.47	972	2051.0	169.2	11.26	5.61	974.6
Run 1404-C-1	4/27/2000	2:56:01 PM	2087	169.1	11.26	5.49	985	2051.8	169.1	11.26	5.61	974.8
Run 1404-C-1	4/27/2000	2:57:01 PM	2071	168.6	11.26	5.49	959	2052.2	169.1	11.26	5.60	974.5
Run 1404-C-1	4/27/2000	2:58:01 PM	2036	170.1	11.27	5.48	1011	2051.8	169.2	11.26	5.60	975.2
Run 1404-C-1	4/27/2000	2:59:01 PM	1990	170.6	11.29	5.47	996	2050.6	169.2	11.26	5.60	975.7
Run 1404-C-1	4/27/2000	3:00:01 PM	2026	171.1	11.27	5.49	993	2050.1	169.2	11.26	5.60	976.0
Run 1404-C-1	4/27/2000	3:01:01 PM	2082	167.5	11.25	5.51	993	2050.7	169.2	11.26	5.60	976.3
Run 1404-C-1	4/27/2000	3:02:01 PM	2021	168.0	11.28	5.49	1019	2050.2	169.2	11.26	5.59	977.1
Run 1404-C-1	4/27/2000	3:03:01 PM	2086	170.1	11.24	5.52	988	2050.8	169.2	11.26	5.59	977.3
Run 1404-C-1	4/27/2000	3:04:01 PM	2054	171.5	11.27	5.50	1031	2050.9	169.2	11.26	5.59	978.3
Run 1404-C-1	4/27/2000	3:05:01 PM	1998	173.1	11.32	5.48	1026	2049.9	169.3	11.26	5.59	979.2
Run 1404-C-1	4/27/2000	3:06:01 PM	1924	175.1	11.30	5.50	1026	2047.7	169.4	11.26	5.59	980.0
Run 1404-C-1	4/27/2000	3:07:01 PM	2045	172.6	11.25	5.53	1018	2047.7	169.4	11.26	5.59	980.6
Run 1404-C-1	4/27/2000	3:08:01 PM	2051	170.1	11.26	5.52	1013	2047.7	169.5	11.26	5.58	981.2
Run 1404-C-1	4/27/2000	3:09:01 PM	2089	167.1	11.24	5.55	1015	2048.4	169.4	11.26	5.58	981.8
END Run 1404-C-1	4/27/2000	3:10:01 PM	2048	167.5	11.23	5.48	751	**2048.4**	**169.4**	**11.26**	**5.58**	**978.0**

Unit 1404, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
START Run 1404-C-2	4/27/2000	3:30:14 PM	1997	171.5	11.32	5.61	1033	1997.0	171.5	11.32	5.61	1033.0
Run 1404-C-2	4/27/2000	3:31:14 PM	2051	173.1	11.27	5.64	1017	2004.8	172.1	11.31	5.61	1027.5
Run 1404-C-2	4/27/2000	3:32:14 PM	2010	170.1	11.28	5.65	1036	2024.8	171.6	11.29	5.62	1030.4
Run 1404-C-2	4/27/2000	3:33:14 PM	2008	171.5	11.29	5.64	1030	2026.2	171.4	11.28	5.63	1030.1
Run 1404-C-2	4/27/2000	3:34:14 PM	1995	175.1	11.29	5.63	964	2012.7	171.9	11.29	5.63	1019.9
Run 1404-C-2	4/27/2000	3:35:14 PM	2105	171.1	11.23	5.67	1022	2026.2	172.3	11.28	5.63	1017.0
Run 1404-C-2	4/27/2000	3:36:14 PM	2008	170.6	11.28	5.65	1048	2030.5	171.8	11.28	5.64	1019.0
Run 1404-C-2	4/27/2000	3:37:14 PM	2017	172.0	11.29	5.64	1039	2029.1	171.8	11.28	5.64	1020.2
Run 1404-C-2	4/27/2000	3:38:16 PM	1972	172.6	11.27	5.66	1057	2026.1	171.8	11.28	5.64	1021.0
Run 1404-C-2	4/27/2000	3:39:16 PM	2046	172.6	11.24	5.69	1014	2026.5	171.9	11.28	5.64	1022.2
Run 1404-C-2	4/27/2000	3:40:16 PM	2058	171.5	11.27	5.68	1028	2029.8	172.0	11.27	5.65	1022.9
Run 1404-C-2	4/27/2000	3:41:16 PM	2023	171.5	11.26	5.67	1047	2032.3	172.0	11.27	5.65	1022.9
Run 1404-C-2	4/27/2000	3:42:16 PM	1997	170.0	11.29	5.66	1025	2033.1	171.8	11.27	5.65	1023.7
Run 1404-C-2	4/27/2000	3:43:16 PM	2026	170.6	11.25	5.70	1049	2034.3	171.8	11.27	5.66	1024.5
Run 1404-C-2	4/27/2000	3:44:16 PM	2023	168.6	11.27	5.69	1049	2035.2	171.6	11.27	5.66	1025.3
Run 1404-C-2	4/27/2000	3:45:16 PM	2041	172.6	11.26	5.70	1055	2032.8	171.5	11.27	5.66	1026.6
Run 1404-C-2	4/27/2000	3:46:16 PM	2072	170.6	11.25	5.70	1080	2034.3	171.6	11.27	5.66	1028.3
Run 1404-C-2	4/27/2000	3:47:16 PM	2075	171.1	11.27	5.69	1076	2036.0	171.5	11.27	5.67	1030.4
Run 1404-C-2	4/27/2000	3:48:16 PM	1959	173.6	11.30	5.67	1074	2035.3	171.5	11.27	5.67	1031.8
Run 1404-C-2	4/27/2000	3:49:16 PM	2025	177.1	11.29	5.69	1042	2032.1	171.8	11.27	5.67	1033.7
Run 1404-C-2	4/27/2000	3:50:16 PM	1985	173.6	11.28	5.68	1038	2031.5	172.0	11.27	5.67	1034.6
Run 1404-C-2	4/27/2000	3:51:16 PM	1994	173.6	11.29	5.67	1072	2030.1	172.1	11.27	5.67	1035.5
Run 1404-C-2	4/27/2000	3:52:16 PM	1966	173.6	11.28	5.69	1066	2028.8	172.1	11.27	5.67	1036.3
Run 1404-C-2	4/27/2000	3:53:16 PM	1996	174.1	11.26	5.69	1034	2026.4	172.2	11.27	5.67	1037.1
Run 1404-C-2	4/27/2000	3:54:16 PM	1995	172.6	11.30	5.67	1032	2025.0	172.2	11.27	5.67	1037.8
Run 1404-C-2	4/27/2000	3:55:16 PM	1968	175.1	11.29	5.66	1029	2023.7	172.3	11.27	5.67	1038.5
Run 1404-C-2	4/27/2000	3:56:16 PM	2001	174.1	11.27	5.67	1047	2021.6	172.4	11.27	5.67	1039.0
Run 1404-C-2	4/27/2000	3:57:16 PM	2058	170.1	11.23	5.68	1069	2022.9	172.4	11.27	5.67	1039.4
Run 1404-C-2	4/27/2000	3:58:16 PM	2032	171.1	11.25	5.67	1080	2023.1	172.3	11.27	5.67	1039.9
Run 1404-C-2	4/27/2000	3:59:16 PM	1964	170.6	11.28	5.64	1066	2022.6	172.3	11.27	5.67	1040.0
Run 1404-C-2	4/27/2000	4:00:16 PM	2049	169.6	11.23	5.67	1069	2022.8	172.2	11.27	5.67	1040.3
Run 1404-C-2	4/27/2000	4:01:16 PM	1981	170.1	11.27	5.64	1076	2022.6	172.1	11.27	5.67	1040.7
Run 1404-C-2	4/27/2000	4:02:16 PM	2012	174.1	11.27	5.63	1034	2021.2	172.1	11.27	5.67	1041.1
Run 1404-C-2	4/27/2000	4:03:16 PM	2016	170.6	11.24	5.64	1088	2021.0	172.1	11.27	5.67	1041.6
Run 1404-C-2	4/27/2000	4:04:16 PM	1916	174.1	11.31	5.59	1055	2020.2	172.1	11.27	5.67	1042.4
Run 1404-C-2	4/27/2000	4:05:16 PM	1793	183.2	11.37	5.57	1091	2014.9	172.3	11.27	5.66	1043.6

Unit 1404, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
Run 1404-C-2	4/27/2000	4:06:15 PM	1793	186.7	11.36	5.57	1103	2008.7	172.7	11.27	5.66	1044.6
Run 1404-C-2	4/27/2000	4:07:16 PM	1671	188.2	11.43	5.52	1109	2001.7	173.1	11.28	5.66	1045.9
Run 1404-C-2	4/27/2000	4:08:16 PM	1680	192.7	11.40	5.54	1095	1993.0	173.6	11.28	5.66	1047.1
Run 1404-C-2	4/27/2000	4:09:16 PM	1699	192.7	11.40	5.54	1097	1984.8	174.1	11.28	5.65	1048.2
Run 1404-C-2	4/27/2000	4:10:16 PM	1670	189.7	11.41	5.52	1070	1978.0	174.5	11.28	5.65	1049.3
Run 1404-C-2	4/27/2000	4:11:16 PM	1609	195.2	11.43	5.51	1090	1968.9	174.9	11.29	5.65	1050.4
Run 1404-C-2	4/27/2000	4:12:16 PM	1714	195.7	11.39	5.54	1069	1961.6	175.5	11.29	5.64	1051.2
Run 1404-C-2	4/27/2000	4:13:16 PM	1798	189.7	11.32	5.56	1086	1957.5	175.8	11.29	5.64	1051.8
Run 1404-C-2	4/27/2000	4:14:16 PM	1881	185.7	11.30	5.58	1099	1954.7	176.1	11.29	5.64	1052.4
Run 1404-C-2	4/27/2000	4:15:16 PM	1870	180.7	11.31	5.56	1107	1952.9	176.2	11.29	5.64	1053.1
Run 1404-C-2	4/27/2000	4:16:16 PM	1884	181.2	11.31	5.56	1099	1951.5	176.3	11.29	5.64	1053.9
Run 1404-C-2	4/27/2000	4:17:16 PM	1874	183.7	11.33	5.53	1048	1950.1	176.5	11.29	5.63	1054.5
Run 1404-C-2	4/27/2000	4:18:16 PM	1908	181.2	11.29	5.56	996	1949.9	176.6	11.29	5.63	1055.2
Run 1404-C-2	4/27/2000	4:19:16 PM	1902	180.7	11.29	5.56	1108	1949.2	176.7	11.29	5.63	1055.7
Run 1404-C-2	4/27/2000	4:20:16 PM	1932	183.2	11.25	5.58	1081	1948.3	176.8	11.29	5.63	1056.4
Run 1404-C-2	4/27/2000	4:21:16 PM	1920	181.7	11.28	5.56	1116	1947.9	176.9	11.29	5.63	1057.3
Run 1404-C-2	4/27/2000	4:22:16 PM	2007	181.2	11.23	5.59	1088	1948.4	177.0	11.29	5.63	1057.8
Run 1404-C-2	4/27/2000	4:23:16 PM	1947	175.5	11.27	5.57	1071	1949.3	177.0	11.29	5.63	1058.4
Run 1404-C-2	4/27/2000	4:24:16 PM	2035	178.1	11.24	5.59	1042	1949.3	177.0	11.29	5.63	1058.5
Run 1404-C-2	4/27/2000	4:25:16 PM	2054	175.1	11.22	5.59	1033	1950.9	177.0	11.29	5.63	1058.2
Run 1404-C-2	4/27/2000	4:26:16 PM	2060	171.5	11.23	5.58	1025	1952.7	176.9	11.29	5.62	1057.9
Run 1404-C-2	4/27/2000	4:27:16 PM	2009	174.1	11.26	5.58	1046	1953.9	176.8	11.29	5.62	1057.6
Run 1404-C-2	4/27/2000	4:28:16 PM	2074	172.0	11.22	5.61	1040	1955.4	176.8	11.29	5.62	1057.2
END Run 1404-C-2	4/27/2000	4:29:16 PM	2027	172.1	11.26	5.60	1051	**1956.6**	**176.7**	**11.29**	**5.62**	**1056.9**

Unit 1404, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
START Run 1404-C-3	4/27/2000	4:48:01 PM	2054	180.0	11.25	5.76	1100	2054.0	180.0	11.25	5.76	1100.0
Run 1404-C-3	4/27/2000	4:49:01 PM	1960	176.6	11.27	5.75	1085	2014.8	177.0	11.26	5.76	1084.6
Run 1404-C-3	4/27/2000	4:50:01 PM	1975	181.2	11.30	5.74	1048	1982.4	177.6	11.27	5.75	1081.9
Run 1404-C-3	4/27/2000	4:51:01 PM	1994	177.6	11.26	5.78	1061	1988.3	178.2	11.27	5.76	1065.5
Run 1404-C-3	4/27/2000	4:52:01 PM	2043	174.1	11.23	5.78	1058	2004.3	177.7	11.26	5.77	1061.6
Run 1404-C-3	4/27/2000	4:53:01 PM	2011	177.1	11.27	5.77	1063	2002.2	177.1	11.26	5.77	1060.1
Run 1404-C-3	4/27/2000	4:54:01 PM	2065	172.6	11.24	5.79	1070	2013.4	176.8	11.26	5.77	1059.9
Run 1404-C-3	4/27/2000	4:55:01 PM	2030	173.6	11.28	5.76	1072	2015.9	176.1	11.26	5.77	1059.4
Run 1404-C-3	4/27/2000	4:56:01 PM	2068	176.0	11.25	5.79	1048	2017.8	176.0	11.26	5.77	1059.5
Run 1404-C-3	4/27/2000	4:57:01 PM	2051	173.6	11.24	5.77	1023	2024.2	175.8	11.26	5.77	1054.8
Run 1404-C-3	4/27/2000	4:58:01 PM	2020	176.1	11.26	5.76	1049	2021.4	175.6	11.26	5.77	1052.3
Run 1404-C-3	4/27/2000	4:59:01 PM	1972	175.1	11.28	5.74	1004	2020.6	175.6	11.26	5.77	1049.5
Run 1404-C-3	4/27/2000	5:00:01 PM	2056	177.1	11.23	5.76	1013	2017.9	175.7	11.26	5.77	1047.6
Run 1404-C-3	4/27/2000	5:01:01 PM	2019	173.1	11.25	5.75	1078	2020.3	175.6	11.26	5.77	1047.5
Run 1404-C-3	4/27/2000	5:02:01 PM	1962	176.6	11.28	5.72	1088	2017.4	175.6	11.26	5.76	1049.4
Run 1404-C-3	4/27/2000	5:03:01 PM	2082	175.5	11.23	5.74	1041	2019.5	175.7	11.26	5.76	1050.4
Run 1404-C-3	4/27/2000	5:04:01 PM	2034	175.5	11.25	5.71	1095	2021.6	175.6	11.26	5.76	1052.1
Run 1404-C-3	4/27/2000	5:05:01 PM	2071	177.6	11.23	5.72	1053	2020.8	175.7	11.26	5.76	1053.8
Run 1404-C-3	4/27/2000	5:06:01 PM	2053	175.5	11.25	5.71	1085	2022.9	175.7	11.26	5.75	1055.3
Run 1404-C-3	4/27/2000	5:07:01 PM	2017	176.1	11.26	5.69	1077	2023.1	175.7	11.26	5.75	1056.3
Run 1404-C-3	4/27/2000	5:08:01 PM	2060	176.6	11.24	5.69	1061	2022.6	175.7	11.26	5.75	1056.3
Run 1404-C-3	4/27/2000	5:09:01 PM	2044	176.6	11.24	5.68	1044	2022.2	175.7	11.26	5.74	1056.2
Run 1404-C-3	4/27/2000	5:10:01 PM	2034	172.0	11.26	5.66	1070	2023.1	175.6	11.26	5.74	1055.8
Run 1404-C-3	4/27/2000	5:11:01 PM	2046	174.1	11.25	5.66	1063	2022.4	175.5	11.26	5.74	1055.7
Run 1404-C-3	4/27/2000	5:12:01 PM	2029	173.6	11.24	5.65	1059	2021.4	175.5	11.26	5.73	1055.7
Run 1404-C-3	4/27/2000	5:13:01 PM	2000	173.6	11.29	5.62	1004	2020.7	175.4	11.26	5.73	1054.2
Run 1404-C-3	4/27/2000	5:14:01 PM	1931	178.6	11.28	5.63	1059	2018.1	175.4	11.26	5.72	1053.4
Run 1404-C-3	4/27/2000	5:15:01 PM	1979	177.6	11.28	5.63	1098	2016.2	175.5	11.26	5.72	1054.7
Run 1404-C-3	4/27/2000	5:16:01 PM	2004	178.6	11.24	5.63	1065	2014.8	175.6	11.26	5.72	1055.9
Run 1404-C-3	4/27/2000	5:17:01 PM	1964	176.0	11.26	5.63	1092	2014.1	175.6	11.26	5.71	1057.0
Run 1404-C-3	4/27/2000	5:18:01 PM	1969	175.6	11.25	5.62	1066	2013.2	175.6	11.26	5.71	1058.3
Run 1404-C-3	4/27/2000	5:19:01 PM	1917	178.1	11.29	5.60	1101	2011.4	175.7	11.26	5.71	1060.0
Run 1404-C-3	4/27/2000	5:20:01 PM	1977	177.6	11.25	5.62	1104	2009.9	175.7	11.26	5.70	1061.4
Run 1404-C-3	4/27/2000	5:21:01 PM	2053	176.6	11.23	5.63	1097	2009.0	175.8	11.26	5.70	1062.7
Run 1404-C-3	4/27/2000	5:22:01 PM	2046	176.0	11.22	5.63	1130	2009.7	175.8	11.26	5.70	1064.0
Run 1404-C-3	4/27/2000	5:23:01 PM	1997	174.6	11.25	5.61	1118	2010.0	175.8	11.26	5.70	1065.3

Unit 1404, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
Run 1404-C-3	4/27/2000	5:24:01 PM	1993	177.1	11.26	5.59	1103	2009.2	175.8	11.26	5.69	1066.5
Run 1404-C-3	4/27/2000	5:25:01 PM	1972	175.6	11.25	5.60	1089	2009.4	175.8	11.26	5.69	1067.5
Run 1404-C-3	4/27/2000	5:26:01 PM	1992	176.0	11.26	5.59	1092	2008.5	175.8	11.26	5.69	1068.5
Run 1404-C-3	4/27/2000	5:27:01 PM	2013	175.1	11.23	5.59	1100	2008.3	175.8	11.26	5.69	1069.5
Run 1404-C-3	4/27/2000	5:28:01 PM	2069	172.6	11.23	5.58	1099	2008.8	175.7	11.26	5.68	1070.3
Run 1404-C-3	4/27/2000	5:29:01 PM	2015	174.1	11.24	5.57	1104	2009.1	175.7	11.26	5.68	1071.1
Run 1404-C-3	4/27/2000	5:30:01 PM	2025	175.1	11.23	5.60	1086	2008.7	175.6	11.26	5.68	1071.6
Run 1404-C-3	4/27/2000	5:31:01 PM	2003	175.1	11.24	5.56	1082	2009.4	175.6	11.25	5.68	1072.0
Run 1404-C-3	4/27/2000	5:32:01 PM	1978	178.6	11.24	5.56	1084	2008.6	175.7	11.25	5.67	1072.5
Run 1404-C-3	4/27/2000	5:33:01 PM	2005	177.1	11.23	5.57	1107	2008.9	175.7	11.25	5.67	1072.9
Run 1404-C-3	4/27/2000	5:34:01 PM	1928	179.5	11.27	5.53	1076	2008.0	175.8	11.25	5.67	1073.4
Run 1404-C-3	4/27/2000	5:35:01 PM	1943	179.5	11.27	5.54	1082	2006.8	175.8	11.25	5.67	1073.8
Run 1404-C-3	4/27/2000	5:36:01 PM	1999	177.6	11.22	5.56	1112	2006.5	175.9	11.25	5.66	1074.0
Run 1404-C-3	4/27/2000	5:37:01 PM	1948	178.6	11.24	5.54	1064	2006.3	175.9	11.25	5.66	1074.3
Run 1404-C-3	4/27/2000	5:38:01 PM	1943	179.1	11.26	5.52	1101	2005.4	176.0	11.25	5.66	1074.5
Run 1404-C-3	4/27/2000	5:39:01 PM	2000	180.7	11.22	5.55	1061	2004.5	176.1	11.25	5.66	1074.7
Run 1404-C-3	4/27/2000	5:40:01 PM	2031	177.6	11.21	5.56	1089	2005.2	176.1	11.25	5.65	1074.9
Run 1404-C-3	4/27/2000	5:41:01 PM	2058	178.1	11.19	5.58	1076	2005.4	176.2	11.25	5.65	1074.9
Run 1404-C-3	4/27/2000	5:42:01 PM	2007	177.1	11.23	5.54	1083	2005.6	176.2	11.25	5.65	1074.9
Run 1404-C-3	4/27/2000	5:43:01 PM	1951	179.1	11.26	5.54	1066	2005.3	176.2	11.25	5.65	1075.0
Run 1404-C-3	4/27/2000	5:44:01 PM	1935	181.7	11.27	5.53	1089	2003.4	176.3	11.25	5.65	1075.0
Run 1404-C-3	4/27/2000	5:45:01 PM	2010	176.6	11.22	5.55	1042	2003.2	176.3	11.25	5.64	1074.9
Run 1404-C-3	4/27/2000	5:46:01 PM	1993	179.1	11.23	5.54	1051	2002.7	176.3	11.25	5.64	1074.7
Run 1404-C-3	4/27/2000	5:47:01 PM	1980	176.0	11.22	5.54	1051	2002.9	176.4	11.25	5.64	1074.5
END Run 1404-C-3	4/27/2000	5:48:01 PM	1986	174.6	11.24	5.52	1046	**2002.9**	**176.3**	**11.25**	**5.64**	**1074.1**

Unit 1405, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
START Run 1405-C-1	4/27/2000	9:21:23 AM	1867	174.1	11.17	5.60	1020	1867.0	174.1	11.17	5.60	1020.0
Run 1405-C-1	4/27/2000	9:22:23 AM	1890	175.1	11.17	5.60	1034	1883.8	174.6	11.16	5.61	1041.1
Run 1405-C-1	4/27/2000	9:23:23 AM	1904	176.6	11.18	5.60	1047	1877.6	175.0	11.17	5.61	1040.6
Run 1405-C-1	4/27/2000	9:24:23 AM	1891	176.6	11.19	5.59	1038	1872.8	175.4	11.17	5.60	1039.4
Run 1405-C-1	4/27/2000	9:25:23 AM	1952	175.1	11.11	5.62	1030	1883.5	175.7	11.17	5.60	1035.9
Run 1405-C-1	4/27/2000	9:26:23 AM	1922	172.0	11.13	5.61	1038	1895.8	175.0	11.16	5.60	1033.7
Run 1405-C-1	4/27/2000	9:27:23 AM	1932	173.1	11.14	5.60	1013	1900.3	174.6	11.15	5.60	1031.7
Run 1405-C-1	4/27/2000	9:28:23 AM	1875	175.1	11.17	5.56	1007	1898.1	174.5	11.15	5.60	1029.3
Run 1405-C-1	4/27/2000	9:29:23 AM	1916	175.5	11.13	5.60	1008	1898.2	174.6	11.15	5.60	1027.4
Run 1405-C-1	4/27/2000	9:30:23 AM	1852	176.0	11.17	5.56	1007	1896.8	174.7	11.15	5.60	1026.0
Run 1405-C-1	4/27/2000	9:31:23 AM	1928	173.1	11.14	5.58	1014	1897.6	174.6	11.15	5.59	1024.0
Run 1405-C-1	4/27/2000	9:32:23 AM	2002	169.5	11.07	5.61	1022	1905.0	174.4	11.15	5.59	1022.4
Run 1405-C-1	4/27/2000	9:33:23 AM	1999	169.5	11.10	5.58	1034	1910.4	173.9	11.14	5.59	1021.7
Run 1405-C-1	4/27/2000	9:34:23 AM	1880	168.6	11.17	5.52	1019	1915.2	173.5	11.14	5.59	1021.2
Run 1405-C-1	4/27/2000	9:35:23 AM	1919	172.0	11.16	5.53	999	1914.4	173.3	11.14	5.59	1020.0
Run 1405-C-1	4/27/2000	9:36:23 AM	1944	169.1	11.12	5.55	1018	1916.7	173.1	11.14	5.58	1018.7
Run 1405-C-1	4/27/2000	9:37:23 AM	1867	170.1	11.14	5.53	986	1916.7	172.9	11.14	5.58	1017.5
Run 1405-C-1	4/27/2000	9:38:23 AM	1994	170.6	11.09	5.56	972	1918.6	172.7	11.14	5.58	1016.2
Run 1405-C-1	4/27/2000	9:39:23 AM	2003	169.1	11.09	5.56	1003	1921.2	172.6	11.14	5.58	1015.0
Run 1405-C-1	4/27/2000	9:40:23 AM	1955	167.1	11.13	5.53	996	1924.8	172.3	11.13	5.58	1013.8
Run 1405-C-1	4/27/2000	9:41:23 AM	1918	169.1	11.15	5.52	987	1925.1	172.1	11.13	5.57	1012.7
Run 1405-C-1	4/27/2000	9:42:23 AM	1965	169.5	11.13	5.53	976	1926.2	172.0	11.13	5.57	1011.5
Run 1405-C-1	4/27/2000	9:43:23 AM	1992	169.1	11.10	5.55	978	1927.3	171.8	11.13	5.57	1010.2
Run 1405-C-1	4/27/2000	9:44:23 AM	1994	168.0	11.09	5.54	989	1929.9	171.7	11.13	5.57	1009.0
Run 1405-C-1	4/27/2000	9:45:23 AM	2009	169.1	11.09	5.57	988	1932.7	171.6	11.13	5.57	1007.9
Run 1405-C-1	4/27/2000	9:46:23 AM	2047	168.0	11.09	5.54	959	1935.8	171.4	11.13	5.57	1006.7
Run 1405-C-1	4/27/2000	9:47:23 AM	1997	167.5	11.12	5.52	990	1938.3	171.3	11.13	5.56	1005.4
Run 1405-C-1	4/27/2000	9:48:23 AM	2017	167.1	11.09	5.55	978	1940.4	171.1	11.13	5.56	1004.3
Run 1405-C-1	4/27/2000	9:49:23 AM	1983	165.1	11.11	5.54	945	1943.0	171.0	11.13	5.56	1002.9
Run 1405-C-1	4/27/2000	9:50:23 AM	2052	166.6	11.10	5.54	932	1945.6	170.8	11.13	5.56	1001.3
Run 1405-C-1	4/27/2000	9:51:23 AM	2109	165.5	11.06	5.55	934	1949.4	170.6	11.12	5.56	999.8
Run 1405-C-1	4/27/2000	9:52:23 AM	1974	165.1	11.12	5.53	955	1951.6	170.5	11.12	5.56	998.4
Run 1405-C-1	4/27/2000	9:53:23 AM	2016	168.6	11.12	5.51	955	1953.3	170.3	11.12	5.56	997.1
Run 1405-C-1	4/27/2000	9:54:23 AM	2048	165.6	11.10	5.52	941	1955.8	170.3	11.12	5.56	995.7
Run 1405-C-1	4/27/2000	9:55:23 AM	2067	164.1	11.09	5.50	945	1959.3	170.1	11.12	5.56	994.3
Run 1405-C-1	4/27/2000	9:56:23 AM	2075	162.6	11.10	5.51	930	1962.6	169.9	11.12	5.55	992.9

Unit 1405, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
Run 1405-C-1	4/27/2000	9:57:23 AM	2031	162.6	11.10	5.49	932	1965.6	169.7	11.12	5.55	991.5
Run 1405-C-1	4/27/2000	9:58:23 AM	2038	163.5	11.15	5.46	961	1967.4	169.5	11.12	5.55	990.2
Run 1405-C-1	4/27/2000	9:59:23 AM	2043	166.1	11.12	5.48	964	1968.7	169.4	11.12	5.55	988.9
Run 1405-C-1	4/27/2000	10:00:23 AM	2047	165.5	11.08	5.49	959	1971.1	169.3	11.12	5.55	987.6
Run 1405-C-1	4/27/2000	10:01:23 AM	2105	164.1	11.09	5.48	972	1973.7	169.2	11.12	5.55	986.4
Run 1405-C-1	4/27/2000	10:02:23 AM	2009	164.1	11.10	5.46	939	1975.5	169.1	11.12	5.54	985.0
Run 1405-C-1	4/27/2000	10:03:23 AM	2045	163.1	11.11	5.44	919	1977.7	168.9	11.12	5.54	983.8
Run 1405-C-1	4/27/2000	10:04:23 AM	2019	164.6	11.13	5.43	927	1978.5	168.8	11.12	5.54	982.6
Run 1405-C-1	4/27/2000	10:05:23 AM	2018	165.5	11.13	5.43	915	1979.5	168.8	11.12	5.54	981.3
Run 1405-C-1	4/27/2000	10:06:23 AM	2010	164.1	11.13	5.42	922	1980.6	168.7	11.12	5.54	980.0
Run 1405-C-1	4/27/2000	10:07:23 AM	2045	163.5	11.10	5.44	923	1982.2	168.6	11.12	5.53	978.8
Run 1405-C-1	4/27/2000	10:08:23 AM	2028	162.6	11.10	5.44	914	1983.5	168.4	11.12	5.53	977.5
Run 1405-C-1	4/27/2000	10:09:23 AM	2021	165.1	11.12	5.43	913	1983.9	168.4	11.12	5.53	976.3
Run 1405-C-1	4/27/2000	10:10:23 AM	2010	165.5	11.14	5.42	934	1984.1	168.3	11.12	5.53	975.1
Run 1405-C-1	4/27/2000	10:11:23 AM	2035	165.5	11.12	5.42	888	1984.8	168.2	11.12	5.53	974.0
Run 1405-C-1	4/27/2000	10:12:23 AM	1975	164.1	11.13	5.44	1018	1985.7	168.2	11.12	5.52	974.2
Run 1405-C-1	4/27/2000	10:13:23 AM	1921	166.0	11.15	5.43	1016	1984.8	168.1	11.12	5.52	975.0
Run 1405-C-1	4/27/2000	10:14:23 AM	2011	166.0	11.13	5.44	1022	1984.4	168.1	11.12	5.52	975.7
Run 1405-C-1	4/27/2000	10:15:23 AM	1973	168.6	11.15	5.42	1009	1983.7	168.0	11.12	5.52	976.4
Run 1405-C-1	4/27/2000	10:16:23 AM	1948	165.1	11.14	5.42	1010	1983.9	168.0	11.12	5.52	976.9
Run 1405-C-1	4/27/2000	10:17:23 AM	1975	166.0	11.15	5.40	995	1983.5	168.0	11.12	5.51	977.4
Run 1405-C-1	4/27/2000	10:18:23 AM	1975	167.1	11.14	5.42	987	1983.2	168.0	11.12	5.51	977.7
Run 1405-C-1	4/27/2000	10:19:23 AM	1931	169.1	11.16	5.41	1005	1982.7	168.0	11.12	5.51	978.1
Run 1405-C-1	4/27/2000	10:20:23 AM	1956	171.5	11.13	5.42	993	1981.8	168.0	11.12	5.51	978.5
END 1405-C-1	4/27/2000	10:21:23 AM	1951	171.1	11.13	5.42	966	**1981.3**	**168.1**	**11.12**	**5.51**	**978.6**

Unit 1405, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
START Run 1405-C-2	4/27/2000	10:40:01 AM	1885	168.6	11.23	5.53	1058	1885.0	168.6	11.23	5.53	1058.0
Run 1405-C-2	4/27/2000	10:41:01 AM	1872	169.1	11.26	5.51	1046	1877.8	168.6	11.24	5.51	1036.6
Run 1405-C-2	4/27/2000	10:42:01 AM	1916	169.1	11.21	5.54	1041	1891.5	168.7	11.24	5.51	1034.7
Run 1405-C-2	4/27/2000	10:43:01 AM	1905	168.6	11.23	5.53	1021	1895.8	168.6	11.23	5.52	1035.0
Run 1405-C-2	4/27/2000	10:44:01 AM	1918	169.1	11.22	5.55	1029	1899.8	168.8	11.23	5.52	1034.4
Run 1405-C-2	4/27/2000	10:45:01 AM	1935	167.5	11.19	5.55	1042	1908.5	168.6	11.22	5.53	1033.9
Run 1405-C-2	4/27/2000	10:46:01 AM	1940	167.5	11.22	5.54	1033	1910.6	168.5	11.22	5.53	1033.4
Run 1405-C-2	4/27/2000	10:47:01 AM	1887	167.5	11.24	5.53	1027	1909.6	168.3	11.22	5.53	1033.7
Run 1405-C-2	4/27/2000	10:48:01 AM	1915	168.6	11.23	5.55	1016	1909.3	168.3	11.22	5.53	1032.7
Run 1405-C-2	4/27/2000	10:49:01 AM	1871	171.5	11.24	5.53	1019	1907.1	168.5	11.22	5.53	1031.7
Run 1405-C-2	4/27/2000	10:50:01 AM	1877	169.5	11.26	5.54	1009	1905.4	168.6	11.22	5.53	1030.4
Run 1405-C-2	4/27/2000	10:51:01 AM	1875	170.5	11.26	5.54	1037	1902.3	168.8	11.23	5.53	1029.5
Run 1405-C-2	4/27/2000	10:52:01 AM	1905	171.1	11.23	5.56	1027	1900.7	169.0	11.23	5.53	1028.2
Run 1405-C-2	4/27/2000	10:53:00 AM	1959	167.5	11.17	5.59	1008	1903.9	169.0	11.23	5.54	1027.0
Run 1405-C-2	4/27/2000	10:54:01 AM	1912	167.1	11.22	5.57	1013	1906.7	168.9	11.22	5.54	1025.9
Run 1405-C-2	4/27/2000	10:55:01 AM	1904	169.1	11.24	5.55	1016	1905.5	168.8	11.22	5.54	1025.1
Run 1405-C-2	4/27/2000	10:56:01 AM	1912	168.6	11.22	5.58	998	1906.3	168.8	11.22	5.54	1023.7
Run 1405-C-2	4/27/2000	10:57:01 AM	1935	169.1	11.22	5.59	995	1906.7	168.8	11.22	5.55	1022.3
Run 1405-C-2	4/27/2000	10:58:01 AM	1947	167.1	11.21	5.59	1020	1908.2	168.8	11.22	5.55	1020.9
Run 1405-C-2	4/27/2000	10:59:01 AM	1959	168.6	11.21	5.57	977	1909.0	168.8	11.22	5.55	1019.8
Run 1405-C-2	4/27/2000	11:00:01 AM	1986	169.1	11.20	5.58	985	1911.5	168.8	11.22	5.55	1019.0
Run 1405-C-2	4/27/2000	11:01:01 AM	1948	167.0	11.21	5.59	994	1914.4	168.7	11.22	5.55	1018.0
Run 1405-C-2	4/27/2000	11:02:03 AM	1944	168.6	11.22	5.59	993	1916.3	168.7	11.22	5.56	1017.2
Run 1405-C-2	4/27/2000	11:03:03 AM	2053	169.1	11.13	5.64	966	1919.6	168.7	11.22	5.56	1016.0
Run 1405-C-2	4/27/2000	11:04:03 AM	1930	166.0	11.24	5.58	985	1922.8	168.6	11.22	5.56	1014.8
Run 1405-C-2	4/27/2000	11:05:03 AM	1968	168.0	11.22	5.59	986	1925.0	168.5	11.22	5.56	1013.7
Run 1405-C-2	4/27/2000	11:06:03 AM	2000	168.0	11.17	5.62	978	1926.6	168.5	11.22	5.56	1012.4
Run 1405-C-2	4/27/2000	11:07:03 AM	1932	169.1	11.21	5.61	980	1927.5	168.4	11.22	5.56	1011.8
Run 1405-C-2	4/27/2000	11:08:03 AM	1990	167.5	11.19	5.61	1018	1928.9	168.5	11.21	5.57	1011.3
Run 1405-C-2	4/27/2000	11:09:03 AM	1982	169.5	11.22	5.59	996	1929.8	168.4	11.21	5.57	1010.7
Run 1405-C-2	4/27/2000	11:10:03 AM	2018	168.6	11.16	5.62	1003	1931.8	168.5	11.21	5.57	1010.1
Run 1405-C-2	4/27/2000	11:11:03 AM	1996	165.5	11.18	5.61	998	1933.8	168.4	11.21	5.57	1009.4
Run 1405-C-2	4/27/2000	11:12:03 AM	1998	164.6	11.20	5.60	979	1936.3	168.3	11.21	5.57	1008.7
Run 1405-C-2	4/27/2000	11:13:03 AM	1939	165.5	11.23	5.58	966	1937.2	168.2	11.21	5.57	1007.9
Run 1405-C-2	4/27/2000	11:14:03 AM	1975	168.6	11.21	5.61	996	1937.2	168.2	11.21	5.57	1007.3
Run 1405-C-2	4/27/2000	11:15:03 AM	1869	167.1	11.24	5.58	1001	1937.4	168.2	11.21	5.57	1006.9

Unit 1405, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
Run 1405-C-2	4/27/2000	11:16:03 AM	1858	171.1	11.25	5.59	990	1934.9	168.2	11.21	5.57	1006.4
Run 1405-C-2	4/27/2000	11:17:03 AM	1814	171.5	11.28	5.56	994	1931.8	168.3	11.22	5.57	1005.9
Run 1405-C-2	4/27/2000	11:18:03 AM	1884	172.0	11.24	5.58	980	1928.9	168.4	11.22	5.57	1005.3
Run 1405-C-2	4/27/2000	11:19:03 AM	1786	171.1	11.28	5.55	970	1926.6	168.5	11.22	5.57	1004.6
Run 1405-C-2	4/27/2000	11:20:03 AM	1680	174.0	11.38	5.48	999	1922.3	168.6	11.22	5.57	1004.3
Run 1405-C-2	4/27/2000	11:21:03 AM	1720	178.0	11.33	5.51	975	1916.9	168.8	11.22	5.57	1003.9
Run 1405-C-2	4/27/2000	11:22:03 AM	1723	176.6	11.33	5.51	993	1912.2	169.0	11.23	5.57	1003.6
Run 1405-C-2	4/27/2000	11:23:03 AM	1690	180.0	11.34	5.50	989	1907.3	169.2	11.23	5.57	1003.3
Run 1405-C-2	4/27/2000	11:24:03 AM	1662	179.0	11.37	5.47	994	1902.2	169.4	11.23	5.56	1003.0
Run 1405-C-2	4/27/2000	11:25:03 AM	1735	180.0	11.33	5.49	997	1897.1	169.7	11.23	5.56	1003.4
Run 1405-C-2	4/27/2000	11:26:03 AM	1725	178.0	11.32	5.49	1003	1893.6	169.9	11.24	5.56	1003.6
Run 1405-C-2	4/27/2000	11:27:03 AM	1620	179.5	11.40	5.44	1026	1889.0	170.0	11.24	5.56	1004.1
Run 1405-C-2	4/27/2000	11:28:03 AM	1660	182.2	11.38	5.46	991	1883.8	170.3	11.24	5.56	1004.4
Run 1405-C-2	4/27/2000	11:29:03 AM	1651	182.1	11.39	5.44	1023	1878.8	170.5	11.24	5.55	1004.6
Run 1405-C-2	4/27/2000	11:30:03 AM	1620	181.2	11.38	5.45	1004	1874.1	170.8	11.25	5.55	1004.8
Run 1405-C-2	4/27/2000	11:31:03 AM	1674	181.6	11.36	5.46	1008	1869.9	171.0	11.25	5.55	1004.9
Run 1405-C-2	4/27/2000	11:32:03 AM	1679	181.6	11.36	5.47	1018	1865.9	171.2	11.25	5.55	1005.0
Run 1405-C-2	4/27/2000	11:33:03 AM	1630	179.5	11.37	5.47	1025	1862.2	171.4	11.25	5.55	1005.1
Run 1405-C-2	4/27/2000	11:34:03 AM	1647	180.7	11.38	5.47	985	1858.4	171.6	11.26	5.55	1005.1
Run 1405-C-2	4/27/2000	11:35:03 AM	1670	180.0	11.37	5.50	1009	1854.6	171.7	11.26	5.54	1005.1
Run 1405-C-2	4/27/2000	11:36:03 AM	1693	179.5	11.36	5.53	983	1851.5	171.8	11.26	5.54	1005.1
Run 1405-C-2	4/27/2000	11:37:03 AM	1654	178.6	11.35	5.54	1038	1848.4	172.0	11.26	5.54	1005.1
Run 1405-C-2	4/27/2000	11:38:03 AM	1694	178.5	11.35	5.55	1001	1845.3	172.1	11.26	5.54	1005.1
END Run 1405-C-2	4/27/2000	11:39:03 AM	1688	177.1	11.35	5.57	998	**1843.1**	**172.2**	**11.26**	**5.54**	**1004.8**

Unit 1405, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
START Run 1405-C-3	4/27/2000	11:57:02 AM	1810	171.0	11.38	5.61	1048	1810.0	171.0	11.38	5.61	1048.0
Run 1405-C-3	4/27/2000	11:58:02 AM	1872	163.1	11.32	5.65	1031	1863.4	166.8	11.33	5.64	1030.3
Run 1405-C-3	4/27/2000	11:59:02 AM	1850	162.1	11.37	5.60	1035	1872.3	164.6	11.32	5.64	1048.3
Run 1405-C-3	4/27/2000	12:00:02 PM	1904	163.5	11.34	5.61	1066	1864.1	164.1	11.34	5.63	1053.2
Run 1405-C-3	4/27/2000	12:01:02 PM	1925	161.6	11.30	5.62	1048	1874.6	163.8	11.33	5.63	1057.6
Run 1405-C-3	4/27/2000	12:02:02 PM	1876	159.1	11.34	5.59	1061	1882.3	163.1	11.33	5.62	1061.2
Run 1405-C-3	4/27/2000	12:03:02 PM	1870	164.0	11.34	5.58	1116	1873.7	162.7	11.34	5.61	1065.3
Run 1405-C-3	4/27/2000	12:04:02 PM	1919	160.6	11.27	5.60	1098	1879.4	162.7	11.33	5.61	1067.5
Run 1405-C-3	4/27/2000	12:05:02 PM	1845	162.6	11.36	5.53	1090	1878.2	162.4	11.33	5.60	1071.5
Run 1405-C-3	4/27/2000	12:06:02 PM	1862	165.5	11.34	5.55	1097	1875.0	162.7	11.33	5.60	1075.1
Run 1405-C-3	4/27/2000	12:07:02 PM	1792	164.6	11.38	5.52	1081	1870.3	162.9	11.33	5.59	1076.8
Run 1405-C-3	4/27/2000	12:08:02 PM	1898	164.6	11.30	5.56	1077	1868.9	163.1	11.33	5.59	1077.7
Run 1405-C-3	4/27/2000	12:09:02 PM	1872	164.0	11.32	5.53	1107	1868.4	163.2	11.33	5.58	1079.5
Run 1405-C-3	4/27/2000	12:10:02 PM	1846	162.1	11.35	5.52	1127	1867.7	163.1	11.33	5.58	1082.1
Run 1405-C-3	4/27/2000	12:11:02 PM	1873	163.1	11.32	5.53	1124	1866.4	163.1	11.33	5.58	1084.7
Run 1405-C-3	4/27/2000	12:12:02 PM	1856	164.0	11.33	5.52	1116	1866.6	163.1	11.33	5.57	1086.9
Run 1405-C-3	4/27/2000	12:13:02 PM	1873	163.5	11.33	5.51	1129	1864.6	163.1	11.33	5.57	1088.3
Run 1405-C-3	4/27/2000	12:14:02 PM	1849	162.0	11.33	5.51	1109	1865.0	163.1	11.33	5.56	1088.9
Run 1405-C-3	4/27/2000	12:15:02 PM	1896	162.6	11.30	5.52	1115	1866.0	163.1	11.33	5.56	1089.8
Run 1405-C-3	4/27/2000	12:16:02 PM	1874	160.6	11.31	5.52	1116	1866.6	163.0	11.33	5.56	1090.2
Run 1405-C-3	4/27/2000	12:17:02 PM	1871	163.1	11.32	5.51	1078	1866.5	162.9	11.33	5.56	1090.9
Run 1405-C-3	4/27/2000	12:18:02 PM	1936	160.6	11.25	5.55	1151	1868.9	162.9	11.33	5.56	1091.9
Run 1405-C-3	4/27/2000	12:19:02 PM	1896	159.1	11.29	5.54	1117	1872.2	162.7	11.32	5.56	1093.2
Run 1405-C-3	4/27/2000	12:20:02 PM	1801	162.1	11.39	5.49	1155	1870.9	162.6	11.32	5.55	1095.0
Run 1405-C-3	4/27/2000	12:21:02 PM	1844	164.6	11.33	5.52	1148	1868.6	162.7	11.32	5.55	1096.7
Run 1405-C-3	4/27/2000	12:22:02 PM	1933	161.6	11.24	5.60	1120	1869.3	162.7	11.32	5.55	1098.2
Run 1405-C-3	4/27/2000	12:23:02 PM	1881	159.1	11.27	5.58	1126	1871.7	162.6	11.32	5.55	1099.5
Run 1405-C-3	4/27/2000	12:24:02 PM	1841	161.1	11.32	5.56	1083	1871.4	162.5	11.32	5.55	1100.6
Run 1405-C-3	4/27/2000	12:25:02 PM	1884	161.6	11.30	5.59	1120	1871.0	162.4	11.32	5.56	1100.5
Run 1405-C-3	4/27/2000	12:26:02 PM	1870	161.6	11.30	5.58	1104	1871.3	162.4	11.32	5.56	1100.1
Run 1405-C-3	4/27/2000	12:27:02 PM	1903	160.6	11.26	5.60	1115	1872.0	162.4	11.32	5.56	1100.0
Run 1405-C-3	4/27/2000	12:28:02 PM	1898	161.1	11.26	5.61	1065	1872.6	162.3	11.31	5.56	1100.0
Run 1405-C-3	4/27/2000	12:29:02 PM	1909	157.6	11.24	5.62	1131	1874.2	162.2	11.31	5.56	1100.0
Run 1405-C-3	4/27/2000	12:30:02 PM	1875	161.1	11.30	5.58	1116	1874.5	162.1	11.31	5.56	1100.1
Run 1405-C-3	4/27/2000	12:31:02 PM	1861	160.0	11.29	5.58	1131	1874.5	162.1	11.31	5.56	1100.0
Run 1405-C-3	4/27/2000	12:32:02 PM	1868	161.1	11.29	5.58	1101	1874.0	162.0	11.31	5.56	1100.3

Unit 1405, Logged Data Records

Run Number	Date	Time	NO_x (ppmv)	CO (ppmv)	O_2 (% vol)	CO_2 (% vol)	THC (ppmv)	AVE NO_x (ppmv)	AVE CO (ppmv)	AVE O_2 (% vol)	AVE CO_2 (% vol)	AVE THC (ppmv)
Run 1405-C-3	4/27/2000	12:33:02 PM	1888	159.5	11.27	5.60	1102	1874.5	162.0	11.31	5.56	1100.7
Run 1405-C-3	4/27/2000	12:34:02 PM	1909	161.6	11.24	5.60	1091	1875.0	161.9	11.31	5.56	1100.5
Run 1405-C-3	4/27/2000	12:35:02 PM	1918	161.6	11.25	5.59	1122	1875.5	161.9	11.31	5.57	1100.7
Run 1405-C-3	4/27/2000	12:36:02 PM	1900	159.5	11.26	5.59	1093	1876.7	161.9	11.30	5.57	1100.7
Run 1405-C-3	4/27/2000	12:37:02 PM	1894	162.1	11.28	5.57	1122	1876.5	161.8	11.30	5.57	1101.1
Run 1405-C-3	4/27/2000	12:38:02 PM	1862	161.1	11.29	5.55	1129	1876.4	161.8	11.30	5.57	1100.9
Run 1405-C-3	4/27/2000	12:39:02 PM	1928	160.6	11.23	5.58	1104	1877.0	161.8	11.30	5.57	1101.1
Run 1405-C-3	4/27/2000	12:40:02 PM	1906	159.5	11.25	5.57	1144	1877.8	161.8	11.30	5.57	1101.1
Run 1405-C-3	4/27/2000	12:41:02 PM	1950	158.6	11.22	5.57	1128	1879.1	161.7	11.30	5.57	1101.1
Run 1405-C-3	4/27/2000	12:42:02 PM	1997	156.0	11.19	5.56	1128	1881.2	161.6	11.30	5.57	1101.4
Run 1405-C-3	4/27/2000	12:43:02 PM	1889	157.1	11.28	5.52	1099	1882.7	161.5	11.30	5.57	1101.7
Run 1405-C-3	4/27/2000	12:44:02 PM	1915	160.1	11.27	5.50	1140	1883.1	161.4	11.29	5.56	1102.0
Run 1405-C-3	4/27/2000	12:45:02 PM	1843	160.1	11.30	5.48	1135	1883.1	161.4	11.29	5.56	1102.7
Run 1405-C-3	4/27/2000	12:46:02 PM	1895	159.6	11.23	5.51	1139	1883.7	161.4	11.29	5.56	1103.3
Run 1405-C-3	4/27/2000	12:47:02 PM	2008	158.1	11.17	5.52	1135	1884.5	161.3	11.29	5.56	1103.9
Run 1405-C-3	4/27/2000	12:48:02 PM	1940	155.6	11.22	5.48	1125	1886.3	161.2	11.29	5.56	1104.5
Run 1405-C-3	4/27/2000	12:49:02 PM	1954	158.1	11.23	5.47	1162	1887.1	161.1	11.29	5.56	1105.2
Run 1405-C-3	4/27/2000	12:50:02 PM	1885	159.5	11.27	5.43	1132	1887.6	161.1	11.29	5.56	1105.8
Run 1405-C-3	4/27/2000	12:51:02 PM	1900	160.6	11.24	5.43	1143	1887.5	161.1	11.29	5.55	1106.6
Run 1405-C-3	4/27/2000	12:52:02 PM	1921	159.6	11.23	5.43	1165	1887.6	161.1	11.29	5.55	1107.2
Run 1405-C-3	4/27/2000	12:53:02 PM	1922	158.6	11.20	5.44	1137	1888.0	161.0	11.29	5.55	1107.9
Run 1405-C-3	4/27/2000	12:54:02 PM	1899	158.6	11.24	5.40	1168	1888.0	161.0	11.28	5.55	1108.6
Run 1405-C-3	4/27/2000	12:55:02 PM	1873	160.6	11.25	5.40	1155	1887.9	160.9	11.28	5.54	1109.4
Run 1405-C-3	4/27/2000	12:56:02 PM	1870	158.1	11.24	5.40	1101	1888.0	160.9	11.28	5.54	1109.8
END Run 1405-C-3	4/27/2000	12:57:02 PM	1879	161.6	11.23	5.40	1104	**1887.7**	**160.9**	**11.28**	**5.54**	**1109.6**

Test Report Summary of Modified Engine 1504

Table 5: Unit 1504 Post-Modification

Florida Gas Transmission
Compressor Station No. 15
6 miles N of Perry, FL on C-361
Worthington SEHG-8 Compressor Engine — 2030 bhp @ 345 rpm
Technicians: LJB, RPO

Test Run No.	1504-CM-1	1504-CM-2	1504-CM-3	
Date	4/28/00	4/28/00	4/28/00	
Start Time	13:15	14:34	15:52	
Stop Time	14:15	15:34	16:52	
Engine/Compressor Operation				**Averages**
Engine Load (bhp, measured at the compressor)	2036	2017	2003	**2019**
Fuel Horsepower (bhp, based upon fuel torque)	2080	2064	2051	**2065**
Engine Speed (rpm)	344	345	345	**345**
Torque (%, full load = 2030 bhp at 345 rpm)	102.7	101.7	101.1	**101.8**
Ignition Timing (°BTDC)	17.0	17.0	17.0	**17.0**
Air Manifold Pressure ("Hg)	10.6	10.7	10.7	**10.7**
Air Manifold Temperature (°F)	99	99	99	**99**
Fuel Manifold Pressure (psig)	32.1	32.1	32.2	**32.1**
Station Suction Pressure (psig)	701	695	694	**697**
Station Suction Temperature (°F)	66.0	66.0	66.0	**66**
Station Discharge Pressure (psig)	947	937	936	**940**
Station Discharge Temperature (°F)	112.7	112.0	112.0	**112.2**
Compressor Flow Rate (MMSCFD)	102	102	102	**102.3**
Loading Step Number	0	0	0	-
Engine Fuel Data (Natural Gas)				
Fuel Heating Value (Btu/SCF, HHV)	1037.0	1037.0	1037.0	**1037.0**
Fuel Specific Gravity	0.5851	0.5851	0.5851	**0.5851**
O_2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	8639	8639	8639	**8639**
CO_2 "F-factor" (DSCFex/MMBtu @ 0% excess air)	1027	1027	1027	**1027**
Fuel Flow (SCFH)	15,216	15,133	15,061	**15,137**
Heat Input (MMBtu/hr)	15.78	15.69	15.62	**15.70**
Brake-specific Fuel Consumption (Btu/bhp-hr)	7,750	7,780	7,797	**7776**
Ambient Conditions				
Atmospheric Pressure ("Hg)	29.82	29.76	29.75	**29.78**
Temperature (°F) : Dry bulb	73.1	82.3	82.3	**79.2**
(°F): Wet bulb	67.0	70.0	72.0	**69.7**
Humidity (lbs moisture/lb air)	0.0125	0.0126	0.0142	**0.0131**
Measured Emissions				
NO_x (ppmv, dry basis)	481.7	446.9	453.9	**460.8**
CO (ppmv, dry basis)	282.4	281.3	278.6	**280.8**
THC (ppmv, wet basis)	1209.5	1146.5	1222.8	**1192.9**
Fuel VOC Fraction (% non-methane/non-ethane)	2.44	2.44	2.44	**2.44**
VOC (ppmv, wet basis)	29.5	28.0	29.8	**29.1**
O_2 (% volume, dry basis)	12.12	12.17	12.19	**12.16**
CO_2 (% volume, dry basis)	5.03	5.00	4.90	**4.98**
F_o (fuel factor, range = 1.600-1.836 for NG)	1.75	1.75	1.78	**1.76**
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	3.36E+05	3.35E+05	3.36E+05	**3.36E+05**
via O_2 "F_c-factor" (SCFH, dry basis)	3.24E+05	3.25E+05	3.24E+05	**3.24E+05**
via CO_2 "F_c-factor" (SCFH, dry basis)	3.22E+05	3.22E+05	3.27E+05	**3.24E+05**
Calculated Emission Rates (via pitot tube)				
NO_x (lbs/hr)	19.3	17.9	18.2	**18.5**
CO (lbs/hr)	6.90	6.85	6.80	**6.85**
VOC (lbs/hr, based on THC emissions and fuel VOC)	0.459	0.435	0.466	**0.453**
NO_x (tons/yr)	84.7	78.3	79.7	**80.9**
CO (tons/yr)	30.2	30.0	29.8	**30.0**
VOC (tons/yr)	2.01	1.91	2.04	**1.99**
NO_x (g/bhp-hr)	4.22	3.93	4.03	**4.06**
CO (g/bhp-hr)	1.51	1.51	1.50	**1.51**
CO (g/bhp-hr)	0.10	0.10	0.10	**0.10**