

Florida Gas Transmission Company

Phase V Expansion Project

Compressor Station No. 12

**APPLICATION
For
AIR CONSTRUCTION
PERMIT**

March 2001



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

RECEIVED

MAR 26 2001

BUREAU OF AIR REGULATION

Reference: Facility: 0390029
Compressor Station No. 12, Santa Rosa 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 two existing 2,000 bhp reciprocating engines 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. 12

Florida Gas Transmission Company

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Prepared by AQMcs, LLC

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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 Munson, in Santa Rosa County, Florida (Compressor Station No. 12). 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 three 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. 12 is located in Santa Rosa County, Florida, north of Munson on Highway 191, approximately 5 miles north of Highway 4. 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 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 two existing 2,000 bhp reciprocating compressor engines 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.

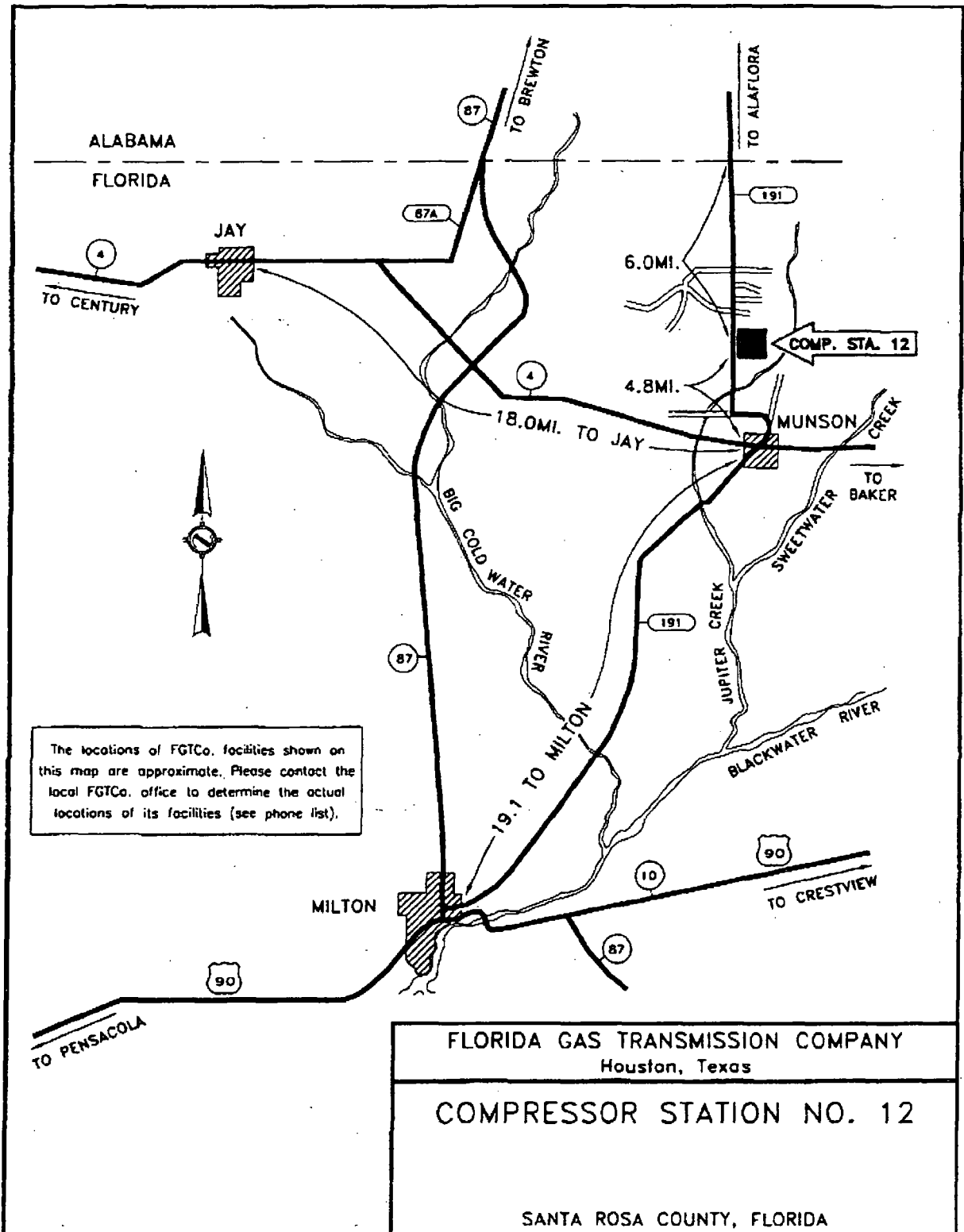
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Engineering designs for the proposed expansion project include selection of an engine incorporating dry low NO_x combustion technology with NO_x emissions at 25 ppmv. This dry low NO_x technology for control of NO_x emissions would represent Best Available 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. 12, 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 engines to be modified and a summary of a test of a similar unit that was modified.

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2.0 PROJECT DESCRIPTION

A plot plan of FGT's Compressor Station No. 12, 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. 12 consists of five 2,000 bhp, one 4,100 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 1201 through 1203). Engine 1204 was installed in 1966 and engine 1205 was installed in 1968. An addition referred to as Phase II was constructed in 1991 (Compressor Engine 1206) and was subject to PSD review. Compressor Engine 1207 was installed in February 2001 as part of the Phase IV Expansion Project.

Of the existing engines, 1204 and 1205 are 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. 12, as part of the Phase V Expansion Project. This will involve adding one new gas-fired turbine (Compressor Engine 1208) and upgrading an existing gas-fired turbine (Compressor Engine 1207). 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 engine compressor unit and associated support equipment at Compressor Station No. 12. The turbine engine will be a Pignone PGT-

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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)
1201	1958	Reciprocating	Cooper-Bessemer	LS-8-SG	2,000
1202	1958	Reciprocating	Cooper-Bessemer	LS-8-SG	2,000
1203	1958	Reciprocating	Cooper-Bessemer	LS-8-SG	2,000
1204	1966	Reciprocating	Cooper-Bessemer	LS-8-SG	2,000
1205	1968	Reciprocating	Cooper-Bessemer	LS-8-SG	2,000
1206	1991	Reciprocating	Dresser-Rand	TVC-10	4,100
1207	2001	Turbine	Solar	Mars 90 T-13000S	10,350

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Table 2-2 Proposed New Compressor Turbine (1208) Specifications and Stack Parameters

Parameter	Design
Compressor Engine	1208
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
<p>NOTE:</p> <p>acfm = actual cubic feet per minute.</p> <p>bhp = brake horsepower.</p> <p>Btu/hp-hr = British thermal units per brake horsepower per hour.</p> <p>°F = degrees Fahrenheit.</p> <p>ft = feet.</p> <p>ft/sec = feet per second.</p> <p>MMscf/hr = million standard cubic feet per hour</p> <p>rpm = revolutions per minute.</p> <p>^a Based on vendor heat rate value plus 10%</p> <p>^b Based on heating value for natural gas of 1040 British thermal units per standard cubic foot (Btu/scf).</p>	

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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 SO₂ 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 (1208)

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 10.23 lb/hr @ 70% load 22.50 lb/hr @ 50% load	Manufacturer Data	7.03 ^a	30.8 ^b
Volatile Organic Compounds	0.29 lb/hr @ 100% load 0.80 lb/hr @ 70% load 1.46 lb/hr @ 50% load	Manufacturer Data	0.45 ^c	2.0 ^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, 70% load for 20% of time & 50% load for 5% 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

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(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), 70% load for 20% (1752 hr/yr) of the time and 50% load for 5% of the time (438 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. 12. 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 (1207) Specifications and Stack Parameters

Parameter	Design
Compressor Engine	1407
Type	Gas Turbine
Manufacturer	Solar
Model	Mars 90 T-13000S
Unit Size	13,078 bhp
Heat Input ^a	8,626 Btu/hp-hr
Maximum Fuel Consumption ^b	0.10847 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
<p>NOTE:</p> <p>acfm = actual cubic feet per minute.</p> <p>bhp = brake horsepower.</p> <p>Btu/hp-hr = British thermal units per brake horsepower per hour.</p> <p>°F = degrees Fahrenheit.</p> <p>ft = feet.</p> <p>ft/sec = feet per second.</p> <p>MMscf/hr = million standard cubic feet per hour.</p> <p>rpm = revolutions per minute.</p> <p>^a Based on vendor heat rate value plus 10%</p> <p>^b Based on heating value for natural gas of 1040 British thermal units per standard cubic foot (Btu/scf).</p>	

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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 SO₂ emissions; therefore, particulate matter emissions are based upon USEPA publication AP-42 Table 3.1-2 (USEPA, 2000) and emissions of SO₂ 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 (1207) Compressor Engine Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	10.21 lb/hr	Manufacturer Data	10.21	44.7
Carbon Monoxide	12.43 lb/hr	Manufacturer Data	12.43	54.5
Volatile Organic Compounds	0.36 lb/hr	Manufacturer Data	0.36	1.6
Particulate Matter*	0.0066 lb/MMBtu	AP-42, Table 3.1-2a	0.74	3.3
Sulfur Dioxide*	10 grains/100 scf	FERC Limit	3.10	13.6
HAPs	Various see Attachment D	GRI HapCalc 3.0	0.62	2.7

* Emissions based on vendor provided heat rate plus 10 per cent

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2.2.3 Proposed Reciprocating Engine Modifications

The following describes and explains the modifications to be made to Emission Unit 1204.

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.

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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 two older slow speed engines (Emission Units 1204 and 1205) at Compressor Station No. 12. 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.

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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. 12 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 through Table 2-10. 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 modified unit 1205. A test report summary is included in Attachment E.

Table 2-6 Proposed Modified Engines(1204, 1205) Specifications and Stack Parameters

Parameter	Design
Compressor Engine	1204, 1205
Type	Reciprocating Engine
Manufacturer	Cooper-Bessemer
Model	LS-8-SG
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
<p>NOTE:</p> <p>acfm = actual cubic feet per minute.</p> <p>bhp = brake horsepower.</p> <p>Btu/hp-hr = British thermal units per brake horsepower per hour.</p> <p>°F = degrees Fahrenheit.</p> <p>ft = feet.</p> <p>ft/sec = feet per second.</p> <p>MMscf/hr = million standard cubic feet per hour.</p> <p>^a Based on heating value for natural gas of 1040 British thermal units per standard cubic foot (Btu/scf).</p>	

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Table 2-7 Pre-modification (1204) Compressor Engine Potential Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	9.50 g/hp-hr	Test Data	41.89	183.5
Carbon Monoxide	0.80 g/hp-hr	Test Data	3.53	15.5
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	3.3

* Emissions based on vendor provided heat rate value

Table 2-8 Post-modification (1204) Compressor Engine Potential Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	5.4 g/hp-hr	Similar Unit Test Data	23.81	104.3
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 heat rate value plus expected 10 % fuel use increase

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Table 2-9 Pre-modification (1205) Compressor Engine Potential Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	11.0 g/hp-hr	Test Data	48.68	213.2
Carbon Monoxide	0.83 g/hp-hr	Test Data	3.66	16.0
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 2-10 Post-modification (1205) Compressor Engine Potential Emissions

Pollutant	Emission Factor	Reference	lb/hr	TPY
Nitrogen Oxides	5.4 g/hp-hr	Test Data	23.81	104.3
Carbon Monoxide*	0.8 g/hp-hr	Test Data	3.53	15.5
Volatile Organic Compounds	0.10 g/hp-hr	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

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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 Tables 2-8 and 2-10 reflect reductions from this converter at approximately 42% 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. 12 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 2-11 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 2-12. 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.

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Table 2-11 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"

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Table 2-12 Potential Annual Emissions (tpy) Summary

SOURCE ID	DESCRIPTION	NO _x	CO	VOC ^a	SO ₂	PM
EXISTING FACILITY						
1201	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.7
1202	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.7
1203	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.7
1204	2000 bhp Recip. Engine ^b	183.5	15.5	1.7	1.8	0.7
1205	2000 bhp Recip. Engine ^b	213.2	16.0	1.7	1.8	0.7
1206	4100 bhp Recip. Engine	77.2	96.6	38.6	3.5	0.6
1207	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 POTENTIAL TOTALS:		1150.7	256.7	72.5	24.2	6.6

PROPOSED MODIFIED FACILITY						
1201	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.6
1202	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.6
1203	2000 bhp Recip. Engine	212.5	27.0	8.5	1.8	0.6
1204	2,000 bhp recip engine – modified ^d	104.3	15.5	1.9	2.0	0.7
1205	2,000 bhp recip engine – modified ^d	104.3	15.5	1.9	2.0	0.7
1206	4100 bhp Recip. Engine	77.2	96.6	38.6	3.5	0.6
1207	13,000 bhp Turbine Engine –upgraded	44.7	54.5	1.6	13.6	3.3
1208	15,700 bhp Turbine engine – new	61.8	30.8	2.0	16.2	3.9
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:		1030.5	294.5	75.6	42.7	11

NET CHANGES IN POTENTIAL EMISSIONS:	-120.2	37.8	3.1	18.5	4.4
--------------------------------------------	---------------	-------------	------------	-------------	------------

- (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. 12.

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. 12.

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. Santa Rosa County is 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.

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

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
	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 Santa Rosa 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

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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.	

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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 / 01 / 01 Date of estimated start of construction.
- b. 7 / 01 / 96 Five years prior to estimated start of construction date.
- c. 10 / 01 / 01 Date of estimated start of operation.
- d. 7 / 01 / 96 to 10 / 01 / 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

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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. 12 are listed in Table 3.4.

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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)
1207 (Ph IV)	0.0	0.0	0.0	0.0
GEN03	0.0	0.0	0.0	0.0
1204	12,498.1	6249.1	41.89	130.9
1205	12,508.1	6254.1	48.68	152.2
1207 (Ph V)	0.0	0.0	0.0	0.0
1208	0.0	0.0	0.0	0.0

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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	1207 (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	1204	Engine modified	104.3	130.9	-26.6	-26.6
12/01/01	1205	Engine modified	104.3	152.2	-47.9	-47.9
12/01/01	1207 (Ph V)*	Uprated turbine	6.1	0.0	6.1	6.1
12/01/01	1208	New turbine	61.8	0.0	61.8	61.8
						32.7

* Phase V portion only

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Since Compressor Station No. 12 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 3.5.

Table 3-5 PSD Applicability

Regulated Pollutant:	NOx
Significance level as defined in 40 CFR 52.21(b)(23)	40
Net contemporaneous change from Table 3-4 (tpy)	32.7
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. 12 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.

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The new turbine to be installed at Compressor Station No. 12 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 SO₂ and requires performance testing and daily monitoring of fuel nitrogen and sulfur.

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

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

$$STD = \text{Allowable NO}_x \text{ emissions \% by volume}$$

$$Y = \text{Heat rate at peak load not to exceed 14.4 Kj/watt-hour}$$

$$F = \text{NO}_x \text{ emission allowance}$$

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. 1208

$$Y = \text{Btu/bhp-hr} \times 1.055 \text{ Kj/Btu} \times \text{hp-hr}/745.7 \text{ watt-hour}$$

$$= 7,807 \text{ Btu/bhp-hr} \times 1.055 \text{ Kj/Btu} \times \text{hp-hr}/745.7 \text{ watt-hour}$$

$$= 11.0 \text{ Kj/watt-hr}$$

$$STD = 0.0150 (14.4/11.0) + 0$$

$$= 0.0196 \%$$

$$= 196 \text{ ppm}_v$$

For uprated Engine No. 1207

$$Y = \text{Btu/bhp-hr} \times 1.055 \text{ Kj/Btu} \times \text{hp-hr}/745.7 \text{ watt-hour}$$

$$= 7,842 \text{ Btu/bhp-hr} \times 1.055 \text{ Kj/Btu} \times \text{hp-hr}/745.7 \text{ watt-hour}$$

$$= 11.1 \text{ Kj/watt-hr}$$

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$$\begin{aligned}\text{STD} &= 0.0150 (14.4/11.1) + 0 \\ &= 0.0195 \% \\ &= 195 \text{ ppm}_v\end{aligned}$$

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 SO₂ 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

$$H_{\text{GEP}} = H + 1.5 L$$

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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. 1207 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. 1207 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. 1208 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. 1208 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.

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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. 1208) at Compressor Station No. 12 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. 12 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.

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3.2 Florida State Air Quality Regulations

Compressor Station No. 12 is currently operating under Permit No.1130037-001-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. 12 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.

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4.0 REFERENCES

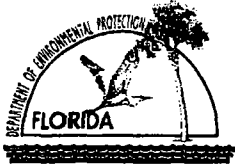
Gas Research institute, 1999. GRI-HAPCalc Software Version 3.0, Radian International, LLC.

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

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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. 12	
3. Facility Identification Number: 1130037 [] Unknown	
4. Facility Location: Street Address or Other Locator: Rt. 1, Box 146 City: Milton County: Santa Rosa Zip Code: 32570-9740	
5. Relocatable Facility? [] Yes [X] No	6. Existing Permitted Facility? [X] Yes [] No

Application Contact

1. Name and Title of Application Contact: Jim Thompson, Environmental Project Manager	
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:	1130037-003-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: _____

- 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: 1130037-001-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: _____

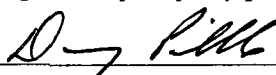
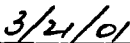
Reason for revision: _____

Air Construction Permit Application

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

- 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>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.</i>  _____  _____ Signature Date

* 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)350-5035 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.

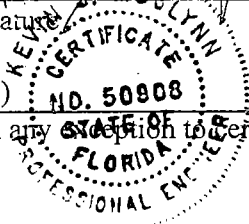
If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X], if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or 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.

Kevin J. Madigan, P.E.
Signature

March 14, 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. 1204, 2000 bhp, Natural Gas Fired	NA	\$0
007	Reciprocating I. C. Compressor Engine No. 1205, 2000 bhp, Natural Gas Fired	NA	\$0
008	Turbine Compressor Engine No. 1207, 13,026 bhp, Natural Gas Fired	NA	\$0
	Turbine Compressor Engine No. 1208, 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 13,078 bhp and to modify two existing 2,000 bhp reciprocating engines.

2. Projected or Actual Date of Commencement of Construction: 07/01/01

3. Projected Date of Completion of Construction: 10/01/01

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. 1130037-002-AV.

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 16 East (km): 510.83 North (km): 3419.03			
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 30/54/42 Longitude (DD/MM/SS): 86/53/12			
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. 12 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. 1, Box 146 City: Milton State: FL Zip Code: 32570-9740			
3. Facility Contact Telephone Numbers: Telephone: (850)957-4221 Fax: (850)957-4619			

Facility Regulatory Classifications

Check all that apply:

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

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		4. Basis for Emissions Cap	5. Pollutant Comment
		lb/hour	tons/year		
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: <input checked="" type="checkbox"/> Attached, Document ID: <i>Narrative Fig. 1-1</i> <input type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
2. Facility Plot Plan: <input checked="" type="checkbox"/> Attached, Document ID: <i>Att. B</i> <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
3. Process Flow Diagram(s): <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
4. Precautions to Prevent Emissions of Unconfined Particulate Matter: <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
5. Fugitive Emissions Identification: <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
6. Supplemental Information for Construction Permit Application: <input checked="" type="checkbox"/> Attached, Document ID: <i>Att. C</i> <input type="checkbox"/> 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 test report for Engines 1204 and 1205.

Additional Supplemental Requirements for Title V Air Operation Permit Applications

8. List of Proposed Insignificant Activities: <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
9. List of Equipment/Activities Regulated under Title VI: <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Equipment/Activities On site but Not Required to be Individually Listed <input checked="" type="checkbox"/> Not Applicable
10. Alternative Methods of Operation: <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
11. Alternative Modes of Operation (Emissions Trading): <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Identification of Additional Applicable Requirements: <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Risk Management Plan Verification: <input type="checkbox"/> 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: _____) <input type="checkbox"/> Plan to be submitted to CEPPO (Date required: _____) <input checked="" type="checkbox"/> Not Applicable
14. Compliance Report and Plan: <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Compliance Certification (Hard-copy Required): <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> 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) <input checked="" type="checkbox"/> 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). <input type="checkbox"/> 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. <input type="checkbox"/> 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) <input checked="" type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit. <input type="checkbox"/> 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. 1208			
4. Emissions Unit Identification Number: ID:		<input checked="" type="checkbox"/> No ID <input type="checkbox"/> ID Unknown	
5. Emissions Unit Status Code: A	6. Initial Startup Date: 10/01/01	7. Emissions Unit Major Group SIC Code: 49	8. Acid Rain Unit? []
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. EMISSION POINT (STACK/VENT) INFORMATION
(Regulated Emissions Units Only)

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? 1208		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: 215,175 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): 510.830 North (km): 3419.030			
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): 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 5

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: 14.10 lb/hour 61.8 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): (14.10 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: 14.10 lb/hour 61.8 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.			

**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: 5.14 lb/hr @ 100% load; 10.23 lb/hr @ 70% load, 22.5 lb/hr @ 50% 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 1752 hr/yr and 50% load for 438 hr/yr. (5.14 lb/hr)(1 ton/2000 lb)(6570 hr/yr) = 16.88 tons/yr (10.23 lb/hr)(1 ton/2000 lb)(1752 hr/yr) = 8.96 tons/yr (22.5 lb/hr)(1 ton/2000 lb)(438 hr/yr) = 4.93 tons/yr 16.88 tpy + 8.96 tpy + 4.93 tpy = 30.77 tpy			
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			

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: 10.23 lb/hour 9.0 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 70% load = to 1752 hr/yr or less (10.23 lb/hr)(1 ton/2000 lb)(1752 hr/yr) = 8.96 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 4.9 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 50% load = to 438 hr/yr or less (22.5 lb/hr)(1 ton/2000 lb)(438 hr/yr) = 4.93 tons/yr	

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: 0.29 lb/hr @ 100% load; 0.80 lb/hr @ 70% load, 1.46 lb/hr @ 50% load 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, 70% load for 1752 hr/yr and 50% load for 438 hr/yr. (0.29 lb/hr)(1 ton/2000 lb)(6570 hr/yr) = 0.95 tons/yr (0.80 lb/hr)(1 ton/2000 lb)(1752 hr/yr) = 0.70 tons/yr (1.46 lb/hr)(1 ton/2000 lb)(438 hr/yr) = 0.32 tons/yr 0.95 tpy + 0.70 tpy + 0.32 tpy = 1.97 tpy	
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) = 0.95 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: 0.80 lb/hour 0.7 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 70% load = to 1752 hr/yr or less (0.80 lb/hr)(1 ton/2000 lb)(1752 hr/yr) = 0.70 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 0.32 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 50% load = to 438 hr/yr or less (1.46 lb/hr)(1 ton/2000 lb)(438 hr/yr) = 0.32 tons/yr	

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 16.2 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): $(10 \text{ gr S}/100 \text{ scf})(0.1296 \text{ MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) = 1.85 \text{ lb S/hr}$ $(1.85 \text{ lb S/hr})(2 \text{ lb SO}_2/\text{lb S}) = 3.70 \text{ lb SO}_2/\text{hr}$ $(3.70 \text{ lb SO}_2/\text{hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 16.22 \text{ ton/yr}$			
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 3.90 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)(134.77 MM Btu/hr) = 0.89 lb/hr (0.89 lb/hr)(8760 hr/yr)(1 ton/2000 lb) = 3.90 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): $(0.0217\text{g/hp-hr})(15,700\text{ hp})(1\text{ lb}/453.6\text{ g}) = 0.751\text{ lb/hr}$ $(0.751\text{ lb/hr})(8760\text{ hr/yr})(1\text{ ton}/2000\text{ lb}) = 3.29\text{ ton/yr}$			
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 <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
2. Fuel Analysis or Specification <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
3. Detailed Description of Control Equipment <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
4. Description of Stack Sampling Facilities <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
5. Compliance Test Report <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Previously submitted, Date: _____ <input checked="" type="checkbox"/> Not Applicable
6. Procedures for Startup and Shutdown <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
7. Operation and Maintenance Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
8. Supplemental Information for Construction Permit Application <input checked="" type="checkbox"/> Attached, Document ID: <u>Narrative</u> <input type="checkbox"/> Not Applicable
9. Other Information Required by Rule or Statute <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
10. Supplemental Requirements Comment: <p>Supplemental information is provided in the narrative description and Attachment C accompanying these forms.</p>

Emissions Unit Information Section 1 of 5

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Alternative Modes of Operation (Emissions Trading) <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Identification of Additional Applicable Requirements <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
14. Compliance Assurance Monitoring Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Acid Rain Part Application (Hard-copy Required) NA <input type="checkbox"/> Acid Rain Part - Phase II (Form No. 62-210.900(1)(a)) Attached, Document ID: _____ <input type="checkbox"/> Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) Attached, Document ID: _____ <input type="checkbox"/> New Unit Exemption (Form No. 62-210.900(1)(a)2.) Attached, Document ID: _____ <input type="checkbox"/> Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) Attached, Document ID: _____ <input type="checkbox"/> Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) Attached, Document ID: _____ <input type="checkbox"/> Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) Attached, Document ID: _____ <input type="checkbox"/> 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) <input checked="" type="checkbox"/> 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). <input type="checkbox"/> 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. <input type="checkbox"/> 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) <input checked="" type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit. <input type="checkbox"/> 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): 13,078 bhp natural gas fired turbine compressor unit, Engine No. 1207			
4. Emissions Unit Identification Number: ID:		<input checked="" type="checkbox"/> No ID <input type="checkbox"/> ID Unknown	
5. Emissions Unit Status Code: A	6. Initial Startup Date: 1/19/01	7. Emissions Unit Major Group SIC Code: 49	8. Acid Rain Unit? <input type="checkbox"/>
9. Emissions Unit Comment: (Limit to 500 Characters) The existing Solar Mars 90 turbine engine will be uprated from 10,350 bhp to 13,078 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 NO_x 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/Bhp-hr plus 10% and 13,078 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? 1207		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): 510.830 North (km): 3419.030			
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 turbine 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): 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

**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: 10.21 lb/hour 44.7 tons/year		4. Synthetically Limited? []	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 _____ to _____ tons/year			
6. Emission Factor: 10.21 lb/hr Reference: Vendor's data		7. Emissions Method Code: 5	
8. Calculation of Emissions (limit to 600 characters): (10.21 lb/hr)(1 ton/2000 lb)(8760hr/1 yr) = 44.72 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: 10.21 lb/hour 44.7 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.			

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: 12.43 lb/hour 54.45 tons/year		4. Synthetically Limited? []	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 _____ to _____ tons/year			
6. Emission Factor: 12.43 lb/hr Reference: Vendor's data		7. Emissions Method Code: 5	
8. Calculation of Emissions (limit to 600 characters): (12.43 lb/hr)(1 ton/2000 lb)(8760 hr/1 yr) = 54.45 tons/year			
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Vendor emission factor is based on a guaranteed value of 50 ppmv.			

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: 0.356 lb/hour 1.56 tons/year		4. Synthetically Limited? []	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 to tons/year			
6. Emission Factor: 3.56 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) = 3.56 lb/hr. Assume 10% is VOC. (0.356 lb/hr)(1 ton/2000 lb)(8760 hr/1 yr) = 1.56 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):			

**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): $(10 \text{ gr S}/100 \text{ scf})(0.10847 \text{ MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) = 1.55 \text{ lb S/hr}$ $(1.55 \text{ lb S/hr})(2 \text{ lb SO}_2/\text{lb S}) = 3.10 \text{ lb SO}_2/\text{hr}$ $(3.10 \text{ lb SO}_2/\text{hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 13.57 \text{ ton/yr}$			
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Based on vendor's fuel use 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: 3.10 lb/hour 13.6 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/PM10		2. Total Percent Efficiency of Control:	
3. Potential Emissions: 0.74 lb/hour 3.3 tons/year		4. Synthetically Limited? []	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 _____ to _____ tons/year			
6. Emission Factor: 0.0066 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): $(0.0066 \text{ lb/MM Btu})(102.15 \text{ MM Btu/hr}) = 0.74 \text{ lb/hr}$ $(0.74 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 3.26 \text{ ton/y}$			
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Based on vendor's fuel use 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: 0.63 lb/hour 2.74 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): $(0.0217 \text{ g/hp-hr})(13,078 \text{ hp-hr})(1 \text{ lb}/453.6 \text{ g}) = 0.626 \text{ lb/hr}$ $(0.626 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 2.74 \text{ ton/yr}$			
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 <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
2. Fuel Analysis or Specification <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
3. Detailed Description of Control Equipment <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
4. Description of Stack Sampling Facilities <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
5. Compliance Test Report <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Previously submitted, Date: _____ <input checked="" type="checkbox"/> Not Applicable
6. Procedures for Startup and Shutdown <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
7. Operation and Maintenance Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
8. Supplemental Information for Construction Permit Application <input checked="" type="checkbox"/> Attached, Document ID: <u>Narrative</u> <input type="checkbox"/> Not Applicable
9. Other Information Required by Rule or Statute <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
10. Supplemental Requirements Comment: <p>Supplemental information is provided in the narrative description and Attachment C accompanying these forms. Emissions testing has not been performed on this unit.</p>

Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Alternative Modes of Operation (Emissions Trading) <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Identification of Additional Applicable Requirements <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
14. Compliance Assurance Monitoring Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Acid Rain Part Application (Hard-copy Required) NA <input type="checkbox"/> Acid Rain Part - Phase II (Form No. 62-210.900(1)(a)) Attached, Document ID: _____ <input type="checkbox"/> Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) Attached, Document ID: _____ <input type="checkbox"/> New Unit Exemption (Form No. 62-210.900(1)(a)2.) Attached, Document ID: _____ <input type="checkbox"/> Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) Attached, Document ID: _____ <input type="checkbox"/> Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) Attached, Document ID: _____ <input type="checkbox"/> Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) Attached, Document ID: _____ <input type="checkbox"/> 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

<p>1. Type of Emissions Unit Addressed in This Section: (Check one)</p> <p><input checked="" type="checkbox"/> 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).</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p>			
<p>2. Regulated or Unregulated Emissions Unit? (Check one)</p> <p><input checked="" type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.</p> <p><input type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.</p>			
<p>3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):</p> <p>Reciprocating I.C. Engine 1204, 2000 bhp, natural gas fired</p>			
<p>4. Emissions Unit Identification Number: ID: 007</p>		<p><input type="checkbox"/> No ID <input type="checkbox"/> ID Unknown</p>	
<p>5. Emissions Unit Status Code: A</p>	<p>6. Initial Startup Date: 1966</p>	<p>7. Emissions Unit Major Group SIC Code: 49</p>	<p>8. Acid Rain Unit? <input type="checkbox"/></p>
<p>9. Emissions Unit Comment: (Limit to 500 Characters)</p> <p>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.</p>			

Emissions Unit Control Equipment

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

A catalytic converter for CO control is being added.
See Narrative Section 2.2.3.

2. Control Device or Method Code(s): 99

Emissions Unit Details

1. Package Unit:

Manufacturer: Cooper-Bessemer

Model Number: LS-8-SG

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):		
<p>Manufacturer rated at 2000 bhp. Heat output based on expected 10% increase after modification.</p>		

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? 1204		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): 510.830 North (km): 3419.030			
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: 138.98	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

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: 23.81 lb/hour 104.3 tons/year		4. Synthetically Limited? []	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 _____ to _____ tons/year			
6. Emission Factor: 5.4 g/hp-hr Reference: Test data for similar unit		7. Emissions Method Code: 1	
8. Calculation of Emissions (limit to 600 characters): $(5.4 \text{ g/hp-hr})(2000 \text{ bhp})(1\text{lb}/453.6 \text{ g}) = 23.81 \text{ lb/hr}$ $(23.81 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 104.3 \text{ ton/yr}$			
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):			

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): $(0.8 \text{ g/hp-hr})(2000 \text{ bhp})(1\text{lb}/453.6 \text{ g}) = 3.53 \text{ lb/hr}$ $(3.53 \text{ lb/hr})(1 \text{ ton}/2000 \text{ lb})(8760 \text{ hr}/1 \text{ yr}) = 15.5 \text{ tons/year}$			
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):			

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): $(0.1 \text{ g/hp-hr})(2000 \text{ bhp})(1\text{lb}/453.6 \text{ g}) = 0.44 \text{ lb/hr}$ $(0.44 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 1.93 \text{ ton/yr}$			
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):			

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

Potential/Fugitive Emissions

1. Pollutant Emitted: SO ₂	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): $(10.0 \text{ gr S}/100 \text{ scf})(0.0159 \text{ MM scf/hr})(1 \text{ lb}/7000 \text{ gr}) = 0.23 \text{ lb S/hr}$ $(0.23 \text{ lb S/hr})(2 \text{ lb/lb S}) = 0.45 \text{ lb SO}_2/\text{hr}$ $(0.45 \text{ lb SO}_2/\text{hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 1.98 \text{ ton/yr}$	
9. Pollutant Potential/Fugitive Emissions Comment (limit to 200 characters): Projected fuel use based on test data. SO ₂ 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):	

**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): $(0.00999 \text{ lb/MM Btu})(16.5 \text{ MM Btu/hr}) = 0.16 \text{ lb/hr}$ $(0.16 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 0.72 \text{ ton/y}$			
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):			

**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): $(0.172 \text{ g/hp-hr})(2,000 \text{ hp-hr})(1 \text{ lb}/453.6 \text{ g}) = 0.758 \text{ lb/hr}$ $(0.758 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 3.32 \text{ ton/yr}$			
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 <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
2. Fuel Analysis or Specification <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
3. Detailed Description of Control Equipment <input checked="" type="checkbox"/> Attached, Document ID: <u>Att. C</u> <input type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
4. Description of Stack Sampling Facilities <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
5. Compliance Test Report <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Previously submitted, Date: _____ <input checked="" type="checkbox"/> Not Applicable
6. Procedures for Startup and Shutdown <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
7. Operation and Maintenance Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
8. Supplemental Information for Construction Permit Application <input checked="" type="checkbox"/> Attached, Document ID: <u>Narrative</u> <input type="checkbox"/> Not Applicable
9. Other Information Required by Rule or Statute <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> 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 E 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 <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Alternative Modes of Operation (Emissions Trading) <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Identification of Additional Applicable Requirements <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
14. Compliance Assurance Monitoring Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Acid Rain Part Application (Hard-copy Required) NA <input type="checkbox"/> Acid Rain Part - Phase II (Form No. 62-210.900(1)(a)) Attached, Document ID: _____ <input type="checkbox"/> Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) Attached, Document ID: _____ <input type="checkbox"/> New Unit Exemption (Form No. 62-210.900(1)(a)2.) Attached, Document ID: _____ <input type="checkbox"/> Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) Attached, Document ID: _____ <input type="checkbox"/> Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) Attached, Document ID: _____ <input type="checkbox"/> Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) Attached, Document ID: _____ <input type="checkbox"/> 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

<p>1. Type of Emissions Unit Addressed in This Section: (Check one)</p> <p><input checked="" type="checkbox"/> 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).</p> <p><input type="checkbox"/> 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.</p> <p><input type="checkbox"/> 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.</p>			
<p>2. Regulated or Unregulated Emissions Unit? (Check one)</p> <p><input checked="" type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.</p> <p><input type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.</p>			
<p>3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):</p> <p>Reciprocating I.C. Engine 1205, 2000 bhp, natural gas fired</p>			
<p>4. Emissions Unit Identification Number:</p> <p>ID: 007</p>		<p><input type="checkbox"/> No ID</p> <p><input type="checkbox"/> ID Unknown</p>	
<p>5. Emissions Unit Status Code:</p> <p>A</p>	<p>6. Initial Startup Date:</p> <p>1968</p>	<p>7. Emissions Unit Major Group SIC Code:</p> <p>49</p>	<p>8. Acid Rain Unit?</p> <p><input type="checkbox"/></p>
<p>9. Emissions Unit Comment: (Limit to 500 Characters)</p> <p>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.</p>			

Emissions Unit Control Equipment

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

A catalytic converter for CO control is being added.
See Narrative Section 2.2.3.

2. Control Device or Method Code(s): 99

Emissions Unit Details

1. Package Unit:		
Manufacturer:	Cooper-Bessemer	Model Number: LS-8-SG
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):		
<p>Manufacturer rated at 2000 bhp. Heat output based on expected 10% increase after modification.</p>		

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	

Emissions Unit Information Section 4 of 5**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? 1205		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): 510.830 North (km): 3419.030				
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: 138.98	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

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: 23.81 lb/hour 104.3 tons/year		4. Synthetically Limited? []	
5. Range of Estimated Fugitive Emissions: [] 1 [] 2 [] 3 _____ to _____ tons/year			
6. Emission Factor: 5.4 g/hp-hr Reference: Test data for similar unit		7. Emissions Method Code: 1	
8. Calculation of Emissions (limit to 600 characters): $(5.4 \text{ g/hp-hr})(2000 \text{ bhp})(1\text{lb}/453.6 \text{ g}) = 23.81 \text{ lb/hr}$ $(23.81 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 104.3 \text{ ton/yr}$			
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):			

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): $(0.8 \text{ g/hp-hr})(2000 \text{ bhp})(1\text{lb}/453.6 \text{ g}) = 3.53 \text{ lb/hr}$ $(3.53 \text{ lb/hr})(1 \text{ ton}/2000 \text{ lb})(8760 \text{ hr}/1 \text{ yr}) = 15.5 \text{ tons/year}$			
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):			

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 1.9 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): $(0.1 \text{ g/hp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.6 \text{ g}) = 0.44 \text{ lb/hr}$ $(0.44 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 1.93 \text{ ton/yr}$	
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):	

**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): $(10.0 \text{ gr S}/100 \text{ scf})(0.0159 \text{ MM scf/hr})(1 \text{ lb}/7000 \text{ gr}) = 0.23 \text{ lb S/hr}$ $(0.23 \text{ lb S/hr})(2 \text{ lb/lb S}) = 0.45 \text{ lb SO}_2/\text{hr}$ $(0.45 \text{ lb SO}_2/\text{hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 1.98 \text{ ton/yr}$			
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):			

**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): $(0.00999 \text{ lb/MM Btu})(16.5 \text{ MM Btu/hr}) = 0.16 \text{ lb/hr}$ $(0.16 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 0.72 \text{ ton/y}$			
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):			

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): $(0.172 \text{ g/hp-hr})(2,000 \text{ hp-hr})(1 \text{ lb}/453.6 \text{ g}) = 0.758 \text{ lb/hr}$ $(0.758 \text{ lb/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) = 3.32 \text{ ton/yr}$			
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 <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
2. Fuel Analysis or Specification <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
3. Detailed Description of Control Equipment <input checked="" type="checkbox"/> Attached, Document ID: <u>Att. C</u> <input type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
4. Description of Stack Sampling Facilities <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
5. Compliance Test Report <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Previously submitted, Date: _____ <input checked="" type="checkbox"/> Not Applicable
6. Procedures for Startup and Shutdown <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
7. Operation and Maintenance Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
8. Supplemental Information for Construction Permit Application <input checked="" type="checkbox"/> Attached, Document ID: <u>Narrative</u> <input type="checkbox"/> Not Applicable
9. Other Information Required by Rule or Statute <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> 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 E 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 <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Alternative Modes of Operation (Emissions Trading) <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Identification of Additional Applicable Requirements <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
14. Compliance Assurance Monitoring Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Acid Rain Part Application (Hard-copy Required) NA <input type="checkbox"/> Acid Rain Part - Phase II (Form No. 62-210.900(1)(a)) Attached, Document ID: _____ <input type="checkbox"/> Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) Attached, Document ID: _____ <input type="checkbox"/> New Unit Exemption (Form No. 62-210.900(1)(a)2.) Attached, Document ID: _____ <input type="checkbox"/> Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) Attached, Document ID: _____ <input type="checkbox"/> Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) Attached, Document ID: _____ <input type="checkbox"/> Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) Attached, Document ID: _____ <input type="checkbox"/> 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

<p>1. Type of Emissions Unit Addressed in This Section: (Check one)</p> <p><input type="checkbox"/> 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).</p> <p><input type="checkbox"/> 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.</p> <p><input checked="" type="checkbox"/> 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.</p>			
<p>2. Regulated or Unregulated Emissions Unit? (Check one)</p> <p><input type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is a regulated emissions unit.</p> <p><input checked="" type="checkbox"/> The emissions unit addressed in this Emissions Unit Information Section is an unregulated emissions unit.</p>			
<p>3. Description of Emissions Unit Addressed in This Section (limit to 60 characters):</p> <p>Fugitive emissions from component leaks.</p>			
<p>4. Emissions Unit Identification Number:</p> <p><input checked="" type="checkbox"/> ID: <input type="checkbox"/> ID Unknown</p>			
<p>5. Emissions Unit Status Code:</p> <p>C</p>	<p>6. Initial Startup Date: 10/01/00</p>	<p>7. Emissions Unit Major Group SIC Code:</p> <p>49</p>	<p>8. Acid Rain Unit?</p> <p><input type="checkbox"/></p>
<p>9. Emissions Unit Comment: (Limit to 500 Characters)</p> <p>These are new fugitive leak emissions from new components (valves, flanges, etc.)</p>			

Emissions 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): 510.830 North (km): 3419.030			
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

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: 0.084 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: <input type="checkbox"/> Rule <input type="checkbox"/> 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: <input type="checkbox"/> Rule	<input type="checkbox"/> 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 <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
2. Fuel Analysis or Specification <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
3. Detailed Description of Control Equipment <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
4. Description of Stack Sampling Facilities <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Not Applicable <input checked="" type="checkbox"/> Waiver Requested
5. Compliance Test Report <input type="checkbox"/> Attached, Document ID: _____ <input type="checkbox"/> Previously submitted, Date: _____ <input checked="" type="checkbox"/> Not Applicable
6. Procedures for Startup and Shutdown <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
7. Operation and Maintenance Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable <input type="checkbox"/> Waiver Requested
8. Supplemental Information for Construction Permit Application <input checked="" type="checkbox"/> Attached, Document ID: Narrative <input type="checkbox"/> Not Applicable
9. Other Information Required by Rule or Statute <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> 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 C accompanying these forms.

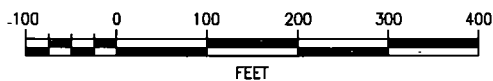
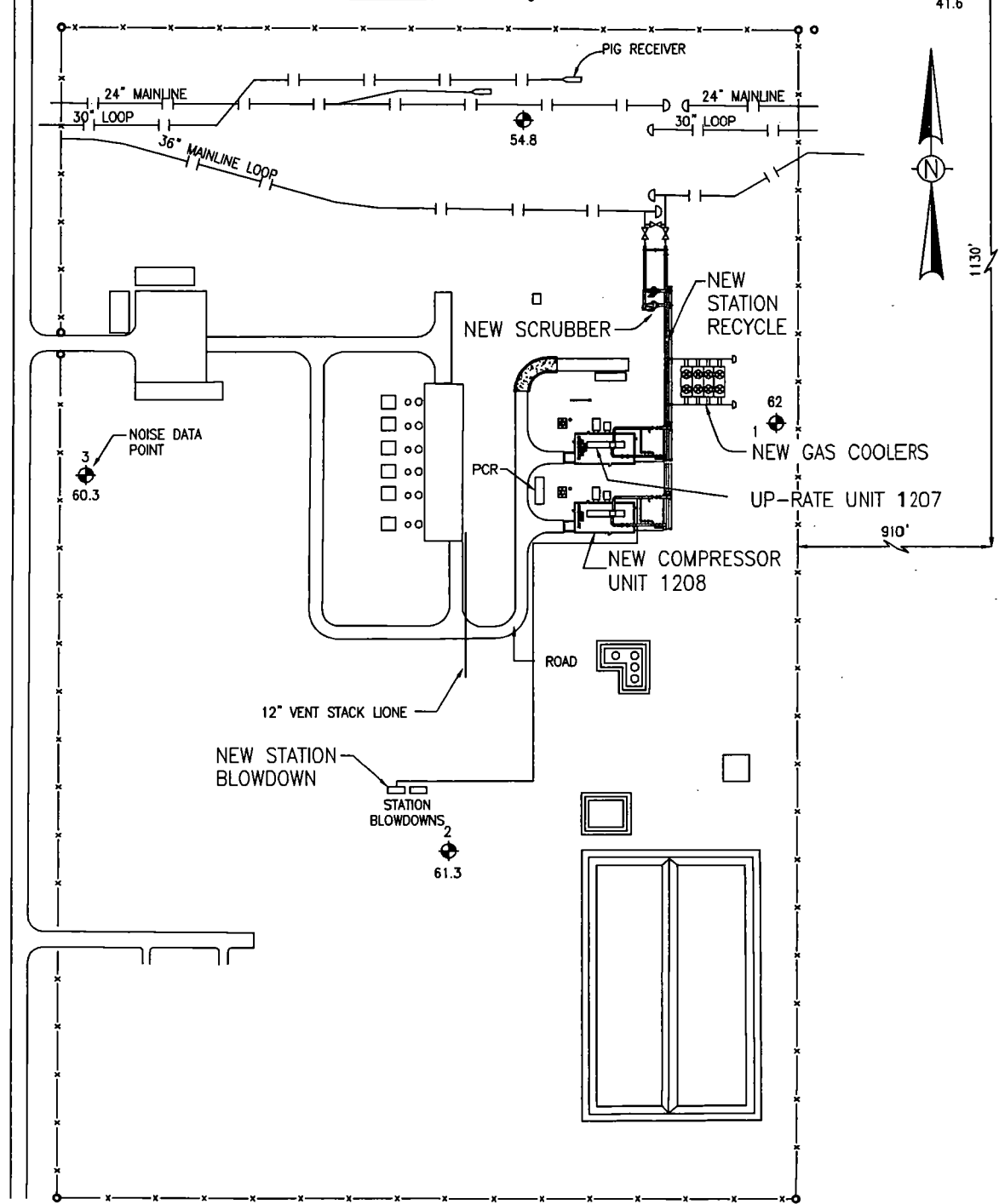
Additional Supplemental Requirements for Title V Air Operation Permit Applications

11. Alternative Methods of Operation <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
12. Alternative Modes of Operation (Emissions Trading) <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
13. Identification of Additional Applicable Requirements <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
14. Compliance Assurance Monitoring Plan <input type="checkbox"/> Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable
15. Acid Rain Part Application (Hard-copy Required) <input type="checkbox"/> Acid Rain Part - Phase II (Form No. 62-210.900(1)(a)) Attached, Document ID: _____ <input type="checkbox"/> Repowering Extension Plan (Form No. 62-210.900(1)(a)1.) Attached, Document ID: _____ <input type="checkbox"/> New Unit Exemption (Form No. 62-210.900(1)(a)2.) Attached, Document ID: _____ <input type="checkbox"/> Retired Unit Exemption (Form No. 62-210.900(1)(a)3.) Attached, Document ID: _____ <input type="checkbox"/> Phase II NOx Compliance Plan (Form No. 62-210.900(1)(a)4.) Attached, Document ID: _____ <input type="checkbox"/> Phase NOx Averaging Plan (Form No. 62-210.900(1)(a)5.) Attached, Document ID: _____ <input checked="" type="checkbox"/> Not Applicable

Attachment B

Plot Plan

LEVELS IN dBA Leg



NOISE DATA:

Avg. 3-15 Sec.
 LEQ taken 8 a.m. 10/26/98
 Temp. 68F
 Wind: 2-8 MPH SE

FLORIDA GAS
 TRANSMISSION COMPANY

PROPOSED FGT PHASE V
 COMPRESSOR STATION NO. 12A
 PLOT PLAN

DWG. NO.

NV-2

9/15/00

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
COMMERCIALE - CODE 1604865-66-67-68	IMPIANTO - PLANT FGT PHASE V

TITOLO - TITLE

EXPECTED EMISSION DATA

REV	DESCRIZIONE - DESCRIPTION	PREP	COND. DATA	APP. APPROV.	DATA DATE	INTEG. INTEGRATED	SUBSTITUIBILE - REPLACED BY
2	GENERAL REVISION	AI			15-12-00		
1	CUSTOMER COMMENTS INCLUDED	AI			02-11-00		
0	EMISSIO - ISSUED	AI	COND. DATA	APP. APPROV.	DATA DATE	N. SOM38867/4	
						A	1/2
<small> Il presente documento è proprietà intellettuale di Enron Engineering Company. È vietata la ristampa o l'uso non autorizzato. This document is the property of ENRON ENGINEERING COMPANY. All rights are reserved according to law. </small>						<small> SOSTITUIBILE O REMPLACED SUBSTITUTIBLE OR REPLACED BY </small>	

Nuovo Pignone
FIRENZE

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
Exhaust Temp °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 ppw @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 this document the expected worst case conditions. All values herein are based on the referenced percentage of load at Full Speed.

		ITEM	
		N. SOM3386714	
3	REVISED	LINGUA-LANG	PAGINA-SHEET
REV	DESCRIZIONE - DESCRIPTION	A	2 / 3
Il presente documento è di proprietà NUOVO PIGNONE. A termine di legge ogni diritto è riservato.		SOSTITUISCE L. - REPLACES	
This document is the property of NUOVO PIGNONE. All rights are reserved according to law.		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 12

Fuel: SD NATURAL GAS Customer: FGT
 Water Injection: NO Inquiry Number: Station 12
 Number of Engines Tested: 0
 Model: MARS 90-T13002S CS/MD 122F MATCH GAS
 Emissions Data: REV. 0.0

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= 13078, %Full Load= 100.0, Elev= 90 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
*	10.21	*	12.43	*	3.560	lbm/hr
*	44.72	*	54.45	*	15.594	ton/yr

Hp= 12424, %Full Load= 95.0, Elev= 90 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
*	9.80	*	11.93	*	3.416	lbm/hr
*	42.90	*	52.24	*	14.960	ton/yr

Hp= 11770, %Full Load= 90.0, Elev= 90 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
*	9.36	*	11.40	*	3.265	lbm/hr
*	41.01	*	49.93	*	14.300	ton/yr

Hp= 11116, %Full Load= 85.0, Elev= 90 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
*	8.95	*	10.90	*	3.122	lbm/hr
*	39.21	*	47.75	*	13.673	ton/yr

Hp= 9808, %Full Load= 75.0, Elev= 90 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
*	8.51	*	10.36	*	2.966	lbm/hr
*	37.26	*	45.36	*	12.991	ton/yr

Hp= 9155, %Full Load= 70.0, Elev= 90 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
*	8.29	*	10.09	*	2.891	lbm/hr
*	36.31	*	44.21	*	12.661	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 12

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	90						
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	59.0
Relative Humidity	%	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Elevation Loss	Hp	43	41	39	37	32	30	
Inlet Loss	Hp	0	0	0	0	0	0	0
Exhaust Loss	Hp	0	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	10615	
Specified Load	Hp	FULL	12424	11770	11116	9808	9155	
Net Output Power	Hp	13078	12424	11770	11116	9808	9155	
Fuel Flow	MMBtu/hr	102.56	98.41	94.09	89.99	85.51	83.34	
Heat Rate	Btu/Hp-hr	7842	7921	7994	8095	8718	9104	
Inlet Air Flow	lbm/hr	318061	312434	306562	300051	288572	283072	
Engine Exhaust Flow	lbm/hr	321991	316182	310119	303431	291772	286184	
PCD	psi(g)	227.7	221.5	215.2	208.3	192.0	184.1	
PT Inlet Temp. (T5)	Deg. F	1253	1227	1201	1179	1183	1186	
Compensated PTIT	Deg. F	1273	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

DeCOx SILENCER in OXIDATION SERVICE

* SPECIFICATIONS

* OPERATION CONDITIONS

* INSTALLATION INSTRUCTIONS

* CLEANING INSTRUCTIONS

* DISASSEMBLY INSTRUCTIONS

* TROUBLE SHOOTING INSTRUCTIONS

8837 Whithorn Drive
P.O. Box 1639

Houston, Texas 77095
Cypress, Texas 77410

281-463-8883
Fax 281-463-8951



DeCOHx

H.L. Harris

The DeCOHx 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.P. 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.

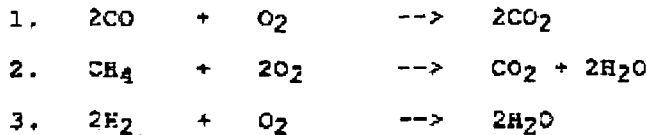
The DeCOHx Silencer shall have external surfaces metallized by the flame spray method for carbon steel construction.

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:



PERFORMANCE

Operating as prescribed in the "OPERATING CONDITIONS" portion of these specifications, the DeCOHx 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**

DeSOXx

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 500°F reduces the oxidation efficiency 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 40 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.

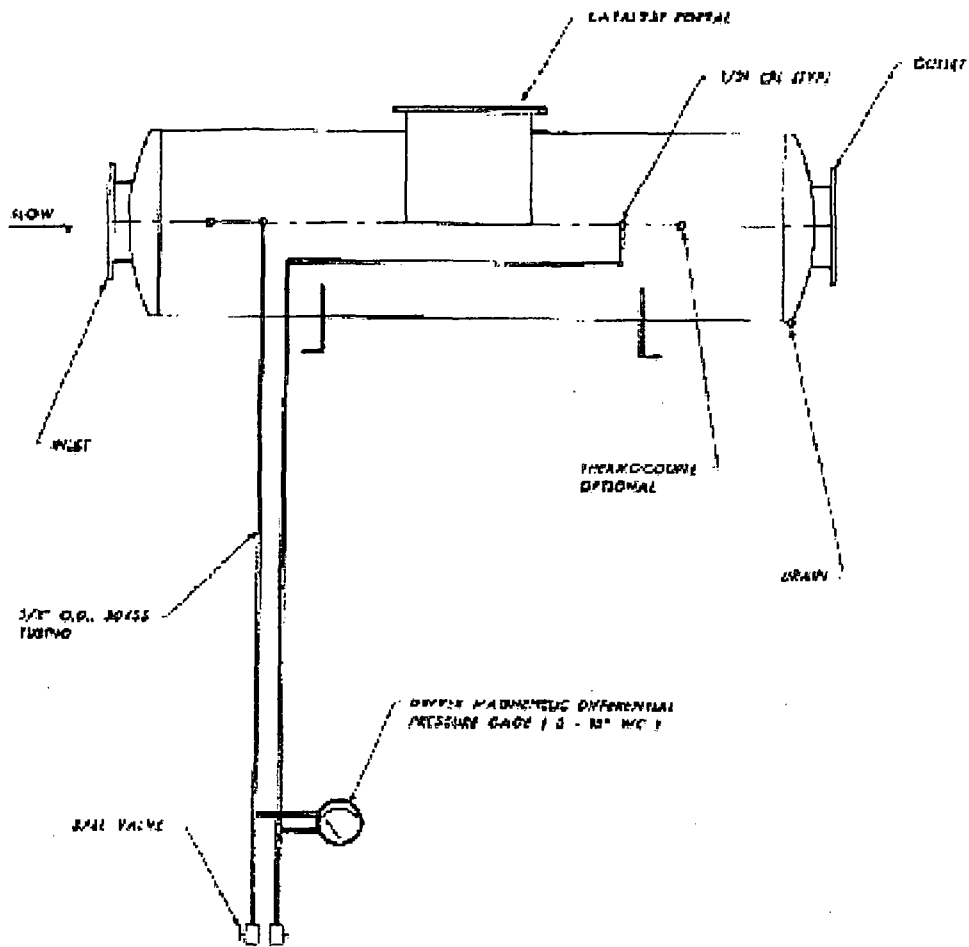
Multiple couplings are provided for gas sampling, pressure differential measurements, temperature monitoring, and drain of free liquid and condensate. See Figure 1 for typical installation of sample lines, differential pressure gage and thermocouple.

DeCOilx Silencer - Oxidation Service

SAMPLE LINE CONFIGURATION



REFERENCE	DeCOilx
PREPARED BY	R.L. HATLIS



Houston Industrial Silencing

DeCOHx

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 contaminants 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

Compressor Station No. 12

Engine No. 1207 EPN: 008

NOx Emissions: (Based on Vendor Data)

$$\text{lb NOx/hr} = 10.21$$

$$\begin{aligned} \text{tons NOx/yr} &= (\text{lb NOx/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (10.21 \text{ lb NOx/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 44.72 \end{aligned}$$

CO Emissions: (Based on Vendor Data)

$$\text{lb CO/hr} = 12.43$$

$$\begin{aligned} \text{tons CO/yr} &= (\text{lb CO/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (12.43 \text{ lb CO/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 54.45 \end{aligned}$$

VOC Emissions: (Based on Vendor Data)

$$\text{lb VOC/hr} = 0.356$$

$$\begin{aligned} \text{tons VOC/yr} &= (\text{lb VOC/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.356 \text{ lb VOC/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 1.56 \end{aligned}$$

SO2 Emissions: (Based on FERC Limits)

$$\begin{aligned} \text{lb S/hr} &= (\text{gr S}/100 \text{ scf})(\text{MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= (10 \text{ gr S}/100 \text{ scf})(0.1085 \text{ MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= 1.55 \end{aligned}$$

$$\begin{aligned} \text{lb SO2/hr} &= (\text{lb S/hr})(2 \text{ lb SO2}/\text{lb S}) \\ &= (1.55 \text{ lb S/hr})(2 \text{ lb SO2}/\text{lb S}) \\ &= 3.10 \end{aligned}$$

$$\begin{aligned} \text{tons SO2/yr} &= (\text{lb SO2/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (3.10 \text{ lb SO2/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 13.57 \end{aligned}$$

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

$$\begin{aligned} \text{lb PM/hr} &= (\text{lb PM}/\text{MMBtu})(\text{MMBtu/hr}) \\ &= (0.0066 \text{ lb}/\text{MMBtu})(112.81 \text{ MMBtu/hr}) \\ &= 0.74 \end{aligned}$$

$$\begin{aligned} \text{tons PM/yr} &= (\text{lb PM/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.74 \text{ lb PM/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 3.26 \end{aligned}$$

Engine No. 1208 EPN:

CO Emissions: (Based on Vendor Data)

A lb CO/hr = 5.14 @ 100% load
B lb CO/hr = 10.23 @ 70% load
C lb CO/hr = 22.5 @ 50% load

A 75% of year = 6570
B 15% of year = 1752
C 10% of year = 438

$$\begin{aligned} \text{tons CO} &= (\text{lb CO/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (5.14 \text{ lb CO/hr})(6570 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 16.88 \end{aligned}$$

$$\begin{aligned} \text{tons CO} &= (\text{lb CO/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (10.23 \text{ lb CO/hr})(1752 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 8.96 \end{aligned}$$

$$\begin{aligned} \text{tons CO} &= (\text{lb CO/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (22.50 \text{ lb CO/hr})(438 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 4.93 \end{aligned}$$

$$\begin{aligned} \text{tons CO/yr} &= (16.88 \text{ tons/yr}) + (8.96 \text{ tons/yr}) + (4.93 \text{ tons/yr}) \\ &= 30.77 \end{aligned}$$

VOC Emissions: (Based on Vendor Data)

A lb VOC/hr = 0.29 @ 100% load
B lb VOC/hr = 1.15 @ 70% load
C lb VOC/hr = 1.46 @ 50% load

A 75% of year = 6570
B 15% of year = 1752
C 10% of year = 438

$$\begin{aligned} \text{tons VOC/yr} &= (\text{lb VOC/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.29 \text{ lb VOC/hr})(6570 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 0.95 \end{aligned}$$

$$\begin{aligned} \text{tons VOC/yr} &= (\text{lb VOC/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.80 \text{ lb VOC/hr})(1752 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 0.70 \end{aligned}$$

$$\begin{aligned} \text{tons VOC/yr} &= (\text{lb VOC/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (1.46 \text{ lb VOC/hr})(438 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 0.32 \end{aligned}$$

$$\begin{aligned} \text{tons VOC/yr} &= (0.95 \text{ tons/yr}) + (0.70 \text{ tons/yr}) + (0.32 \text{ tons/yr}) \\ &= 1.97 \end{aligned}$$

NOx Emissions: (Based on Vendor Data)

lb NOx/hr = 14.10

$$\begin{aligned} \text{tons NOx/yr} &= (\text{lb NOx/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (14.10 \text{ lb NOx/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 61.76 \end{aligned}$$

SO2 Emissions: (Based on FERC Limits)

$$\begin{aligned} \text{lb S/hr} &= (\text{gr S}/100 \text{ scf})(\text{MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= (10 \text{ gr S}/100 \text{ scf})(0.1296 \text{ MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= 1.85 \end{aligned}$$

$$\begin{aligned} \text{lb SO}_2/\text{hr} &= (\text{lb S/hr})(2 \text{ lb SO}_2/\text{lb S}) \\ &= (1.85 \text{ lb S/hr})(2 \text{ lb SO}_2/\text{lb S}) \\ &= 3.70 \end{aligned}$$

$$\begin{aligned} \text{tons SO}_2/\text{yr} &= (\text{lb SO}_2/\text{hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (3.70 \text{ lb SO}_2/\text{hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 16.22 \end{aligned}$$

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

$$\begin{aligned} \text{lb PM/hr} &= (\text{lb PM/MMBTU})(\text{MMscf/hr}) \\ &= (0.0066 \text{ lb/MMBTU})(134.77 \text{ MMBtu/hr}) \\ &= 0.89 \end{aligned}$$

$$\begin{aligned} \text{tons PM/yr} &= (\text{lb PM/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.89 \text{ lb PM/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 3.90 \end{aligned}$$

Modified Engine No. 1204
EPN: 007

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

$$\begin{aligned}\text{lb NOx/hr} &= (\text{g/bhp-hr})(\text{bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= (5.4 \text{ g/bhp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= 23.81\end{aligned}$$

$$\begin{aligned}\text{tons NOx/yr} &= (\text{lb NOx/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (23.8 \text{ lb NOx/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 104.29\end{aligned}$$

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

$$\begin{aligned}\text{lb CO/hr} &= (\text{g/bhp-hr})(\text{bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= (0.8 \text{ g/bhp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= 3.53\end{aligned}$$

$$\begin{aligned}\text{tons CO/yr} &= (\text{lb CO/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (3.53 \text{ lb CO/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 15.45\end{aligned}$$

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

$$\begin{aligned}\text{lb VOC/hr} &= (\text{g/bhp-hr})(\text{bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= (0.1 \text{ g/bhp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= 0.441\end{aligned}$$

$$\begin{aligned}\text{tons VOC/yr} &= (\text{lb VOC/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.44 \text{ lb VOC/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 1.93\end{aligned}$$

SO2 Emissions: (Based on FERC Limits)

$$\begin{aligned}\text{lb S/hr} &= (\text{gr S}/100 \text{ scf})(\text{MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= (10 \text{ gr S}/100 \text{ scf})(0.0159 \text{ MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= 0.23\end{aligned}$$

$$\begin{aligned}\text{lb SO2/hr} &= (\text{lb S/hr})(2 \text{ lb SO2}/\text{lb S}) \\ &= (0.23 \text{ lb S/hr})(2 \text{ lb SO2}/\text{lb S}) \\ &= 0.45\end{aligned}$$

$$\begin{aligned}\text{tons SO2/yr} &= (\text{lb SO2/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.45 \text{ lb SO2/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 1.99\end{aligned}$$

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

$$\begin{aligned}\text{lb PM/hr} &= (\text{lb PM}/\text{MMBtu})(\text{MMBtu/hr}) \\ &= (0.00999 \text{ MMBtu})(16.5 \text{ MMBtu/hr}) \\ &= 0.16\end{aligned}$$

$$\begin{aligned}\text{tons PM/yr} &= (\text{lb PM/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.16 \text{ lb PM/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 0.72\end{aligned}$$

Modified Engine No. 1205

EPN: 007

NOx Emissions: (Based on Test Data)

$$\begin{aligned} \text{lb NOx/hr} &= (\text{g/bhp-hr})(\text{bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= (5.4 \text{ g/bhp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= 23.81 \end{aligned}$$

$$\begin{aligned} \text{tons NOx/yr} &= (\text{lb NOx/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (23.8 \text{ lb NOx/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 104.29 \end{aligned}$$

CO Emissions: (Based on Test Data)

$$\begin{aligned} \text{lb CO/hr} &= (\text{g/bhp-hr})(\text{bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= (0.8 \text{ g/bhp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= 3.53 \end{aligned}$$

$$\begin{aligned} \text{tons CO/yr} &= (\text{lb CO/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (3.53 \text{ lb CO/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 15.45 \end{aligned}$$

VOC Emissions: (Based on Test Data)

$$\begin{aligned} \text{lb VOC/hr} &= (\text{g/bhp-hr})(\text{bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= (0.1 \text{ g/bhp-hr})(2000 \text{ bhp})(1 \text{ lb}/453.59 \text{ g}) \\ &= 0.441 \end{aligned}$$

$$\begin{aligned} \text{tons VOC/yr} &= (\text{lb VOC/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.44 \text{ lb VOC/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 1.93 \end{aligned}$$

SO2 Emissions: (Based on FERC Limits)

$$\begin{aligned} \text{lb S/hr} &= (\text{gr S}/100 \text{ scf})(\text{MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= (10 \text{ gr S}/100 \text{ scf})(0.0159 \text{ MMscf/hr})(1 \text{ lb}/7000 \text{ gr}) \\ &= 0.23 \end{aligned}$$

$$\begin{aligned} \text{lb SO2/hr} &= (\text{lb S/hr})(2 \text{ lb SO2}/\text{lb S}) \\ &= (0.23 \text{ lb S/hr})(2 \text{ lb SO2}/\text{lb S}) \\ &= 0.45 \end{aligned}$$

$$\begin{aligned} \text{tons SO2/yr} &= (\text{lb SO2/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.45 \text{ lb SO2/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 1.99 \end{aligned}$$

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

$$\begin{aligned} \text{lb PM/hr} &= (\text{lb PM/MMBtu})(\text{MMBtu/hr}) \\ &= (0.00999 \text{ MMBtu/hr})(16.5000 \text{ MMBtu/hr}) \\ &= 0.16 \end{aligned}$$

$$\begin{aligned} \text{tons PM/yr} &= (\text{lb PM/hr})(\text{hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= (0.16 \text{ lb PM/hr})(8760 \text{ hr/yr})(1 \text{ ton}/2000 \text{ lb}) \\ &= 0.72 \end{aligned}$$

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 1208 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 1207 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	

Engines 1204 AND 1205 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
Per engine TOTALS:	0.1721109	3.32	0.7582	

Fugitive Leak Emissions

Fugitive Leak Emissions - FGT Compressor Station No. 12

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 Emission Estimates"

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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	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	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 1204 and 1205 Pre-modification Report
Summary of Modified Engine 1205**

Engine 1204 and 1205 Pre-modification Report

TEST REPORT
ON
EXHAUST EMISSIONS

FROM
TWO COOPER-BESSEMER LS-G-8
COMPRESSOR ENGINES
AT
COMPRESSOR STATION NO. 12

PREPARED FOR
FLORIDA GAS TRANSMISSION COMPANY

MAY, 2000

CUBIX JOB NO. 5832

PREPARED BY



Cubix
Corporation

<http://www.cubixcorp.com>

CORPORATE HEADQUARTERS

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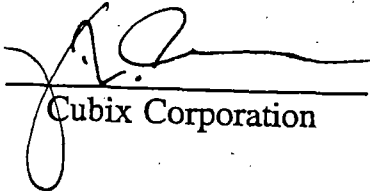
INTRODUCTION

Emission testing was conducted on two reciprocating engines in service at Florida Gas Transmission Station 12 near Munson in Santa Rosa County, Florida. Nitrogen oxides (NO_x), carbon monoxide (CO), and other combustion products were measured in the exhaust of the engines. Cubix Corporation of Austin, Texas conducted these tests April 24, 2000.

The purpose of this testing was to provide baseline mass emission rates for two Cooper-Bessemer LS-8-SG engines (Units 1204 and 1205). 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**

<u>Source Owner:</u>	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.
<u>Test Contractor:</u>	Cubix Corporation 9225 US Highway 183 South Austin, Texas 78747 (512) 243-0202 TEL (512) 243-0222 FAX Attn: Jeff Thomason
<u>Process Description:</u>	Reciprocating compressor engines are used to compress natural gas for pipeline transmission.
<u>Test Dates:</u>	April 24, 2000
<u>Locations:</u>	4 and one-half miles north of Munson, Florida
<u>Emission Sampling Points:</u>	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.
<u>Test Participants:</u>	Florida Gas Transmission George Gardener William Rogers Sid Burrows Danny Parker Enron Construction & Engineering Marcello Minotti V. Duane Pierce (AQMcS)

Cubix Corporation

Jeff Thomason

Greg Madsen

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 (O₂) and carbon dioxide (CO₂) 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 O₂ and CO₂ "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 propane basis.

SUMMARY OF RESULTS

FGT owns and operates Compressor Station 12 located near Munson, in Santa Rosa County, 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 1204	Cooper-Bessemer LS-8-SG
Unit 1205	Cooper-Bessemer LS-8-SG

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, O₂, and CO₂ 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 1204 Baseline

Florida Gas Transmission
 Compressor Station No. 12
 near Munson on Hwy 191, Santa Rosa County, FL
 Cooper-Bessemer LSG8 Compressor Engine
 Technicians: JT, GM

2000 bhp @
 330 rpm

Test Run No.	1204-C-1	1204-C-2	1204-C-3	
Date	4/24/00	4/24/00	4/24/00	
Start Time	15:28	16:53	18:13	
Stop Time	16:28	17:53	19:23	
Engine/Compressor Operation				Averages
Engine Load (bhp, measured at the compressor)	1979	1963	1987	1976
Fuel Horsepower (bhp, based upon fuel torque)	1940	1940	1924	1935
Engine Speed (rpm)	329	329	329	329
Torque (% full load = 2000 bhp at 330 rpm)	99	98	98	98
Ignition Timing (°BTDC)	29	29	30	-
Air Manifold Pressure ("Hg)	6.5	6.5	6.5	6.5
Fuel Manifold Pressure (psig)	7.2	7.2	7.2	7.2
Station Suction Pressure (psig)	746	739	737	741
Station Suction Temperature (°F)	67	67	67	67
Station Discharge Pressure (psig)	964.0	964.0	960.0	963
Unit Discharge Temperature (°F)	107	108	108	108
Loading Step Number	3.0	3.0	3.0	-
Compressor Throughput (MMSCFD)	140	136	136	137.3
Engine Fuel Data (Natural Gas)				
Fuel Heating Value (Btu/SCF, HHV)	1042.9	1042.9	1042.9	1042.9
Fuel Specific Gravity	0.5891	0.5891	0.5891	0.5891
O2 "Fd-factor" (DSCFex/MMBtu @ 0% excess air)	8642	8642	8642	8642
CO2 "Fc-factor" (DSCFex/MMBtu @ 0% excess air)	1028	1028	1028	1028
Heat Input (MMBtu/hr)	14	14	14	14
Brake-specific Fuel Consumption (Btu/bhp-hr)	7110.77	7067.23	7086.98	7088.33
Ambient Conditions				
Atmospheric Pressure ("Hg)	29.44	29.44	29.44	29.44
Temperature (°F): Dry bulb	70.0	81.0	78.0	76.3
(°F): Wet bulb	65.0	73.0	69.0	69.0
Humidity (lbs moisture/lb air)	0.0120	0.0155	0.0131	0.0135
Measured Emissions				
NOX (ppmv, dry basis)	1731.1	1561.1	1545.1	1612.4
CO (ppmv, dry basis)	220.4	224.7	226.3	223.8
O2 (% volume, dry basis)	9.3	9.2	9.4	9.3
CO2 (% volume, dry basis)	6.51	6.53	6.49	6.51
THC (ppmv)	616.7	608.0	590.8	605.2
VOC (ppmv as % of THC by weight from fuel gas analysis)	16.33	16.10	15.64	16.02
FO (fuel factor, range = 1.600-1.836 for NG)	1.79	1.79	1.77	1.78
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	2.24E+05	1.95E+05	2.11E+05	2.12E+05
via O2 "F-factor" (SCFH, dry basis)	2.14E+05	2.12E+05	2.14E+05	2.18E+05
via CO2 "F-factor" (SCFH, dry basis)	2.18E+05	2.16E+05	2.16E+05	2.19E+05
Calculated Emission Rates (via pitot tube)				
NOX (lbs/hr)	46.3	36.4	38.9	40.6
CO (lbs/hr)	3.59	3.19	3.46	3.41
VOC (lbs/hr)	0.418	0.359	0.377	0.38
NOX (tons/yr)	202.7	159.3	170.2	177.4
CO (tons/yr)	15.7	14.0	15.2	14.9
VOC (tons/yr)	1.83	1.57	1.65	1.7
NOX (g/bhp-hr)	10.83	8.51	9.17	9.51
CO (g/bhp-hr)	0.84	0.75	0.82	0.80
VOC (g/bhp-hr)	0.10	0.08	0.09	0.09

Table 3: Unit 1205 Baseline

Florida Gas Transmission
 Compressor Station No. 12
 near Munson on Hwy 191, Santa Rosa County, FL
 Cooper-Bessemer LSG8 Compressor Engine
 Technicians: JT, GM

2000 bhp @
 330 rpm

Test Run No.	1205-C-4	1205-C-5	1205-C-6	
Date	4/24/00	4/24/00	4/24/00	
Start Time	20:43	21:56	23:06	
Stop Time	21:43	22:56	00:06	
Engine/Compressor Operation				Averages
Engine Load (bhp, measured at the compressor)	1987	1978	1953	1964
Fuel Horsepower (bhp, based upon fuel torque)	1861	1939	1938	1913
Engine Speed (rpm)	330	330	330	330
Torque (% , full load = 2000 bhp at 330 rpm)	99	99	98	99
Ignition Timing (°BTDC)	27.0	26.5	26.7	26.7
Air Manifold Temperature (°F)	80.0	80.5	82.0	80.8
Fuel Manifold Pressure (psig)	8	8	8	8
Station Suction Pressure (psig)	723	718	712	718
Station Suction Temperature (°F)	67.0	67.0	67.0	67
Station Discharge Pressure (psig)	967	964	960	964
Unit Discharge Temperature (°F)	110.0	111.0	111.0	110.7
Loading Step Number	3	3	3	-
Compressor Throughput (MMSCFD)	124	121	119	121.3
Engine Fuel Data (Natural Gas)				
Fuel Heating Value (Btu/SCF, HHV)	1042.9	1042.9	1042.9	1042.9
Fuel Specific Gravity	0.5891	0.5891	0.5891	0.5891
O2 "Fd-factor" (DSCFex/MMBtu @ 0% excess air)	8642	8642	8642	8642
CO2 "Fc-factor" (DSCFex/MMBtu @ 0% excess air)	1028	1028	1028	1028
Heat Input (MMBtu/hr)	14	14	14	14
Brake-specific Fuel Consumption (Btu/bhp-hr)	7536.47	7210.17	7164.93	7303.86
Ambient Conditions				
Atmospheric Pressure ("Hg)	29.59	29.59	29.62	29.60
Temperature (°F) : Dry bulb	66.0	66.0	63.0	65.0
(°F): Wet bulb	62.0	62.0	60.0	61.3
Humidity (lbs moisture/lb air)	0.0109	0.0109	0.0103	0.0
Measured Emissions				
NOX (ppmv, dry basis)	1984.5	1803.8	1711.2	1833.2
CO (ppmv, dry basis)	228.3	225.0	223.9	225.7
O2 (% volume, dry basis)	9.2	9.4	9.5	9.4
CO2 (% volume, dry basis)	6.66	6.47	6.51	6.55
THC (ppmv)	563.2	564.3	559.3	562.3
VOC (ppmv as % of THC by weight from fuel gas analysis)	14.91	14.94	14.81	14.89
FO (fuel factor, range = 1.600-1.836 for NG)	1.76	1.78	1.75	1.76
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	2.09E+05	2.15E+05	2.11E+05	2.12E+05
via O2 "F-factor" (SCFH, dry basis)	2.16E+05	2.19E+05	2.20E+05	2.18E+05
via CO2 "F-factor" (SCFH, dry basis)	2.17E+05	2.22E+05	2.19E+05	2.19E+05
Calculated Emission Rates (via pitot tube)				
NOX (lbs/hr)	49.6	46.4	43.2	46.4
CO (lbs/hr)	3.48	3.52	3.44	3.48
VOC (lbs/hr)	0.358	0.369	0.358	0.362
NOX (tons/yr)	217.4	203.3	189.3	203.4
CO (tons/yr)	15.2	15.4	15.1	15.2
VOC (tons/yr)	1.57	1.61	1.57	1.58
NOX (g/bhp-hr)	12.11	10.87	10.13	11.04
CO (g/bhp-hr)	0.85	0.82	0.81	0.83
VOC (g/bhp-hr)	0.09	0.09	0.08	0.09

ANALYTICAL TECHNIQUE

The emissions from two Cooper-Bessemer 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 CO₂ by continuous instrumental monitors. THC analysis was on a wet basis; all other exhaust gas analyses were performed on a dry basis. Table 3 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 O₂ and CO₂ 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 O₂ and CO₂ "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 CO₂ and O₂ 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 CO₂ analyzer was based on the principle of infrared absorption; and, the O₂ 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 O₂ to CO₂ 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 NO₂. 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 NO₂.

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, CO₂, and other combustion products.

THC measurements were made via EPA Method 25a. Measurements were made and reported on a propane 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.

Test data from the continuous monitoring instruments were recorded on two synchronized 3-pen strip chart recorders (Soltec Model 1243). These recorders were operated at a chart speed of 30 centimeters/hour and record over a 25-centimeter width. Strip chart records for Units 1204 and 1205 may be found in Appendix G of this report.

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.

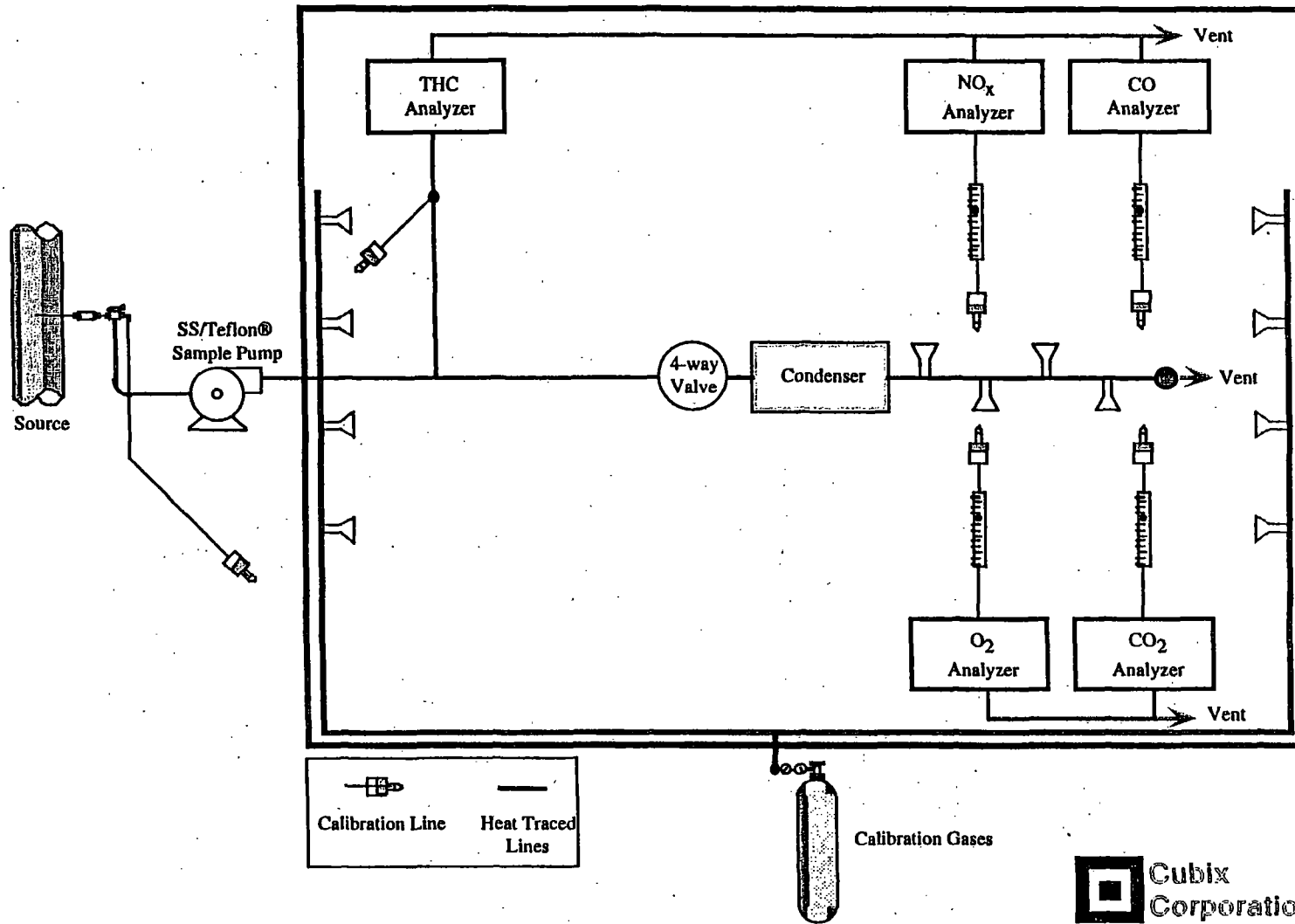
Emission calculations were conducted by a computer spreadsheet as shown in Tables 2-3 of this report. Example calculations were performed manually using a hand-held calculator in order to verify the formulas used in the spreadsheet. Example calculations are in Appendix B of this report.

TABLE 4
ANALYTICAL INSTRUMENTATION

Parameter	Model and Manufacturer	Common Use Ranges	Sensitivity	Response Time (sec.)	Detection Principle
NO _x	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, O₂, and CO₂, the instrument's response was accepted as being linear if the response of the other calibration gases agreed within $\pm 2\%$ span of the predicted values. The response of the infrared absorption type CO and CO₂ analyzers is made linear through electronic suppression.

The efficiency of the NO₂ to NO converter in the NO_x analyzer was checked by monitoring a mixture of NO in N₂ standard gas and zero grade air from a Tedlar® bag. When this bag is mixed and exposed to sunlight, the NO is oxidized to NO₂. 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 NO₂. 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, O₂, and CO₂ 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 $\pm 5\%$.

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 $\pm 3\%$ or $\pm 5\%$ 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 $\pm 1\%$ 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**

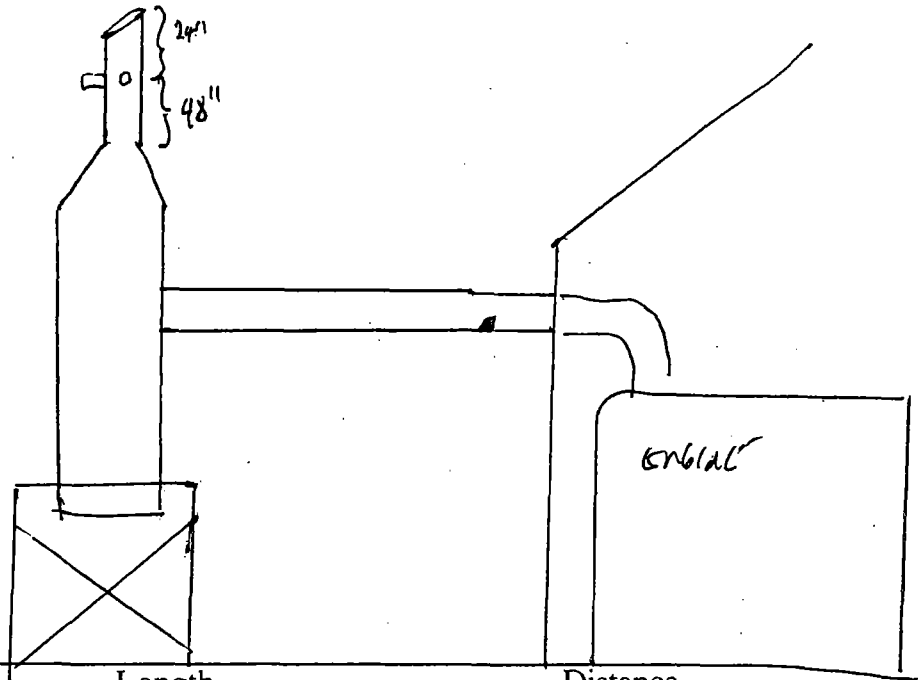
Circular Stack Sampling Traverse Point Layout (EPA Method 1)

Date: 4/24/00
 Plant: F&T STATION 12
 Source: C-BLS-8-SG UNITS 1204/1205
 Technician(s): JT, GM

Port + Stack ID: 17.5 in.
 Port Extension 2.5 in.
 Stack ID: 15.0 in.
 Stack Area 1.23 ft²
 Total Req'd Traverse Pts. 16
 No. of Traverse Pts. 8 /diam.
 No. of Traverse Pts. 8 /port

UNITS 1204 & 1205 ARE IDENTICAL

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



Traverse Point Number	Length Factor (% of diameter)				Distance from Reference Point (inches)
	4	6	8	12	
1	6.7	4.4	3.2	2.1	<u>0.51</u>
2	25.0	14.6	10.5	6.7	<u>1.68</u>
3	75.0	29.6	19.4	11.8	<u>3.10</u>
4	93.3	70.4	32.3	17.7	<u>5.17</u>
5		85.4	67.7	25.0	<u>10.83</u>
6		95.6	80.6	35.6	<u>12.90</u>
7			89.5	64.4	<u>14.32</u>
8			96.8	75.0	<u>15.49</u>
9				82.3	_____
10				88.2	_____
11				93.3	_____
12				97.9	_____

Moisture, Molecular Weight, Volumetric Flow

Location: Station #12
Source: Cooper-Bessemer LSG8
Technicians: JT, GM
Engine Rated: 2000 Hp @ 330 RPM
Unit Number: 1204

Test Run No.	1204-C-1	1204-C-2	1204-C-3
Date	4/24/2000	4/24/2000	4/24/2000
Start Time	15:28	16:53	18:13
Stop Time	16:28	17:53	19:23
Stack Moisture & Molecular Wt. via Method 4			
CO2 (%) (corrected)	6.51	6.53	6.49
O2 (%) (corrected)	9.26	9.23	9.38
Beginning Meter Reading (ft3)	863.294	886.33	908.65
Ending Meter Reading (ft3)	886.246	908.45	930.01
Beginning Impinger Wt. (g)	2321.00	2344.40	2378.90
Ending Impinger Wt. (g)	2380.40	2404.30	2435.50
Dry Gas Meter Factor (Y)	0.9925	0.9925	0.9925
Dry Gas Meter Temperature (°F begin)	78.00	82.00	82.00
Dry Gas Meter Temperature (°F end)	82.00	82.00	84.00
Atmospheric Pressure (in Hg, abs.)	29.44	29.44	29.44
Stack Gas Moisture by EPA M.4 (% volume)	11.34	11.84	11.64
Dry Gas Fraction	0.89	0.88	0.88
Stack Gas Molecular Wt. (lbs/lb-mole)	28.12	28.06	28.08
Stack Flow Rate via Pitot Tube			
Pitot Tube Factor	0.84	0.84	0.84
ΔP #1	1.90	1.16	1.64
ΔP #2	2.06	1.06	1.88
ΔP #3	2.50	1.41	2.01
ΔP #4	2.34	1.22	2.02
ΔP #5	2.42	1.65	2.42
ΔP #6	2.41	2.26	2.15
ΔP #7	2.91	2.17	2.16
ΔP #8	2.24	1.87	1.91
ΔP #9	2.25	1.25	2.07
ΔP #10	2.28	2.05	2.19
ΔP #11	2.41	2.24	2.45
ΔP #12	2.36	2.26	2.49
ΔP #13	2.34	2.45	2.31
ΔP #14	2.41	2.30	2.18
ΔP #15	2.33	2.11	1.97
ΔP #16	2.25	1.95	1.87
Sum of Square Root of ΔP's	24.4	21.5	23.2
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	1.53	1.34	1.45
Average Temperature (°F)	745.625	757.0	759.9
Static Pressure (in. H2O)	1.52	1.41	1.53
Stack Diameter (in., at sample point)	15	15	15
Stack Area (ft2)	1.23	1.23	1.23
Stack Velocity (ft/min)	7927	7015	7571
Stack Flow, wet (ACF/Sec.)	162	143	155
Stack Flow, wet (ACFM)	9728	8608	9291
Stack Flow, dry (SCFH)	2.24E+05	1.95E+05	2.11E+05

MOISTURE AND VELOCITY FIELD DATA SHEET

Date: 04/24/00
 Plant/Operator: FGT STATION 12
 Source: C-B LSG8 / 1204
 Technicians: JT, GM
 Atm. Pres. 29.44 in.Hg(Pb)
 Test Run # 1

Dry Gas Meter ID: EQUMEFCM 1348739
 Dry Gas Meter Factor: 0.9925 (Kd(Y))
 Pitot Tube #/Type: 301 / "5"
 Pitot Tube Factor: 0.84 (Kp)
 Static Press. 1.52 in.H2O(Pg)
 Average Stack Temp. 75.5 °F(Ts)

Moisture Train

Sample Box #	<u>T3</u>	
Leak Check		
Pre-test Leak check	0.0 ^(ft.3) or L/min at in. Hg Vacuum <u>21.0"</u>	
Post-test Leak check	0.0 ^(ft.3) or L/min at in. Hg Vacuum <u>23.0"</u>	
	Initial	Final
Time:	<u>1535</u>	<u>1632</u>
Meter Reading (ft ³ or L)	<u>863,294</u>	<u>886,246</u>
Meter Temp. (°F)	<u>76</u>	<u>72</u>
O2 %		
CO2 %		

Impinger #	Contents	Initial Weight	Final Weight
1	Di H2O	657.6	703.9
2	Di H2O	594.1	602.0
3	MT	477.4	478.3
4	S16EL	591.9	596.2
5	 		
6	 		
Totals		2321.0	2380.4

Pitot Tube Traverse/Stack Temp.

CYCLONIC Sample Port 4 Sample Port B

Traverse Pt.	ΔP (" H2O)	°F	ΔP (" H2O)	°F
00 1 -2°	1.902	749	2.251	685
-10 2 10	2.063	749	2.283	736
00 3 0°	2.496	752	2.408	731
00 4 0°	2.336	756	2.362	736
10 5 0°	2.424	750	2.339	750
10 6 0°	2.408	752	2.411	757
00 7 2°	2.907	748	2.329	761
00 8 10	2.244	754	2.251	764
9				
10				
11				
12				

PITOT TUBE LEAK CHECK
 pre post
 3.5"/1:30 + 3.0"/1:15
 -2.5"/1:15 - -3.0"/1:15

NO EVIDENCE OF SIGNIFICANT CYCLONIC FLOW

MOISTURE AND VELOCITY FIELD DATA SHEET

Date: 4/24/00 Dry Gas Meter ID: EQUIMETON 1348739
 Plant/Operator: FRT STATION 12 Dry Gas Meter Factor: 0.9925 (Kd)(Y)
 Source: CB LSK8/1204 Pitot Tube #/Type: 301 1" S"
 Technicians: JT, KM Pitot Tube Factor: 0.84 (Kp)
 Atm. Pres. 29.44 in. Hg (Pb) Static Press. 1.046 in. H₂O (Pg)
 Test Run # 2 Average Stack Temp. 757.0 °F (Ts)

Moisture Train

Sample Box #	<u>T3</u>	
Leak Check		
Pre-test Leak check	<u>0.0</u> ft ³ or L/min at in. Hg Vacuum <u>21 in Hg</u>	
Post-test Leak check	<u>0.0</u> ft ³ or L/min at in. Hg Vacuum <u>21 in Hg</u>	
	Initial	Final
Time:	<u>1655</u>	<u>1750</u>
Meter Reading (ft ³ or L)	<u>886.325</u>	<u>908.450</u>
Meter Temp. (°F)	<u>82</u>	<u>82</u>
O ₂ %		
CO ₂ %		

Impinger #	Contents	Initial Weight	Final Weight
1	<u>D₁ H₂O</u>	<u>687.9</u>	<u>737.8</u>
2	<u>D₁ H₂O</u>	<u>582.0</u>	<u>585.9</u>
3	<u>MT</u>	<u>478.3</u>	<u>479.7</u>
4	<u>SIGEL</u>	<u>596.2</u>	<u>600.9</u>
5	 		
6	 		
Totals		<u>2344.4</u>	<u>2404.3</u>

Pitot Tube Traverse/Stack Temp.

Traverse Pt.	Sample Port <u>A</u>		Sample Port <u>B</u>	
	ΔP (" H ₂ O)	°F	ΔP (" H ₂ O)	°F
1	<u>1.16</u>	<u>742</u>	<u>1.252</u>	<u>748</u>
2	<u>1.06</u>	<u>748</u>	<u>2.046</u>	<u>756</u>
3	<u>1.405</u>	<u>748</u>	<u>2.241</u>	<u>758</u>
4	<u>1.215</u>	<u>761</u>	<u>2.258</u>	<u>759</u>
5	<u>1.652</u>	<u>757</u>	<u>2.454</u>	<u>762</u>
6	<u>2.258</u>	<u>761</u>	<u>2.295</u>	<u>769</u>
7	<u>2.169</u>	<u>758</u>	<u>2.112</u>	<u>758</u>
8	<u>1.873</u>	<u>764</u>	<u>1.945</u>	<u>762</u>
9	 			
10	 			
11	 			
12	 			

MOISTURE AND VELOCITY FIELD DATA SHEET

Date: 4/24/00 Dry Gas Meter ID: EQUIMETER 1348739
 Plant/Operator: FRT STATION 12 Dry Gas Meter Factor: 0.9925 (Kd(Y))
 Source: C-B LSK 1 1204 Pitot Tube #/Type: 301 1" S"
 Technicians: ST GM Pitot Tube Factor: 0.84 (Kp)
 Atm. Pres. 29.44 in.Hg(Pb) Static Press. 1.53 in.H2O(Pg)
 Test Run # 3 Average Stack Temp. 759.9 °F(Ts)

Moisture Train

Sample Box #	<u>T3</u>	
Leak Check		
Pre-test Leak check	<u>20.0</u> or L/min at in. Hg Vacuum <u>24"</u>	
Post-test Leak check	<u>20.0</u> or L/min at in. Hg Vacuum <u>23.5"</u>	
	Initial	Final
Time:	<u>1813</u>	<u>1923</u>
Meter Reading (ft ³ or L)	<u>908.651</u>	<u>930.01</u>
Meter Temp. (°F)	<u>82</u>	<u>84</u>
O2 %		
CO2 %		

Impinger #	Contents	Initial Weight	Final Weight
1	<u>D₁ H₂O</u>	<u>712.4</u>	<u>755.7</u>
2	<u>D₁ H₂O</u>	<u>585.9</u>	<u>596.7</u>
3	<u>MT</u>	<u>479.7</u>	<u>480.4</u>
4	<u>91682</u>	<u>600.9</u>	<u>602.7</u>
5	 		
6	 		
Totals		<u>2378.9</u>	<u>2435.5</u>

Pitot Tube Traverse/Stack Temp.

Traverse Pt.	Sample Port <u>A</u>		Sample Port <u>B</u>	
	ΔP (" H2O)	°F	ΔP (" H2O)	°F
1	<u>1.636</u>	<u>752</u>	<u>2.066</u>	<u>749</u>
2	<u>1.882</u>	<u>754</u>	<u>2.185</u>	<u>761</u>
3	<u>2.009</u>	<u>762</u>	<u>2.446</u>	<u>756</u>
4	<u>2.024</u>	<u>758</u>	<u>2.490</u>	<u>754</u>
5	<u>2.423</u>	<u>771</u>	<u>2.311</u>	<u>758</u>
6	<u>2.142</u>	<u>766</u>	<u>2.177</u>	<u>767</u>
7	<u>2.160</u>	<u>768</u>	<u>1.974</u>	<u>750</u>
8	<u>1.914</u>	<u>774</u>	<u>1.872</u>	<u>754</u>
9				
10	 			
11	 			
12				

Moisture, Molecular Weight, Volumetric Flow

Location: Station #12
 Source: Cooper-Bessemer LS-8-SG
 Technicians: JT, GM
 Engine Rated: 2000 Hp @ 330 RPM
 Unit Number: 1205

Test Run No.	1205-C-4	1205-C-5	1205-C-6
Date	4/24/2000	4/24/2000	4/24/2000
Start Time	20:43	21:56	23:06
Stop Time	21:43	22:56	00:06
<i>Stack Moisture & Molecular Wt. via Method 4</i>			
CO2 (%) (corrected)	6.66	6.47	6.51
O2 (%) (corrected)	9.19	9.36	9.51
Beginning Meter Reading (ft3)	930.06	952.28	974.28
Ending Meter Reading (ft3)	952.22	974.182	996.46
Beginning Impinger Wt (g)	2282.10	2310.40	2342.80
Ending Impinger Wt. (g)	2340.30	2367.70	2402.10
Dry Gas Meter Factor (Y)	0.9925	0.9925	0.9925
Dry Gas Meter Temperature (°F begin)	72.00	72.00	68.00
Dry Gas Meter Temperature (°F end)	73.00	69.00	65.00
Atmospheric Pressure (in Hg, abs.)	29.59	29.59	29.62
Stack Gas Moisture by EPA M.4 (% volume)	11.30	11.22	11.36
Dry Gas Fraction	0.89	0.89	0.89
Stack Gas Molecular Wt. (lbs/lb-mole)	28.14	28.13	28.12
<i>Stack Flow Rate via Pitot Tube</i>			
Pitot Tube Factor	0.84	0.84	0.84
ΔP #1	1.74	2.06	1.60
ΔP #2	1.87	2.16	1.65
ΔP #3	2.14	2.40	2.04
ΔP #4	2.25	2.41	2.26
ΔP #5	2.30	2.38	2.44
ΔP #6	2.35	2.23	2.35
ΔP #7	2.21	1.91	2.04
ΔP #8	1.56	1.74	1.77
ΔP #9	1.62	1.86	1.79
ΔP #10	1.82	1.95	1.91
ΔP #11	2.05	2.07	1.97
ΔP #12	2.12	2.18	2.34
ΔP #13	2.38	2.52	2.24
ΔP #14	2.55	2.34	2.41
ΔP #15	2.16	2.40	2.29
ΔP #16	1.77	1.86	2.20
Sum of Square Root of ΔP's	22.9	23.5	23.0
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	1.43	1.47	1.44
Average Temperature (°F)	754.5	748.0	746.6
Static Pressure (in. H2O)	1.604	1.77	1.608
Stack Diameter (in., at sample point)	15	15	15
Stack Area (ft2)	1.23	1.23	1.23
Stack Velocity (ft/min)	7428	7591	7449
Stack Flow, wet (ACF/Sec.)	152	155	152
Stack Flow, wet (ACFM)	9115	9316	9141
Stack Flow, dry (SCFH)	2.09E+05	2.15E+05	2.11E+05

MOISTURE AND VELOCITY FIELD DATA SHEET

Date: 4/24/00 Dry Gas Meter ID: EQUIMETON 1348739
 Plant/Operator: F&T STATION 12 Dry Gas Meter Factor: 0.9925 (Kd)
 Source: C-BLSFK UNIT 1205 Pitot Tube #/Type: 301 1/5"
 Technicians: JT, GM Pitot Tube Factor: 0.84 (Kp)
 Atm. Pres. 29.59 in.Hg(Pb) Static Press. 1.604 in.H2O(Pg)
 Test Run # 4 Average Stack Temp. 754.5 °F(Ts)

Moisture Train

Sample Box #	<u>T3</u>	
Leak Check		
Pre-test Leak check	<u>0.0</u> ft.3 or L/min at in. Hg Vacuum <u>21" Hg</u>	
Post-test Leak check	<u>0.0</u> ft.3 or L/min at in. Hg Vacuum <u>22.5" Hg</u>	
	Initial	Final
Time:	<u>2042</u>	<u>2132</u>
Meter Reading (ft3 or L)	<u>930.055</u>	<u>952.221</u>
Meter Temp. (°F)	<u>72</u>	<u>73</u>
O2 %		
CO2 %		

Impinger #	Contents	Initial Weight	Final Weight
1	<u>D. H2O</u>	<u>588.6</u>	<u>644.2</u>
2	<u>D. H2O</u>	<u>639.2</u>	<u>639.2</u>
3	<u>MT</u>	<u>495.1</u>	<u>495.2</u>
4	<u>516FL</u>	<u>559.2</u>	<u>561.7</u>
5			
6			
Totals	 	<u>2282.1</u>	<u>2340.3</u>

Pitot Tube Traverse/Stack Temp.

CYCLONIC Flow Sample Port A Sample Port B

Traverse Pt.	ΔP (" H2O)	°F	ΔP (" H2O)	°F
<u>0° 1 0°</u>	<u>1.74</u>	<u>749</u>	<u>1.62</u>	<u>740</u>
<u>0° 2 0°</u>	<u>1.874</u>	<u>757</u>	<u>1.824</u>	<u>756</u>
<u>0° 3 0°</u>	<u>2.143</u>	<u>760</u>	<u>2.048</u>	<u>759</u>
<u>0° 4 1°</u>	<u>2.246</u>	<u>762</u>	<u>2.124</u>	<u>764</u>
<u>0° 5 0°</u>	<u>2.296</u>	<u>756</u>	<u>2.384</u>	<u>749</u>
<u>0° 6 0°</u>	<u>2.354</u>	<u>750</u>	<u>2.553</u>	<u>753</u>
<u>1° 7 2°</u>	<u>2.206</u>	<u>755</u>	<u>2.164</u>	<u>756</u>
<u>2° 8 2°</u>	<u>1.558</u>	<u>758</u>	<u>1.767</u>	<u>758</u>
<u>9</u>				
<u>10</u>				
<u>11</u>				
<u>12</u>				

NO EVIDENCE OF SIGNIFICANT CYCLONIC FLOW

Pitot Tube Leak Check
 pre 4.5"/15 + post 2.0"/1:20
 - 3.8"/15 - -2.5"/1:20

MOISTURE AND VELOCITY FIELD DATA SHEET

Date: 4/24/00 Dry Gas Meter ID: EQUIMETER 1348739
 Plant/Operator: FRT STATION 12 Dry Gas Meter Factor: 0.9925 (Kd)
 Source: C-B LSG8 UNIT 1205 Pitot Tube #/Type: 301 / "S"
 Technicians: JT, GM Pitot Tube Factor: 0.84 (Kp)
 Atm. Pres. 29.59 in.Hg(Pb) Static Press. 1.77 in.H2O(Pg)
 Test Run # 5 Average Stack Temp. _____ °F(Ts)

Moisture Train

Sample Box #	<u>T3</u>	
Leak Check		
Pre-test Leak check	ft^3 or L/min at in. Hg Vacuum <u>21.5"</u>	
Post-test Leak check	ft^3 or L/min at in. Hg Vacuum <u>21.5"</u>	
	Initial	Final
Time:	<u>2156</u>	<u>2249</u>
Meter Reading (ft^3 or L)	<u>952.28</u>	<u>974.182</u>
Meter Temp. (°F)	<u>72</u>	<u>69</u>
O2 %		
CO2 %		

Impinger #	Contents	Initial Weight	Final Weight
1	<u>D. H2O</u>	<u>614.2</u>	<u>667.6</u>
2	<u>A. H2O</u>	<u>639.3</u>	<u>640.1</u>
3	<u>WT</u>	<u>495.2</u>	<u>495.4</u>
4	<u>51602</u>	<u>561.7</u>	<u>564.6</u>
5	 		
6	 		
Totals		<u>2310.4</u>	<u>2367.7</u>

Pitot Tube Traverse/Stack Temp.

Sample Port A Sample Port B

Traverse Pt.	ΔP (" H2O)	°F	ΔP (" H2O)	°F
1	<u>2.064</u>	<u>732</u>	<u>1.864</u>	<u>735</u>
2	<u>2.157</u>	<u>729</u>	<u>1.953</u>	<u>732</u>
3	<u>2.397</u>	<u>746</u>	<u>2.066</u>	<u>752</u>
4	<u>2.412</u>	<u>753</u>	<u>2.178</u>	<u>758</u>
5	<u>2.384</u>	<u>760</u>	<u>2.1522</u>	<u>756</u>
6	<u>2.231</u>	<u>761</u>	<u>2.1372</u>	<u>749</u>
7	<u>1.913</u>	<u>762</u>	<u>2.397</u>	<u>741</u>
8	<u>1.741</u>	<u>763</u>	<u>1.859</u>	<u>739</u>
9	 			
10	 			
11	 			
12	 			

PITOT TUBE LEAK CHECK
 pre post

+

-

MOISTURE AND VELOCITY FIELD DATA SHEET

Date: 4/24/00
 Plant/Operator: FGT STATION 12
 Source: C-3LS68 UNIT 1205
 Technicians: JT, GM
 Atm. Pres.: 29.62 in.Hg(Pb)
 Test Run #: 6
 Dry Gas Meter ID: EQUIMETER 1748739
 Dry Gas Meter Factor: 0.9925 (Kd)
 Pitot Tube #/Type: 301 1" 5"
 Pitot Tube Factor: 0.84 (Kp)
 Static Press.: 1.605 in.H2O(Pg)
 Average Stack Temp.: 746.6 °F(Ts)

Moisture Train

Sample Box #	<u>T3</u>	
Leak Check		
Pre-test Leak check	<input checked="" type="checkbox"/> ft.3 or L/min at in. Hg Vacuum <u>21.5"</u>	
Post-test Leak check	<input checked="" type="checkbox"/> ft.3 or L/min at in. Hg Vacuum <u>21.0"</u>	
	Initial	Final
Time:	<u>2304</u>	<u>2355</u>
Meter Reading (ft3 or L)	<u>974.282</u>	<u>996.455</u>
Meter Temp. (°F)	<u>68</u>	<u>65</u>
O2 %		
CO2 %		

Impinger #	Contents	Initial Weight	Final Weight
1	<u>D₁H₂O</u>	<u>646.6</u>	<u>691.5</u>
2	<u>D₁H₂O</u>	<u>639.3</u>	<u>646.4</u>
3	<u>MT</u>	<u>495.2</u>	<u>496.1</u>
4	<u>5/60L</u>	<u>561.7</u>	<u>568.1</u>
5	 		
6	 		
Totals		<u>2342.8</u>	<u>2402.1</u>

Pitot Tube Traverse/Stack Temp.

Traverse Pt.	Sample Port <u>A</u>		Sample Port <u>B</u>	
	ΔP (" H2O)	°F	ΔP (" H2O)	°F
1	<u>1.602</u>	<u>728</u>	<u>1.793</u>	<u>718</u>
2	<u>1.647</u>	<u>740</u>	<u>1.911</u>	<u>734</u>
3	<u>2.044</u>	<u>746</u>	<u>1.971</u>	<u>744</u>
4	<u>2.263</u>	<u>753</u>	<u>2.343</u>	<u>755</u>
5	<u>2.437</u>	<u>755</u>	<u>2.236</u>	<u>754</u>
6	<u>2.353</u>	<u>756</u>	<u>2.410</u>	<u>749</u>
7	<u>2.1037</u>	<u>755</u>	<u>2.286</u>	<u>757</u>
8	<u>1.765</u>	<u>749</u>	<u>2.196</u>	<u>753</u>
9				
10				
11				
12				

PITOT TUBE LEAK CHECK

pre

post

$4.4''/1:20 + 2.0''/1:15$

$2.5''/1:15 = 3.2''/1:15$

**Cubix Corporation
Air Emission Testing Job Safety Analysis**

Job Name <u>FGT STATION 12</u>	Description of Testing Activities:		
Job Number <u>5825</u>	<u>MAPPING OF TAIL/CRANE/ACIPLS</u>		
Project Mgr. <u>THOMASUN</u>			
Plant Contact <u>DANNY PULLIN</u>			
Date <u>4/24, 26/00</u>			
Permits Required (Y or N)		Personal Protective Equipment Required (Y or N)	
Hot Work <u>N</u>	hard hat <u>Y</u>	acid suit <u>N</u>	
Cold Work <u>Y</u>	ear plugs/muffs <u>Y</u>	rubber boots <u>N</u>	
Lock & Tag <u>N</u>	safety glasses <u>Y</u>	monogoggles <u>N</u>	
Scaffolding <u>N</u>	steel toed shoes <u>Y</u>	face shield <u>Y</u>	
Crane/Lift <u>Y</u>	gloves <u>Y</u>	safety harness <u>Y</u>	
Line Break <u>Y</u>	hot gloves <u>Y</u>	respirator <u>Y</u>	
Emergency Response			
Safe Haven Location: <u>Q MAIN OFFICE</u>	Alarm Knowledge (list type of sound) <u>NA</u>		
Wind Direction: <u>N NE E SE S SW W NW</u>	Evacuate: _____ Fire _____		
Evacuation Route <u>E TO ROAD, N TO GAP</u>	Poison Gas: _____ All Clear: _____		
Assembly Points <u>MAIN GATE, COMM. TOWER</u>	Other _____ <u>EVACUATE ON SOUND</u>		
Plant Map Reviewed/Posted (Y or N) <u>Y</u>			
Emergency Equipment Locations Identified (Y or N)			
fire monitors <u>Y</u>			
fire extinguishers <u>Y</u>			
safety showers <u>Y</u>			
escape air <u>NA</u>			
JOB HAZARD IDENTIFIED (circle)		PRECAUTIONS (circle items completed or required)	
Hazardous Materials			
flammability, reactivity, health hazards	MSDS reviewed		
Environmental Hazards			
airborne particulate	respirator	shade breaks	
heat stress	liquid intake	gloves	hard hat liner
cold weather/frostbite	cold weather clothing	night lighting	
<u>inadequate lighting</u>	<u>flash light/head lamp</u>		
<u>noise</u>	hearing protection		
<u>poor access/egress</u>	<u>housekeeping</u>	alternate route	
Chemical Hazards			
asphyxiation	carcinogen	Respiratory	Protective Clothing
poison gas	chemical burns	supplied fresh air	slicker suit
chemical eye exposure	chemical skin exposure	SCBA	acid suit
flammable gas	flamable liquid	respirator	rubber boots
strong acid	strong base	escape pack	monogoggles
		exposure dosimeter	face shield
Equipment/lifting			
test equipment hoisting (pulley/boom)	<u>equipment secure</u>	<u>clear lift zone</u>	
fork lift	<u>certification reviewed</u>	<u>rope condition</u>	
<u>man lift (hydraulic)</u>	<u>guy lines</u>	<u>harness</u>	
personnel basket (crane)	<u>radios/handsignals</u>	guard rails, toe plates	
stairs/ladders	<u>housekeeping</u>	<u>braces/tie offs</u>	
rigging	<u>lines secure</u>	monorails secure	
scaffold	<u>secure tools</u>	<u>hard hats</u>	

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 1205-C-4 (Eq. 6c-1)

$$C_{gas} = (C - C_0) \times \frac{C_{ma}}{C_m - C_0} = \text{equation 6c-1}$$

$$C_{NOx} = \text{concentration of NOx (uncorrected)} = 2135.0 \text{ ppmv}$$

$$C_0 = \text{avg. of initial and final cal. bias checks, zero gas} = 0.0 \text{ ppmv}$$

$$C_m = \text{avg. of initial and final cal. bias checks, drift check gas} \\ = 961.25 \text{ ppmv}$$

$$C_{ma} = \text{actual concentration of upscale cal. gas} = 893.5 \text{ ppmv}$$

$$C_{NOx} = (2135.0 - 0.0) \times \frac{893.5}{961.25 - 0.0} = 1984.5 \text{ ppmv}$$

$$C_{CO} = \text{concentration of CO (uncorrected)} = 225.0 \text{ ppmv}$$

$$C_0 = \text{avg. of initial and final cal. bias checks, zero gas} = 0.0 \text{ ppmv}$$

$$C_m = \text{avg. of initial and final cal. bias checks, drift check gas} \\ = 445.5 \text{ ppmv}$$

$$C_{ma} = \text{actual concentration of upscale cal. gas} = 452.0 \text{ ppmv}$$

$$C_{CO} = (225.0 - 0.0) \times \frac{452.0}{445.5 - 0.0} = 228.3 \text{ ppmv}$$

$$C_{O_2} = \text{concentration of O}_2 \text{ (uncorrected)} = 9.28\%$$

$$C_0 = \text{avg. of initial and final cal. bias checks, zero gas} = 0.0\%$$

$$C_m = \text{avg. of initial and final cal. bias checks, drift check gas} \\ = 21.11\%$$

$$C_{ma} = \text{actual concentration of upscale cal. gas} = 20.90\%$$

$$C_{O_2} = (9.28 - 0.0) \times \frac{20.90}{21.11 - 0.0} = 9.19\%$$

$$C_{CO_2} = \text{concentration of CO}_2 \text{ (uncorrected)} = 6.04\%$$

$$C_0 = \text{avg. of initial and final cal. bias checks, zero gas} = (-0.04)\%$$

$$C_m = \text{avg. of initial and final cal. bias checks, drift check gas} \\ = 3.64\%$$

$$C_{ma} = \text{actual concentration of upscale cal. gas} = 4.03\%$$

$$C_{CO_2} = (6.04 - (-0.04)) \times \frac{4.03}{3.64 - (-0.04)} = 6.66\%$$

$$C_{THC} = \text{concentration of THC (uncorrected)} = 558.0 \text{ ppmv}$$

$$C_0 = \text{avg. of initial and final cal. bias checks, zero gas} = (-4.0) \text{ ppmv}$$

$$C_m = \text{avg. of initial and final cal. bias checks, drift check gas} \\ = 913.0 \text{ ppmv}$$

C_{ma} = actual concentration of upscale cal. gas = 919.0 ppmv

$$CTHC = (558.0 - (-4.0)) \times \frac{919.0}{913.0 - (-4.0)} = 563.23 \text{ ppmv}$$

Calculation of VOC from THC ppmv and fuel analysis

Refers to test run 1205-C-4

CTHC = 563.23 ppmv
%NM,NE = 2.65% (from fuel analysis)

CVOC = CTHC x %NM, NE
= 563.23 x 0.0265

CVOC = 14.93 ppmv

F_o Calculation to Verify O₂/CO₂ Measurements

Refers to test run 1205-C-4

CCO₂ = concentration of carbon dioxide = 6.66% (from analyzer)
CO₂ = concentration of oxygen = 9.19% (from analyzer)

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

$$F_o = \frac{20.9 - 9.19}{6.66}$$

$F_o = 1.758$ (acceptable F_o values for natural gas = 1.600 to 1.836)

Moisture Content via EPA Method 4

Refers to test run 1205-C-4 (eq. 4-4)

$$\begin{aligned}V_1 &= \text{initial dry gas meter reading} = 930.06 \text{ ft}^3 \\V_2 &= \text{final dry gas meter reading} = 952.22 \text{ ft}^3 \\V_M &= \text{total gas sample volume collected} \\&= V_2 - V_1 = 22.16 \text{ ft}^3 \\Y &= \text{dry gas meter factor (unitless)} = 0.9925 \\V_{M\text{corrected}} &= V_M \times Y = 21.21 \times 0.9925 \\&= 21.994 \text{ ft}^3\end{aligned}$$

$$\begin{aligned}W_i &= \text{initial weight of impinger train} = 2282.1 \text{ g} \\W_f &= \text{final weight of impinger train} = 2340.3 \text{ g} \\W_{\text{tot}} &= \text{total weight gain of all impingers (g)} \\&= W_f - W_i = 58.2 \text{ g}\end{aligned}$$

$$K_2 = 1.335 \text{ liters /1.0 gram @ EPA STP}$$

$$K_3 = \left(\frac{528^\circ\text{R}}{29.92\text{''Hg}} \right) \times 28.3 \text{ l/ft}^3 = 499.4 \text{ @ EPA STP}$$

$$P_{\text{atm}} = \text{atmospheric pressure (in Hg), ground level} = 29.59$$

$$T = \text{average temperature of Dry Gas Meter (}^\circ\text{F)} = 72.5$$

$$\begin{aligned}V_{M(\text{std})} &= \left(\frac{V_{M\text{corrected}} \times P_{\text{atm}} \times K_3}{T + 460} \right) \\&= \left(\frac{21.994 \times 29.59 \times 499.4}{72.5 + 460} \right) = 610.343\end{aligned}$$

BWS = moisture fraction by volume

$$\begin{aligned}&= \left(\frac{W_{\text{tot}} \times K_2}{(W_{\text{tot}} \times K_2) + V_{M(\text{std})}} \right) \\&= \left(\frac{58.2 \times 1.335}{(58.2 \times 1.335) + 610.343} \right)\end{aligned}$$

$$\mathbf{BWS = 0.1129 = 11.29\% \text{ moisture}}$$

Stack Gas Molecular Weight

Refers to test run 1205-C-4 (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)	
BWS	= moisture fraction by volume = 0.1129	
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
CCO_2	= vol. fraction dry CO_2	= 0.0666 (from analyzer)
CO_2	= vol. fraction dry O_2	= 0.0919 (from analyzer)
C_{N_2}	= vol. fraction dry = $1 - (CCO_2 + CO_2)$	= 0.8415
$1 - BWS$	= dry gas fraction	= 0.8871

$$\begin{aligned} M_s &= \text{wt. of } CO_2 + \text{wt. of } O_2 + \text{wt. of } N_2 \text{ (Eq. 3-1)} \\ &= ((MW_{CO_2} \times CCO_2) + (MW_{O_2} \times CO_2) + (MW_{N_2} \times C_{N_2})) \\ &= ((44 \times 0.0666) + (32 \times 0.0919) + (28 \times 0.8415)) \end{aligned}$$

$$M_s = 29.433 \text{ lb/lb-mole}$$

$$\begin{aligned} M_d &= (18 \times BWS) + ((1 - BWS) \times M_s) \text{ (Eq 2-5)} \\ &= (18 \times 0.1129) + (0.8871 \times 29.433) \end{aligned}$$

$$M_d = 28.14 \text{ lb/lb-mole}$$

Stack Gas Flow Rate via Pitot Tube

Refers to test run 1205-C-4 (eq. 2-6, 2-8, 2-9, 2-10)

$$\begin{aligned}C_p &= \text{pitot tube coefficient, dimensionless} = 0.84 \\ \Delta P &= \text{pressure difference in stack as measured (in. H}_2\text{O)} \\ (\sqrt{\Delta P})_{\text{avg}} &= \text{average of square root of } \Delta P\text{'s} = 1.43 \text{ (from pitot readings)} \\ t_s &= \text{stack temperature} = 754.5 \text{ }^\circ\text{F} \\ T_s &= \text{absolute stack temperature, } ^\circ\text{R} \\ &= t_s + 460 = 1214.5 \text{ }^\circ\text{R (eq. 2-8)}\end{aligned}$$

$$\begin{aligned}K_p &= \text{pitot tube constant} = 85.49 \text{ ft/sec} \sqrt{\left(\frac{\text{lb/lb mole} \times \text{in. Hg}}{^\circ\text{R} \times \text{in. H}_2\text{O}}\right)} \\ &= \text{pitot tube constant} = 5129 \text{ ft/min} \sqrt{\left(\frac{\text{lb/lb mole} \times \text{in. Hg}}{^\circ\text{R} \times \text{in. H}_2\text{O}}\right)}\end{aligned}$$

$$\begin{aligned}K_y &= \text{standard temperature/pressure constant} \\ &= \frac{528^\circ\text{R}}{29.92 \text{ "Hg}} \times \frac{60 \text{ minutes}}{\text{hour}} = 1059\end{aligned}$$

$$\begin{aligned}P_b &= \text{atmospheric pressure (in Hg)} = 29.59 \\ P_g &= \text{stack static pressure (in. H}_2\text{O)} = 1.604 \\ P_s &= \text{absolute stack pressure (eq. 2-6)} \\ &= P_b + (P_g \times .0735 \text{ in.Hg / in.H}_2\text{O}) = 29.71 \text{ in. Hg}\end{aligned}$$

$$\begin{aligned}A &= \text{area of stack (ft}^2\text{)} = \frac{\text{diameter}^2}{4} \times \Pi \\ &= \frac{15.00^2}{4} \times 3.1416 \\ &= \frac{15.00^2}{4} \times 3.1416 = 1.227 \text{ ft}^2\end{aligned}$$

$$\begin{aligned}v_s &= \text{stack velocity (ft/min)} \\ &= K_p \times C_p \times (\sqrt{\Delta P})_{\text{avg}} \times \sqrt{\frac{T_s}{P_s \times M_s}} \text{ (eq. 2-9)} \\ &= 5129 \times 0.84 \times 1.43 \times \sqrt{\frac{1214.5}{29.71 \times 28.14}} \\ &= 7,425.9 \text{ ft/min at stack conditions}\end{aligned}$$

$$\begin{aligned}Q_a &= \text{stack flow rate (ft}^3\text{/min)} \\ &= v_s \times A, \text{ where } A = \text{area of stack} = 1.227 \text{ ft}^2 \\ &= 7425.9 \times 1.227 = 9,111.6 \text{ ft}^3\text{/min at stack conditions}\end{aligned}$$

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

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

$$= 9,111.6 \times 1059 \times \frac{29.71}{1214.5} \times 0.8871$$

Qd = 209,396 DSCFH = 2.09E+05 DSCFH

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

Refers to test run 1205-C-4

CNO _x	=1984.5 ppmv (corrected)
CCO	= 228.3 ppmv (corrected)
CVOC	= 14.93 PPMV (calculated from corrected THC)
Qd	= 2.09E+05 (from pitot tube data)
MW of NO _x	= 46.01 lb/lb-mole
MW of CO	= 28.00 lb/lb-mole
MW of VOC (as C ₃ H ₈)	= 44.09 lb/lb-mole
for ideal gas, 385.15 SCF = 1.0 lb/mole @ EPA STP	

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

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

$$E_{NO_x} = C_{NO_x} \times Qd \times 10^{-6} \times \frac{46.01}{385.15}$$

$$E_{NO_x} = 49.60 \text{ lb/hr}$$

$$E_{CO} = C_{CO} \times Qd \times 10^{-6} \times \frac{28.00}{385.15}$$

$$E_{CO} = 3.47 \text{ lb/hr}$$

$$E_{voc} = C_{VOC} \times Qd \times 10^{-6} \times \frac{44.09}{385.15}$$

$$E_{voc} = 0.358 \text{ lb/hr}$$

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

Refers to test run 1205-C-4

ENox	=	49.60 lb/hr
ECO	=	3.47 lb/hr
CVOC	=	0.358 lb/hr
BHp	=	1877
g/lb	=	454

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

$$\text{NOx g/Hp-H} = \frac{49.60 \times 454}{1877}$$

$$\text{NOx g/Hp-H} = \mathbf{11.997}$$

$$\text{CO g/Hp-H} = \frac{3.47 \times 454}{1877}$$

$$\text{CO g/Hp-H} = \mathbf{0.839}$$

$$\text{VOC g/Hp-H} = \frac{0.358 \times 454}{1877}$$

$$\text{VOC g/Hp-H} = \mathbf{0.09}$$

APPENDIX C:
Fuel Analyses and Calculations

Compressor Station 12

East Chromatographs

	Station 12 36"	Station 12 30" ✓	Station 15 36"	Station 15 30"	Station 15 24"	Station 16	Gainsville Lab	Station 21
n-Hexanes +	0.0385	0.0644	0.0363	0.0584	0.0743	0.0526	0.0445	0.0512
Nitrogen	0.2617	0.4619	0.2973	0.4104	0.4040	0.3873	0.2607	0.3441
Methane	97.0609	94.8826	96.7191	95.1949	95.3336	95.1663	97.0133	95.9914
Carbon Dioxide	0.7268	0.6698	0.7267	0.6868	0.6957	0.7388	0.7283	0.7117
Ethane	1.4686	3.1686	1.7283	2.8878	2.7603	2.9053	1.5263	2.2826
Propane	0.2910	0.4903	0.3216	0.4899	0.4681	0.4917	0.2749	0.4010
Iso-Butane	0.0616	0.1053	0.0691	0.1087	0.1045	0.1046	0.0594	0.0870
n-Butane	0.0623	0.1089	0.0696	0.1109	0.1070	0.1072	0.0622	0.0881
Iso-Pentane	0.0173	0.0297	0.0203	0.0316	0.0319	0.0288	0.0190	0.0263
n-Pentane	0.0112	0.0186	0.0119	0.0205	0.0207	0.0175	0.0116	0.0000
Neo-Pentane								0.0000
Normalized Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Specific Gravity	0.5763	0.5892	0.5782	0.5878	0.5873	0.5879	0.5766	0.5829
BTU / cu. ft.	1025.2	1043.6	1027.7	1041.8	1040.9	1041.0	1025.7	1034.6

CR12

CR15

BRO1

GLAB

(P)

Dew Point and H2S

Retail

West Chromatographs

Gas Fuel F Factor & Heating Value Calculation

Client **FGT**
 Sample ID **Station 12 30"**
 Time **13:46**
 Date **4/24/2000**

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

Component	% Volume	Molecular Wt.	Density (lb/ft3)	% volume x Density		Component Gross Btu/lb	Weight Fract. Btu	Gross Heating Value (Btu/SCF)	Volume Fract. Btu
				Density	weight %				
Hydrogen		2.016	0.0053	0.0000	0.0000	61100	0.00	325.0	0
Oxygen		32.000	0.0846	0.0000	0.0000	0	0.00	0.0	0
Nitrogen	0.4619	28.016	0.0744	0.00034	0.7626	0	0.00	0.0	0
CO2	0.6698	44.010	0.1170	0.00078	1.7389	0	0.00	0.0	0
CO		28.010	0.0740	0.00000	0.0000	4347	0.00	322.0	0
Methane	94.8826	16.041	0.0424	0.04023	89.2704	23879	21316.87	1013.0	961.160738
Ethane	3.1686	30.067	0.0803	0.00254	5.6460	22320	1260.18	1792.0	56.781312
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614.0	0
Propane	0.4903	44.092	0.1196	0.00059	1.3012	21661	281.86	2590.0	12.69877
propylene		42.077	0.1110	0.00000	0.0000	21041	0.00	2336.0	0
isobutane	0.1053	58.118	0.1582	0.00017	0.3696	21308	78.76	3363.0	3.541239
n-butane	0.1089	58.118	0.1582	0.00017	0.3823	21257	81.26	3370.0	3.66993
Isobutene		56.102	0.1480	0.00000	0.0000	20840	0.00	3068.0	0
Isopentane	0.0297	72.144	0.1904	0.00006	0.1255	21091	26.47	4008.0	1.190376
n-pentane	0.0186	72.144	0.1904	0.00004	0.0786	21052	16.54	4016.0	0.746976
n-hexane	0.0644	86.169	0.2274	0.00015	0.3250	20940	68.05	4762.0	3.066728
H2S		34.076	0.0911	0.00000	0.0000	7100	0.00	647.0	0
total	100.00		Average Density	0.04507	100.0000	Gross Heating Value		Gross Heating Value	
			Specific Gravity	0.58909		Btu/lb	23130	Btu/SCF	1043

CALCULATION OF F FACTORS

Component	Mol. Wt.	C Factor	H Factor	% volume	Fract. Wt.	Weight Percents				
						Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur
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	0.46	12.9406			0.759958791		
CO2	44.010	0.272273	0	0.67	29.4779	0.471342977			1.25853957	
CO	28.010	0.42587	0	0.00	0.0000	0			0	
Methane	16.041	0.75	0.25	94.88	1522.0118	67.03710194	22.34570065			
Ethane	30.067	0.8	0.2	3.17	95.2703	4.475931739	1.118982935			
Ethylene	28.051	0.85714	0.14286	0.00	0.0000	0	0			
Propane	44.092	0.81818	0.181818	0.49	21.6183	1.038739157	0.230831206			
Propene	42.077	0.85714	0.14286	0.00	0.0000	0	0			
Isobutane	58.118	0.82759	0.17247	0.11	6.1198	0.297433731	0.061985277			
n-butane	58.118	0.82759	0.17247	0.11	6.3291	0.307602405	0.064104432			
Isobutene	56.102	0.85714	0.14286	0.00	0.0000	0	0			
Isopentane	72.144	0.83333	0.16667	0.03	2.1427	0.104859948	0.020972493			
n-pentane	72.144	0.83333	0.16667	0.02	1.3419	0.065669866	0.013134288			
n-hexane	86.169	0.83721	0.16279	0.06	5.5493	0.272839522	0.053051858			
H2S	34.076	0	0.058692335	0.00	0.0000	0	0			0
Totals				100.00010	1702.8016	74.07152129	23.91	0.759958791	1.25853957	0

CALCULATED VALUES		
O2 F Factor (dry)	8642	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet)	10637	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	1995	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	18.76	volume % water in flue gas @ 0% excess air
CO2 F Factor	1028	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air
Carbon Dioxide	11.90	volume % CO2 in flue gas @ 0% O2
Predicted Fo Factor	1.76	EPA Method 3a Fo value
Fuel VOC % (non-C1)	8.38%	non-methane fuel VOC content
Fuel VOC % (non-C1,C2)	2.65%	non-methane non-ethane fuel VOC content

Test/Inspection Report
 Office Meter and Temperature Recorder

★ Required Entries
 Procedure 60.201A

Station Number 0, 8, 6, 1, 2, 8 Station Name Maason Compressor GASDC 3, 7, 0, 5

Company Number 062 Date 0, 4, 2, 1, 0, 0 Test Inspection

Start. Inlet Pressure PSIG H₂S Grain/CSCF Water Vapor %MMSCF CO₂ PPM

Run Number 12 05 Meter Type HG DRI Etc.

Measurement Found in Error \pm 1% or Greater Yes No

Differential Connection Pipe OR Flange

Static Connection U/S OR D/S

High Range 50 PSI 50 "H₂O"

Chart Rotation days OR Electronic

DIFF Found Left

CALIBRATION "AS FOUND"

DIFF. W. P. Zero 0 " Shut In Leak Test OK

DIFF. Pen Arc OK Min. Slow Min. Fast

DIFF. UP		DIFF. DOWN	
STD. "	METER "	STD. "	METER "
<u>0</u>	<u>0</u>	<u>25</u>	<u>25</u>
<u>25</u>	<u>25.0</u>	<u>0</u>	<u>0</u>
<u>50</u>	<u>50.1</u>		

STATIC PRESSURE

ATMOS. PRESS. 14.73 PSIA ZERO W. P.

Std. (PSIG)

Recorder PSIG PSIA

ORIFICE PLATE

Present Size 2 x 1.6 1.25

Condition oil + sharp

Run Number Meter Type HG DRI Etc.

Measurement Found in Error \pm 1% or Greater Yes No

Differential Connection Pipe OR Flange

Static Connection U/S OR D/S

High Range PSI "H₂O"

Chart Rotation days OR Electronic

DIFF Found Left

CALIBRATION "AS FOUND"

DIFF. W. P. Zero " Shut In Leak Test

DIFF. Pen Arc OK Min. Slow Min. Fast

DIFF. UP		DIFF. DOWN	
STD. "	METER "	STD. "	METER "

STATIC PRESSURE

ATMOS. PRESS. PSIA ZERO W. P.

Std. (PSIG)

Recorder PSIG PSIA

ORIFICE PLATE

Present Size " X

Condition

Run Number Meter Type HG DRI Etc.

Measurement Found in Error \pm 1% or Greater Yes No

Differential Connection Pipe OR Flange

Static Connection U/S OR D/S

High Range PSI "H₂O"

Chart Rotation days OR Electronic

DIFF Found Left

CALIBRATION "AS FOUND"

DIFF. W. P. Zero " Shut In Leak Test

DIFF. Pen Arc OK Min. Slow Min. Fast

DIFF. UP		DIFF. DOWN	
STD. "	METER "	STD. "	METER "

STATIC PRESSURE

ATMOS. PRESS. PSIA ZERO W. P.

Std. (PSIG)

Recorder PSIG PSIA

ORIFICE PLATE

Present Size " X

Condition

TEMPERATURE RECORDER "AS FOUND"

Spot Test Range of 20 To 200 °F 20 °F 19.9 °F 200 °F 200.2 °F

Span Test

Remarks

TESTER Jerry Watson

APPENDIX D:
Operational Data

Compressor Health Report

FloridaGas

Munson #1204

Unit Name: 1204-C
 Location: Munson, Florida

Model: KM-2
 Unit Mfr: Cooper-Bessemer

Date: 4/24/00 4:00:55 PM
 Serial No.:

Mechanical Efficiency, %	95	Marker Correction Angle, deg	165.0	Periods Collected (PT)	6
Overall Efficiency, %	85	Stroke, (ins)	14.000		
Atmospheric Pressure, psia	3.0	Speed, RPM	327	Specific Gravity	0.577
Load Step	3				

Cyl End	Cyl Stg	Cir Set (%)	Rod Bore (ins)	Rod Diam (ins)	ConRod Length (ins)	Pressure		Temp.		Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (ihp)	Suction Loss	Disch. Loss	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
						Ps (psig)	Pd (psig)	Ts	Td				(ihp)	(ihp)					
1H	1	150	18.500	N/A	38.000	740	986	65F	107F	1.30	37.95	504.3	39.9	29.0	1.00	13	87C	67	56
1C	1	159	18.500	4.000	38.000	735	956	65F	107F	1.30	35.22	455.4	18.6	39.3	1.00	14	74T	66	55
2H	1	189	18.500	N/A	38.000	733	971	65F	106F	1.32	30.96	411.1	10.4	13.9	0.98	9	97C	55	46
2C	1	157	18.500	4.000	38.000	741	981	65F	106F	1.30	35.80	472.2	36.7	36.4	1.01	13	73T	67	55

- 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)	1843	@	327	RPM	Rated Power, (bhp)	2000	@	330	RPM
Gas Power, (ghp)	1940	@	327	RPM	Derated Power, (bhp)	1980	@	327	RPM
Auxiliary Power, (bhp)	0	@	330	RPM	Percent Torque Load, %	98	%		
Compressor Total Power, (bhp)	1940	@	327	RPM	Compressor Efficiency, %	88	%		

Observations and Recommendations	Machine Condition Notes

Analyst Signature: _____ 4/24/00 4:20:49 PM

1204 UNIT OPERATING DATA

3:31:58 PM 4/24/00

TEST # **1204-C1A**

ENGINE SPEED 329 RPM
IGNITION TIMING OUTPUT 29.2 °BTDC
GOVERNOR SETTING
AIR MANIFOLD PRESS. 6.6 "Hg
AIR MANIFOLD TEMP. 76 °F
TURBOCHARGER VIBRATION 0.60 IN/SEC
FUEL STATIC PRESS. 71.5 PSIG
FUEL DIFF. PRESS. 15.9 "H2O
FUEL GAS HEADER PRESS. 7.2 PSIG
FUEL TEMP. 76 °F
COMPUTER FUEL FLOW SCF 13203
AGA3 CAL. FUEL FLOW SCF
CYLINDER #1 TEMP. 961 °F
CYLINDER #2 TEMP. 964 °F
CYLINDER #3 TEMP. 940 °F
CYLINDER #4 TEMP. 935 °F
CYLINDER #5 TEMP. 922 °F
CYLINDER #6 TEMP. 921 °F
CYLINDER #7 TEMP. 960 °F
CYLINDER #8 TEMP. 918 °F
MODE AUTO

AMBIENT TEMPERATURE 81 °F
LOAD STEP NUMBER 3
STATION SUCTION PRESSURE 748 PSIG
STATION SUCTION TEMP. 67 °F
STATION DISCH. PRESSURE 964 PSIG
STATION DISCH. TEMP. 106 °F
COMPRESSOR FLOW RATE 141 MMSCFD
"A" COMP. EFFICIENCY 79 %
"B" COMP. EFFICIENCY 85 %
AVERAGE COMP. EFFICIENCY 82 %
"A" COMP. SUCTION TEMP. # °F
"B" COMP. SUCTION TEMP. # °F
"A" COMP. DISCHARGE TEMP. 106 °F
"B" COMP. DISCHARGE TEMP. 106 °F
FUEL TORQUE HP 1975 BHP
TORQUE 99 %
GEO. HP 1969 BHP
GEO. HP - FUEL TORQUE HP -6 BHP



1204 UNIT OPERATING DATA

3:58:04 PM 4/24/00

TEST # 1204-C1B

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	80 °F
IGNITION TIMING OUTPUT	29.2 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	746 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	76 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.68 IN/SEC	STATION DISCH. TEMP.	107 °F
FUEL STATIC PRESS.	71.1 PSIG	COMPRESSOR FLOW RATE	140 MMSCFD
FUEL DIFF. PRESS.	16.1 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	76 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13251	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	960 °F	"A" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #2 TEMP.	966 °F	"B" COMP. DISCHARGE TEMP.	106 °F
CYLINDER #3 TEMP.	937 °F	FUEL TORQUE HP	1983 BHP
CYLINDER #4 TEMP.	933 °F	TORQUE	99 %
CYLINDER #5 TEMP.	925 °F	GEO. HP	1968 BHP
CYLINDER #6 TEMP.	934 °F	GEO. HP - FUEL TORQUE HP	-15 BHP
CYLINDER #7 TEMP.	958 °F		
CYLINDER #8 TEMP.	924 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

4:08:52 PM 4/24/00

TEST # 1204-C1L

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	79 °F
IGNITION TIMING OUTPUT	29.2 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	745 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	76 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.64 IN/SEC	STATION DISCH. TEMP.	107 °F
FUEL STATIC PRESS.	70.8 PSIG	COMPRESSOR FLOW RATE	139 MMSCFD
FUEL DIFF. PRESS.	15.9 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.3 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	76 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13287	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	959 °F	"A" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #2 TEMP.	964 °F	"B" COMP. DISCHARGE TEMP.	106 °F
CYLINDER #3 TEMP.	939 °F	FUEL TORQUE HP	1989 BHP
CYLINDER #4 TEMP.	929 °F	TORQUE	100 %
CYLINDER #5 TEMP.	922 °F	GEO. HP	1971 BHP
CYLINDER #6 TEMP.	938 °F	GEO. HP - FUEL TORQUE HP	-19 BHP
CYLINDER #7 TEMP.	961 °F		
CYLINDER #8 TEMP.	924 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

4:19:44 PM 4/24/00

TEST# 1204-C10

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	79 °F
IGNITION TIMING OUTPUT	29.3 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	744 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	76 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.66 IN/SEC	STATION DISCH. TEMP.	107 °F
FUEL STATIC PRESS.	71.3 PSIG	COMPRESSOR FLOW RATE	138 MMSCFD
FUEL DIFF. PRESS.	15.9 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	76 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13213	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	962 °F	"A" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #2 TEMP.	965 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	939 °F	FUEL TORQUE HP	1977 BHP
CYLINDER #4 TEMP.	928 °F	TORQUE	99 %
CYLINDER #5 TEMP.	923 °F	GEO. HP	1963 BHP
CYLINDER #6 TEMP.	940 °F	GEO. HP -- FUEL TORQUE HP	-14 BHP
CYLINDER #7 TEMP.	956 °F		
CYLINDER #8 TEMP.	922 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

4:30:18 PM 4/24/00

TEST # 1204C/E

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	80 °F
IGNITION TIMING OUTPUT	29.3 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	742 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	77 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.55 IN/SEC	STATION DISCH. TEMP.	107 °F
FUEL STATIC PRESS.	71.1 PSIG	COMPRESSOR FLOW RATE	137 MMSCFD
FUEL DIFF. PRESS.	15.9 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13186	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	956 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	964 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	936 °F	FUEL TORQUE HP	1971 BHP
CYLINDER #4 TEMP.	934 °F	TORQUE	99 %
CYLINDER #5 TEMP.	922 °F	GEO. HP	1965 BHP
CYLINDER #6 TEMP.	933 °F	GEO. HP - FUEL TORQUE HP	-5 BHP
CYLINDER #7 TEMP.	958 °F		
CYLINDER #8 TEMP.	920 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

4:53:40 PM 4/24/00

TEST# **1204-C2A**

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	79 °F
IGNITION TIMING OUTPUT	29.3 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING	<input type="text"/>	STATION SUCTION PRESSURE	741 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	76 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.56 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.2 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.9 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13200	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	959 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	961 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	935 °F	FUEL TORQUE HP	1974 BHP
CYLINDER #4 TEMP.	930 °F	TORQUE	99 %
CYLINDER #5 TEMP.	919 °F	GEO. HP	1957 BHP
CYLINDER #6 TEMP.	926 °F	GEO. HP - FUEL TORQUE HP	-17 BHP
CYLINDER #7 TEMP.	954 °F		
CYLINDER #8 TEMP.	917 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

5:03:11 PM 4/24/00

TEST # **C-2-3**

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	81 °F
IGNITION TIMING OUTPUT	29.5 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING	<input type="text"/>	STATION SUCTION PRESSURE	740 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	75 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.52 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.2 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.9 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.1 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13135	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	957 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	962 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	934 °F	FUEL TORQUE HP	1961 BHP
CYLINDER #4 TEMP.	931 °F	TORQUE	98 %
CYLINDER #5 TEMP.	919 °F	GEO. HP	1956 BHP
CYLINDER #6 TEMP.	916 °F	GEO. HP - FUEL TORQUE HP	-5 BHP
CYLINDER #7 TEMP.	956 °F		
CYLINDER #8 TEMP.	915 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

5:13:50 PM 4/24/00

TEST# C-22

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	81 °F
IGNITION TIMING OUTPUT	29.4 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	740 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	77 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.54 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.2 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.8 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13128	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	959 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	962 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	937 °F	FUEL TORQUE HP	1960 BHP
CYLINDER #4 TEMP.	932 °F	TORQUE	98 %
CYLINDER #5 TEMP.	923 °F	GEO. HP	1959 BHP
CYLINDER #6 TEMP.	927 °F	GEO. HP - FUEL TORQUE HP	-1 BHP
CYLINDER #7 TEMP.	957 °F		
CYLINDER #8 TEMP.	918 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

5:26:02 PM 4/24/00

TEST# (-2-1)

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	80 °F
IGNITION TIMING OUTPUT	29.4 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	739 PSIG
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	77 °F	STATION DISCH. PRESSURE	964 PSIG
TURBOCHARGER VIBRATION	0.63 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.3 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.9 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	84 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13139	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	960 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	964 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	936 °F	FUEL TORQUE HP	1961 BHP
CYLINDER #4 TEMP.	931 °F	TORQUE	98 %
CYLINDER #5 TEMP.	924 °F	GEO. HP	1957 BHP
CYLINDER #6 TEMP.	932 °F	GEO. HP - FUEL TORQUE HP	-3 BHP
CYLINDER #7 TEMP.	960 °F		
CYLINDER #8 TEMP.	919 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

5:39:23 PM 4/24/00

TEST# **1204-026**

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	81 °F
IGNITION TIMING OUTPUT	29.4 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING	<input type="text"/>	STATION SUCTION PRESSURE	738 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	77 °F	STATION DISCH. PRESSURE	963 PSIG
TURBOCHARGER VIBRATION	0.62 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.2 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.8 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	84 %
FUEL TEMP.	78 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13138	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	955 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	962 °F	"B" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #3 TEMP.	936 °F	FUEL TORQUE HP	1960 BHP
CYLINDER #4 TEMP.	929 °F	TORQUE	98 %
CYLINDER #5 TEMP.	919 °F	GEO. HP	1955 BHP
CYLINDER #6 TEMP.	930 °F	GEO. HP - FUEL TORQUE HP	-5 BHP
CYLINDER #7 TEMP.	957 °F		
CYLINDER #8 TEMP.	916 °F		
MODE	AUTO		



Compressor Health Report

FloridaGas

Munson #1204

Unit Name: 1204-C
 Location: Munson, Florida

Model: KM-2
 Unit Mfr: Cooper-Bessemer

Date: 4/24/00 6:03:51 PM
 Serial No.:

Mechanical Efficiency, %		95		Marker Correction Angle, deg		0.0		Periods Collected (PT)		6									
Overall Efficiency, %		85		Stroke, (Ins)		14.000													
Atmospheric Pressure, psia		3.0		Speed, RPM		327		Specific Gravity				0.577							
Load Step		3																	
Cyl End	Clr Stg	Set (%)	Bore (Ins)	Rod Diam (Ins)	ConRod Length (Ins)	Pressure		Temp.		Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (Ihp)	Suction Loss (Ihp)	Disch. Loss (Ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
						Ps (psig)	Pd	Ts	Td										
1H	1	150	18.500	N/A	38.000	729	963	65F	108F	1.32	36.27	498.1	37.0	23.5	1.01	13	98C	66	54
1C	1	158	18.500	4.000	38.000	725	950	65F	108F	1.31	33.90	452.9	17.3	37.3	0.98	14	75T	64	54
2H	1	189	18.500	N/A	38.000	728	965	65F	108F	1.33	30.47	409.2	15.9	10.3	1.01	11	97C	55	45
2C	1	187	18.500	4.000	38.000	731	958	66F	108F	1.31	34.76	467.7	35.7	33.4	1.00	14	74T	65	54

- 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)	1828	@	327	RPM	Rated Power, (bhp)	2000	@	330	RPM
Gas Power, (ghp)	1924	@	327	RPM	Derated Power, (bhp)	1983	@	327	RPM
Auxiliary Power, (bhp)	0	@	330	RPM	Percent Torque Load, %	97	%		
Compressor Total Power, (bhp)	1924	@	327	RPM	Compressor Efficiency, %	88	%		

Observations and Recommendations	Machine Condition Notes
Analyst Signature: _____	
4/24/00 6:25:40 PM	

1204 UNIT OPERATING DATA

6:09:45 PM 4/24/00

TEST# **C-C-A**

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	78 °F
IGNITION TIMING OUTPUT	29.4 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING	[REDACTED]	STATION SUCTION PRESSURE	737 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	79 °F	STATION DISCH. PRESSURE	963 PSIG
TURBOCHARGER VIBRATION	0.57 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.4 PSIG	COMPRESSOR FLOW RATE	135 MMSCFD
FUEL DIFF. PRESS.	15.7 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.2 PSIG	"B" COMP. EFFICIENCY	84 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13145	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF	[REDACTED]	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	957 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	964 °F	"B" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #3 TEMP.	937 °F	FUEL TORQUE HP	1962 BHP
CYLINDER #4 TEMP.	929 °F	TORQUE	98 %
CYLINDER #5 TEMP.	918 °F	GEO. HP	1957 BHP
CYLINDER #6 TEMP.	937 °F	GEO. HP - FUEL TORQUE HP	-5 BHP
CYLINDER #7 TEMP.	959 °F		
CYLINDER #8 TEMP.	916 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

6:19:10 PM 4/24/00

TEST# **C-3-B**

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	77 °F
IGNITION TIMING OUTPUT	29.5 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING	<input type="text"/>	STATION SUCTION PRESSURE	737 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	78 °F	STATION DISCH. PRESSURE	962 PSIG
TURBOCHARGER VIBRATION	0.56 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.5 PSIG	COMPRESSOR FLOW RATE	135 MMSCFD
FUEL DIFF. PRESS.	15.5 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.1 PSIG	"B" COMP. EFFICIENCY	84 %
FUEL TEMP.	77 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13090	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	953 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	960 °F	"B" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #3 TEMP.	937 °F	FUEL TORQUE HP	1951 BHP
CYLINDER #4 TEMP.	931 °F	TORQUE	98 %
CYLINDER #5 TEMP.	919 °F	GEO. HP	1953 BHP
CYLINDER #6 TEMP.	933 °F	GEO. HP - FUEL TORQUE HP	1 BHP
CYLINDER #7 TEMP.	955 °F		
CYLINDER #8 TEMP.	914 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

6:35:16 PM 4/24/00

TEST # C-3-C

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	76 °F
IGNITION TIMING OUTPUT	29.5 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	736 PSIG
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	79 °F	STATION DISCH. PRESSURE	961 PSIG
TURBOCHARGER VIBRATION	0.68 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.4 PSIG	COMPRESSOR FLOW RATE	135 MMSCFD
FUEL DIFF. PRESS.	15.6 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.1 PSIG	"B" COMP. EFFICIENCY	84 %
FUEL TEMP.	76 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13084	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	955 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	963 °F	"B" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #3 TEMP.	939 °F	FUEL TORQUE HP	1950 BHP
CYLINDER #4 TEMP.	929 °F	TORQUE	98 %
CYLINDER #5 TEMP.	918 °F	GEO. HP	1952 BHP
CYLINDER #6 TEMP.	935 °F	GEO. HP - FUEL TORQUE HP	3 BHP
CYLINDER #7 TEMP.	956 °F		
CYLINDER #8 TEMP.	913 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

6:52:23 PM 4/24/00

TEST # **C-3-0**

ENGINE SPEED 330 RPM
IGNITION TIMING OUTPUT 29.6 °BTDC
GOVERNOR SETTING
AIR MANIFOLD PRESS. 6.4 "Hg
AIR MANIFOLD TEMP. 76 °F
TURBOCHARGER VIBRATION 0.66 IN/SEC
FUEL STATIC PRESS. 71.5 PSIG
FUEL DIFF. PRESS. 15.6 "H2O
FUEL GAS HEADER PRESS. 7.1 PSIG
FUEL TEMP. 76 °F
COMPUTER FUEL FLOW SCF 13074
AGA3 CAL. FUEL FLOW SCF
CYLINDER #1 TEMP. 954 °F
CYLINDER #2 TEMP. 960 °F
CYLINDER #3 TEMP. 937 °F
CYLINDER #4 TEMP. 927 °F
CYLINDER #5 TEMP. 918 °F
CYLINDER #6 TEMP. 934 °F
CYLINDER #7 TEMP. 957 °F
CYLINDER #8 TEMP. 915 °F
MODE AUTO

AMBIENT TEMPERATURE 74 °F
LOAD STEP NUMBER 3
STATION SUCTION PRESSURE 736 PSIG
STATION SUCTION TEMP. 67 °F
STATION DISCH. PRESSURE 960 PSIG
STATION DISCH. TEMP. 108 °F
COMPRESSOR FLOW RATE 135 MMSCFD
"A" COMP. EFFICIENCY 79 %
"B" COMP. EFFICIENCY 84 %
AVERAGE COMP. EFFICIENCY 82 %
"A" COMP. SUCTION TEMP. # °F
"B" COMP. SUCTION TEMP. # °F
"A" COMP. DISCHARGE TEMP. 108 °F
"B" COMP. DISCHARGE TEMP. 108 °F
FUEL TORQUE HP 1948 BHP
TORQUE 97 %
GEO. HP 1956 BHP
GEO. HP - FUEL TORQUE HP 8 BHP



1204 UNIT OPERATING DATA

7:06:07 PM 4/24/00

TEST # 1204 C3 E

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	73 °F
IGNITION TIMING OUTPUT	29.5 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	737 PSIG
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	78 °F	STATION DISCH. PRESSURE	960 PSIG
TURBOCHARGER VIBRATION	0.57 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.7 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.4 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.1 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	75 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13032	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	953 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	959 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	938 °F	FUEL TORQUE HP	1941 BHP
CYLINDER #4 TEMP.	931 °F	TORQUE	97 %
CYLINDER #5 TEMP.	918 °F	GEO. HP	1947 BHP
CYLINDER #6 TEMP.	932 °F	GEO. HP - FUEL TORQUE HP	6 BHP
CYLINDER #7 TEMP.	951 °F		
CYLINDER #8 TEMP.	915 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

7:10:50 PM 4/24/00

TEST # C-3-E

ENGINE SPEED	329 RPM	AMBIENT TEMPERATURE	73 °F
IGNITION TIMING OUTPUT	29.5 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	737 PSIG
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	79 °F	STATION DISCH. PRESSURE	959 PSIG
TURBOCHARGER VIBRATION	0.56 IN/SEC	STATION DISCH. TEMP.	108 °F
FUEL STATIC PRESS.	71.7 PSIG	COMPRESSOR FLOW RATE	136 MMSCFD
FUEL DIFF. PRESS.	15.5 "H2O	"A" COMP. EFFICIENCY	79 %
FUEL GAS HEADER PRESS.	7.1 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	75 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13071	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	956 °F	"A" COMP. DISCHARGE TEMP.	108 °F
CYLINDER #2 TEMP.	959 °F	"B" COMP. DISCHARGE TEMP.	107 °F
CYLINDER #3 TEMP.	938 °F	FUEL TORQUE HP	1948 BHP
CYLINDER #4 TEMP.	928 °F	TORQUE	98 %
CYLINDER #5 TEMP.	917 °F	GEO. HP	1948 BHP
CYLINDER #6 TEMP.	930 °F	GEO. HP - FUEL TORQUE HP	1 BHP
CYLINDER #7 TEMP.	956 °F		
CYLINDER #8 TEMP.	914 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

7:20:47 PM 4/24/00

TEST # **C-3-6**

ENGINE SPEED 330 RPM
IGNITION TIMING OUTPUT 29.5 °BTDC
GOVERNOR SETTING
AIR MANIFOLD PRESS. 6.4 "Hg
AIR MANIFOLD TEMP. 79 °F
TURBOCHARGER VIBRATION 0.68 IN/SEC
FUEL STATIC PRESS. 71.8 PSIG
FUEL DIFF. PRESS. 15.5 "H2O
FUEL GAS HEADER PRESS. 7.1 PSIG
FUEL TEMP. 75 °F
COMPUTER FUEL FLOW SCF 13096
AGA3 CAL. FUEL FLOW SCF
CYLINDER #1 TEMP. 955 °F
CYLINDER #2 TEMP. 960 °F
CYLINDER #3 TEMP. 935 °F
CYLINDER #4 TEMP. 931 °F
CYLINDER #5 TEMP. 918 °F
CYLINDER #6 TEMP. 927 °F
CYLINDER #7 TEMP. 955 °F
CYLINDER #8 TEMP. 911 °F
MODE AUTO

AMBIENT TEMPERATURE 72 °F
LOAD STEP NUMBER 3
STATION SUCTION PRESSURE 737 PSIG
STATION SUCTION TEMP. 67 °F
STATION DISCH. PRESSURE 958 PSIG
STATION DISCH. TEMP. 107 °F
COMPRESSOR FLOW RATE 137 MMSCFD
"A" COMP. EFFICIENCY 79 %
"B" COMP. EFFICIENCY 85 %
AVERAGE COMP. EFFICIENCY 82 %
"A" COMP. SUCTION TEMP. # °F
"B" COMP. SUCTION TEMP. # °F
"A" COMP. DISCHARGE TEMP. 108 °F
"B" COMP. DISCHARGE TEMP. 107 °F
FUEL TORQUE HP 1952 BHP
TORQUE 98 %
GEO. HP 1952 BHP
GEO. HP - FUEL TORQUE HP 1 BHP



Compressor Health Report FloridaGas Munson #1205

Unit Name: 1205-C
Location: Munson, Florida

Model: KM-2
Unit Mfr: Cooper-Bessemer

Date: 4/24/00 8:00:57 PM
Serial No.:

Mechanical Efficiency, %	95	Marker Correction Angle, deg	0.0	Periods Collected (PT)	6
Overall Efficiency, %	85	Stroke, (ins)	14.000		
Atmospheric Pressure, psia	3.1	Speed, RPM	330	Specific Gravity	0.577
Load Step	3				

Cyl End	Cir Stg	Bore (%)	Rod Diam (ins)	ConRod Length (ins)	Pressure		Temp.		Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (Ihp)	Suction Loss (Ihp)	Disch. Loss (Ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)	
					Ps	Pd	Ts	Td											
1H	1	157	18.500	N/A	38.000	715	970	65F	111F	1.35	31.87	484.9	31.9	15.9	1.06	12	104C	61	47
1C	1	165	18.500	4.000	38.000	707	962	66F	111F	1.36	28.67	435.6	7.9	24.3	0.93	11	80T	55	48
2H	1	192	18.500	N/A	38.000	707	964	65F	109F	1.36	26.74	393.2	9.4	18.2	0.97	8	102C	49	40
2C	1	160	18.500	4.000	38.000	714	965	65F	109F	1.35	30.21	454.1	25.6	21.7	0.94	10	81T	58	49

- 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)	1768	@ 330 RPM	Rated Power, (bhp)	2000	@ 330 RPM
Gas Power, (ghp)	1861	@ 330 RPM	Derated Power, (bhp)	1999	@ 330 RPM
Auxiliary Power, (bhp)	100	@ 330 RPM	Percent Torque Load, %	98	%
Compressor Total Power, (bhp)	1961	@ 330 RPM	Compressor Efficiency, %	91	%

Observations and Recommendations	Machine Condition Notes
Analyst Signature: _____	
4/24/00 9:35:32 PM	

1205 UNIT OPERATING DATA

8:42:38 PM 4/24/00

TEST # 2054 A

ENGINE SPEED	332 RPM	AMBIENT TEMPERATURE	65 °F
IGNITION TIMING OUTPUT	26.7 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.6 "Hg	STATION SUCTION PRESSURE	727 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.26 IN/SEC	STATION DISCH. PRESSURE	968 PSIG
FUEL STATIC PRESS.	67.9 PSIG	STATION DISCH. TEMP.	110 °F
FUEL DIFF. PRESS.	17.5 "H2O	COMPRESSOR FLOW RATE	126 MMSCFD
FUEL GAS HEADER PRESS.	7.7 PSIG	"A" COMP. EFFICIENCY	82 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13589	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	941 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	940 °F	"A" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #3 TEMP.	908 °F	"B" COMP. DISCHARGE TEMP.	109 °F
CYLINDER #4 TEMP.	966 °F	FUEL TORQUE HP	2003 BHP
CYLINDER #5 TEMP.	953 °F	TORQUE	100 %
CYLINDER #6 TEMP.	876 °F	GEO. HP	1889 BHP
CYLINDER #7 TEMP.	888 °F	GEO. HP - FUEL TORQUE HP	-114 BHP
CYLINDER #8 TEMP.	904 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

8:56:00 PM 4/24/00

TEST # 6-4-B

ENGINE SPEED	328 RPM	AMBIENT TEMPERATURE	65 °F
IGNITION TIMING OUTPUT	26.2 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION PRESSURE	725 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.24 IN/SEC	STATION DISCH. PRESSURE	967 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	111 °F
FUEL DIFF. PRESS.	17.3 "H2O	COMPRESSOR FLOW RATE	124 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13498	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	943 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	945 °F	"A" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #3 TEMP.	908 °F	"B" COMP. DISCHARGE TEMP.	109 °F
CYLINDER #4 TEMP.	963 °F	FUEL TORQUE HP	1993 BHP
CYLINDER #5 TEMP.	951 °F	TORQUE	100 %
CYLINDER #6 TEMP.	877 °F	GEO. HP	1860 BHP
CYLINDER #7 TEMP.	888 °F	GEO. HP - FUEL TORQUE HP	-133 BHP
CYLINDER #8 TEMP.	899 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

9:10:00 PM 4/24/00

TEST #6-4-C

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	64 °F
IGNITION TIMING OUTPUT	26.7 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION PRESSURE	722 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.22 IN/SEC	STATION DISCH. PRESSURE	968 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	111 °F
FUEL DIFF. PRESS.	17.3 "H2O	COMPRESSOR FLOW RATE	124 MMSCFD
FUEL GAS HEADER PRESS.	7.5 PSIG	"A" COMP. EFFICIENCY	82 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13541	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF		"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	943 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	946 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	911 °F	"B" COMP. DISCHARGE TEMP.	109 °F
CYLINDER #4 TEMP.	968 °F	FUEL TORQUE HP	1999 BHP
CYLINDER #5 TEMP.	949 °F	TORQUE	100 %
CYLINDER #6 TEMP.	875 °F	GEO. HP	1868 BHP
CYLINDER #7 TEMP.	889 °F	GEO. HP - FUEL TORQUE HP	-131 BHP
CYLINDER #8 TEMP.	898 °F		
MODE	AUTO		



1204 UNIT OPERATING DATA

9:18:36 PM 4/24/00

TEST# C-4-D

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	64 °F
IGNITION TIMING OUTPUT	29.6 °BTDC	LOAD STEP NUMBER	3
GOVERNOR SETTING		STATION SUCTION PRESSURE	722 PSIG
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION TEMP.	67 °F
AIR MANIFOLD TEMP.	78 °F	STATION DISCH. PRESSURE	967 PSIG
TURBOCHARGER VIBRATION	0.64 IN/SEC	STATION DISCH. TEMP.	111 °F
FUEL STATIC PRESS.	68.4 PSIG	COMPRESSOR FLOW RATE	123 MMSCFD
FUEL DIFF. PRESS.	16.0 "H2O	"A" COMP. EFFICIENCY	80 %
FUEL GAS HEADER PRESS.	7.1 PSIG	"B" COMP. EFFICIENCY	85 %
FUEL TEMP.	72 °F	AVERAGE COMP. EFFICIENCY	82 %
COMPUTER FUEL FLOW SCF	13070	"A" COMP. SUCTION TEMP.	# °F
AGA3 CAL. FUEL FLOW SCF		"B" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	951 °F	"A" COMP. DISCHARGE TEMP.	112 °F
CYLINDER #2 TEMP.	961 °F	"B" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	933 °F	FUEL TORQUE HP	1946 BHP
CYLINDER #4 TEMP.	921 °F	TORQUE	97 %
CYLINDER #5 TEMP.	912 °F	GEO. HP	1920 BHP
CYLINDER #6 TEMP.	933 °F	GEO. HP - FUEL TORQUE HP	-26 BHP
CYLINDER #7 TEMP.	958 °F		
CYLINDER #8 TEMP.	913 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

9:27:58 PM 4/24/00

TEST# 6-4-E

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	64 °F
IGNITION TIMING OUTPUT	26.6 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION PRESSURE	721 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.25 IN/SEC	STATION DISCH. PRESSURE	966 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	111 °F
FUEL DIFF. PRESS.	17.1 "H2O	COMPRESSOR FLOW RATE	122 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13506	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF		"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	939 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	940 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	909 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	966 °F	FUEL TORQUE HP	1993 BHP
CYLINDER #5 TEMP.	951 °F	TORQUE	100 %
CYLINDER #6 TEMP.	877 °F	GEO. HP	1856 BHP
CYLINDER #7 TEMP.	888 °F	GEO. HP - FUEL TORQUE HP	-137 BHP
CYLINDER #8 TEMP.	904 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

9:36:35 PM 4/24/00

TEST # 1205G-F

ENGINE SPEED	331 RPM.	AMBIENT TEMPERATURE	63 °F
IGNITION TIMING OUTPUT	26.4 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION PRESSURE	721 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.25 IN/SEC	STATION DISCH. PRESSURE	966 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	111 °F
FUEL DIFF. PRESS.	17.3 "H2O	COMPRESSOR FLOW RATE	123 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13491	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	942 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	940 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	915 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	962 °F	FUEL TORQUE HP	1985 BHP
CYLINDER #5 TEMP.	954 °F	TORQUE	99 %
CYLINDER #6 TEMP.	877 °F	GEO. HP	1866 BHP
CYLINDER #7 TEMP.	889 °F	GEO. HP - FUEL TORQUE HP	-119 BHP
CYLINDER #8 TEMP.	902 °F		
MODE	AUTO		



Compressor Health Report

FloridaGas

Munson #1205

Unit Name: 1205-C
 Location: Munson, Florida

Model: KM-2
 Unit Mfr: Cooper-Bessemer

Date: 4/24/00 10:14:19 PM
 Serial No.:

Mechanical Efficiency, %		95		Marker Correction Angle, deg		0.0		Periods Collected (PT)		6									
Overall Efficiency, %		85		Stroke, (ins)		14.000													
Atmospheric Pressure, psia		14.7		Speed, RPM		329		Specific Gravity		0.577									
Load Step		3																	
Cyl End	Clr Stg Set	Bore (ins)	Rod Diam (ins)	ConRod Length (ins)	Pressure		Temp.		Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (ihp)	Suction Disch.		Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)	
					Ps (psig)	Pd	Ts	Td				Loss (ihp)	Loss (ihp)						
1H	1	157	18,500	N/A	38,000	711	964	65F	111F	1.35	33.56	502.2	33.6	21.4	1.03	13	104C	62	49
1C	1	165	18,500	4,000	38,000	704	958	65F	111F	1.35	30.20	448.5	9.6	25.7	0.95	12	81T	57	49
2H	1	192	18,500	N/A	38,000	707	958	65F	110F	1.35	28.48	418.7	16.1	23.4	0.97	11	104C	51	43
2C	1	160	18,500	4,000	38,000	712	958	65F	110F	1.34	31.89	472.7	31.1	28.7	0.96	13	82T	60	51

- 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)	1842 @ 329 RPM	Rated Power, (bhp)	2000 @ 330 RPM
Gas Power, (ghp)	1939 @ 329 RPM	Derated Power, (bhp)	1995 @ 329 RPM
Auxiliary Power, (bhp)	100 @ 330 RPM	Percent Torque Load, %	102 %
Compressor Total Power, (bhp)	2039 @ 329 RPM	Compressor Efficiency, %	90 %

Observations and Recommendations	Machine Condition Notes

Analyst Signature: _____ 4/27/00 11:57:08 AM

1205 UNIT OPERATING DATA

9:56:31 PM 4/24/00

TEST # 120505A

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	63 °F
IGNITION TIMING OUTPUT	26.3 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION PRESSURE	719 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.25 IN/SEC	STATION DISCH. PRESSURE	965 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.3 "H2O	COMPRESSOR FLOW RATE	122 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13511	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	941 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	937 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	912 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	962 °F	FUEL TORQUE HP	1992 BHP
CYLINDER #5 TEMP.	953 °F	TORQUE	100 %
CYLINDER #6 TEMP.	878 °F	GEO. HP	1859 BHP
CYLINDER #7 TEMP.	887 °F	GEO. HP - FUEL TORQUE HP	-133 BHP
CYLINDER #8 TEMP.	900 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

10:06:02 PM 4/24/00

TEST # C-5-8

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	63 °F
IGNITION TIMING OUTPUT	26.4 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION PRESSURE	718 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.25 IN/SEC	STATION DISCH. PRESSURE	965 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.1 "H2O	COMPRESSOR FLOW RATE	122 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13451	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	942 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	942 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	913 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	962 °F	FUEL TORQUE HP	1979 BHP
CYLINDER #5 TEMP.	950 °F	TORQUE	99 %
CYLINDER #6 TEMP.	876 °F	GEO. HP	1862 BHP
CYLINDER #7 TEMP.	888 °F	GEO. HP - FUEL TORQUE HP	-117 BHP
CYLINDER #8 TEMP.	899 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

10:21:40 PM 4/24/00

TEST # 4.5-C

ENGINE SPEED	328 RPM	AMBIENT TEMPERATURE	62 °F
IGNITION TIMING OUTPUT	25.9 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION PRESSURE	718 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.27 IN/SEC	STATION DISCH. PRESSURE	964 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.2 "H2O	COMPRESSOR FLOW RATE	120 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13436	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF		"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	937 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	936 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	909 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	960 °F	FUEL TORQUE HP	1983 BHP
CYLINDER #5 TEMP.	948 °F	TORQUE	100 %
CYLINDER #6 TEMP.	876 °F	GEO. HP	1836 BHP
CYLINDER #7 TEMP.	882 °F	GEO. HP - FUEL TORQUE HP	-147 BHP
CYLINDER #8 TEMP.	896 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

10:28:13 PM 4/24/00

TEST# C-S-D

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	62 °F
IGNITION TIMING OUTPUT	26.4 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION PRESSURE	717 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.26 IN/SEC	STATION DISCH. PRESSURE	964 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.0 "H2O	COMPRESSOR FLOW RATE	121 MMSCFD
FUEL GAS HEADER PRESS.	7.5 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13407	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	936 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	937 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	910 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	962 °F	FUEL TORQUE HP	1971 BHP
CYLINDER #5 TEMP.	950 °F	TORQUE	98 %
CYLINDER #6 TEMP.	879 °F	GEO. HP	1856 BHP
CYLINDER #7 TEMP.	885 °F	GEO. HP - FUEL TORQUE HP	-115 BHP
CYLINDER #8 TEMP.	889 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

10:32:36 PM 4/24/00

TEST # 120505 E

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	62 °F
IGNITION TIMING OUTPUT	26.6 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.3 "Hg	STATION SUCTION PRESSURE	717 PSIG
AIR MANIFOLD TEMP.	80 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.25 IN/SEC	STATION DISCH. PRESSURE	964 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.1 "H2O	COMPRESSOR FLOW RATE	121 MMSCFD
FUEL GAS HEADER PRESS.	7.5 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13441	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	927 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	940 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	909 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	963 °F	FUEL TORQUE HP	1975 BHP
CYLINDER #5 TEMP.	949 °F	TORQUE	99 %
CYLINDER #6 TEMP.	877 °F	GEO. HP	1853 BHP
CYLINDER #7 TEMP.	885 °F	GEO. HP - FUEL TORQUE HP	-123 BHP
CYLINDER #8 TEMP.	899 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

10:47:41 PM 4/24/00

TEST #120545

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	62 °F
IGNITION TIMING OUTPUT	26.6 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.4 "Hg	STATION SUCTION PRESSURE	717 PSIG
AIR MANIFOLD TEMP.	81 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.24 IN/SEC	STATION DISCH. PRESSURE	963 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.4 "H2O	COMPRESSOR FLOW RATE	121 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13398	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	919 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	937 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	909 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	962 °F	FUEL TORQUE HP	1968 BHP
CYLINDER #5 TEMP.	947 °F	TORQUE	98 %
CYLINDER #6 TEMP.	874 °F	GEO. HP	1856 BHP
CYLINDER #7 TEMP.	883 °F	GEO. HP - FUEL TORQUE HP	-111 BHP
CYLINDER #8 TEMP.	893 °F		
MODE	AUTO		



Compressor Health Report

FloridaGas

Munson #1205

Unit Name: 1205-C
 Location: Munson, Florida

Model: KM-2
 Unit Mfr: Cooper-Bessemer

Date: 4/24/00 11:50:49 PM
 Serial No.:

Mechanical Efficiency, %		95		Marker Correction Angle, deg		0.0		Periods Collected (PT)		6									
Overall Efficiency, %		85		Stroke, (ins)		14.000													
Atmospheric Pressure, psia		14.7		Speed, RPM		330		Specific Gravity				0.577							
Load Step		3																	
Cyl End	Stg	Cir Set		Rod Diam (ins)	ConRod Length (ins)	Pressure		Temp.		Comp. Ratio	Calc. Capacity (mmscfd)	Indicated Power (Ihp)	Suction Loss (Ihp)	Disch. Loss (Ihp)	Flow Balance	Dis T Delta (F)	Rod Load (%)	SVE (%)	DVE (%)
		(%)	(ins)			Ps	Pd (psig)	Ts	Td										
1H	1	157	18.500	N/A	38.000	704	961	65F	112F	1.36	33.11	498.7	28.6	19.0	1.02	13	105C	61	48
1C	1	185	18.500	4.000	38.000	699	953	65F	112F	1.36	30.07	452.0	12.2	25.3	0.96	13	81T	58	49
2H	1	192	18.500	N/A	38.000	699	954	65F	110F	1.36	27.51	415.4	12.9	21.3	0.95	10	104C	50	42
2C	1	160	18.500	4.000	38.000	707	955	65F	110F	1.34	31.47	473.9	31.5	26.5	0.96	12	81T	59	51

- 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)	1841 @ 330 RPM	Rated Power, (bhp)	2000 @ 330 RPM
Gas Power, (ghp)	1938 @ 330 RPM	Derated Power, (bhp)	1997 @ 330 RPM
Auxiliary Power, (bhp)	100 @ 330 RPM	Percent Torque Load, %	102 %
Compressor Total Power, (bhp)	2038 @ 330 RPM	Compressor Efficiency, %	90 %

Observations and Recommendations	Machine Condition Notes
Analyst Signature: _____	
4/25/00 12:10:24 AM	

1205 UNIT OPERATING DATA

11:08:34 PM 4/24/00

TEST # 120500A

ENGINE SPEED	330 RPM	AMBIENT TEMPERATURE	61 °F
IGNITION TIMING OUTPUT	27.0 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.3 "Hg	STATION SUCTION PRESSURE	714 PSIG
AIR MANIFOLD TEMP.	81 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.27 IN/SEC	STATION DISCH. PRESSURE	962 PSIG
FUEL STATIC PRESS.	68.0 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.0 "H2O	COMPRESSOR FLOW RATE	120 MMSCFD
FUEL GAS HEADER PRESS.	7.5 PSIG	"A" COMP. EFFICIENCY	82 %
FUEL TEMP.	77 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13363	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	921 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	936 °F	"A" COMP. DISCHARGE TEMP.	111 °F
CYLINDER #3 TEMP.	909 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	967 °F	FUEL TORQUE HP	1964 BHP
CYLINDER #5 TEMP.	950 °F	TORQUE	98 %
CYLINDER #6 TEMP.	875 °F	GEO. HP	1848 BHP
CYLINDER #7 TEMP.	885 °F	GEO. HP - FUEL TORQUE HP	-115 BHP
CYLINDER #8 TEMP.	894 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

11:22:45 PM 4/24/00

TEST #C-6-B

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	60 °F
IGNITION TIMING OUTPUT	26.7 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.5 "Hg	STATION SUCTION PRESSURE	714 PSIG
AIR MANIFOLD TEMP.	82 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.25 IN/SEC	STATION DISCH. PRESSURE	962 PSIG
FUEL STATIC PRESS.	68.1 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	17.0 "H2O	COMPRESSOR FLOW RATE	120 MMSCFD
FUEL GAS HEADER PRESS.	7.6 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	76 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13373	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	916 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	931 °F	"A" COMP. DISCHARGE TEMP.	112 °F
CYLINDER #3 TEMP.	904 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	963 °F	FUEL TORQUE HP	1961 BHP
CYLINDER #5 TEMP.	944 °F	TORQUE	98 %
CYLINDER #6 TEMP.	869 °F	GEO. HP	1850 BHP
CYLINDER #7 TEMP.	881 °F	GEO. HP - FUEL TORQUE HP	-110 BHP
CYLINDER #8 TEMP.	891 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

11:40:54 PM 4/24/00

TEST #C-6-C

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	59 °F
IGNITION TIMING OUTPUT	26.7 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.3 "Hg	STATION SUCTION PRESSURE	712 PSIG
AIR MANIFOLD TEMP.	82 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.26 IN/SEC	STATION DISCH. PRESSURE	960 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	16.6 "H2O	COMPRESSOR FLOW RATE	120 MMSCFD
FUEL GAS HEADER PRESS.	7.4 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	76 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13267	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	919 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	940 °F	"A" COMP. DISCHARGE TEMP.	112 °F
CYLINDER #3 TEMP.	910 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	962 °F	FUEL TORQUE HP	1942 BHP
CYLINDER #5 TEMP.	949 °F	TORQUE	97 %
CYLINDER #6 TEMP.	875 °F	GEO. HP	1845 BHP
CYLINDER #7 TEMP.	884 °F	GEO. HP - FUEL TORQUE HP	-97 BHP
CYLINDER #8 TEMP.	891 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

11:48:05 PM 4/24/00

TEST # C-6-D

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	59 °F
IGNITION TIMING OUTPUT	27.0 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.3 "Hg	STATION SUCTION PRESSURE	711 PSIG
AIR MANIFOLD TEMP.	82 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.26 IN/SEC	STATION DISCH. PRESSURE	959 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	16.7 "H2O	COMPRESSOR FLOW RATE	119 MMSCFD
FUEL GAS HEADER PRESS.	7.4 PSIG	"A" COMP. EFFICIENCY	82 %
FUEL TEMP.	76 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13296	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF		"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	919 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	935 °F	"A" COMP. DISCHARGE TEMP.	112 °F
CYLINDER #3 TEMP.	910 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	964 °F	FUEL TORQUE HP	1945 BHP
CYLINDER #5 TEMP.	948 °F	TORQUE	97 %
CYLINDER #6 TEMP.	876 °F	GEO. HP	1844 BHP
CYLINDER #7 TEMP.	885 °F	GEO. HP - FUEL TORQUE HP	-101 BHP
CYLINDER #8 TEMP.	893 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

11:55:56 PM 4/24/00

TEST # C-6-C

ENGINE SPEED	326 RPM	AMBIENT TEMPERATURE	59 °F
IGNITION TIMING OUTPUT	26.1 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.3 "Hg	STATION SUCTION PRESSURE	711 PSIG
AIR MANIFOLD TEMP.	82 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.26 IN/SEC	STATION DISCH. PRESSURE	960 PSIG
FUEL STATIC PRESS.	68.3 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	16.7 "H2O	COMPRESSOR FLOW RATE	117 MMSCFD
FUEL GAS HEADER PRESS.	7.4 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	76 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13260	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	918 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	938 °F	"A" COMP. DISCHARGE TEMP.	112 °F
CYLINDER #3 TEMP.	911 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	961 °F	FUEL TORQUE HP	1952 BHP
CYLINDER #5 TEMP.	950 °F	TORQUE	99 %
CYLINDER #6 TEMP.	874 °F	GEO. HP	1806 BHP
CYLINDER #7 TEMP.	883 °F	GEO. HP - FUEL TORQUE HP	-146 BHP
CYLINDER #8 TEMP.	895 °F		
MODE	AUTO		



1205 UNIT OPERATING DATA

12:04:53 AM 4/25/00

TEST # 120506-P

ENGINE SPEED	331 RPM	AMBIENT TEMPERATURE	58 °F
IGNITION TIMING OUTPUT	26.6 °BTDC	LOAD STEP NUMBER	3
AIR MANIFOLD PRESS.	6.3 "Hg	STATION SUCTION PRESSURE	710 PSIG
AIR MANIFOLD TEMP.	82 °F	STATION SUCTION TEMP.	67 °F
TURBOCHARGER VIBRATION	0.26 IN/SEC	STATION DISCH. PRESSURE	959 PSIG
FUEL STATIC PRESS.	68.2 PSIG	STATION DISCH. TEMP.	112 °F
FUEL DIFF. PRESS.	16.7 "H2O	COMPRESSOR FLOW RATE	119 MMSCFD
FUEL GAS HEADER PRESS.	7.5 PSIG	"A" COMP. EFFICIENCY	81 %
FUEL TEMP.	76 °F	"B" COMP. EFFICIENCY	83 %
COMPUTER FUEL FLOW SCF	13333	AVERAGE COMP. EFFICIENCY	82 %
AGA3 CAL. FUEL FLOW SCF	<input type="text"/>	"A" COMP. SUCTION TEMP.	# °F
CYLINDER #1 TEMP.	918 °F	"B" COMP. SUCTION TEMP.	# °F
CYLINDER #2 TEMP.	942 °F	"A" COMP. DISCHARGE TEMP.	112 °F
CYLINDER #3 TEMP.	910 °F	"B" COMP. DISCHARGE TEMP.	110 °F
CYLINDER #4 TEMP.	961 °F	FUEL TORQUE HP	1953 BHP
CYLINDER #5 TEMP.	947 °F	TORQUE	97 %
CYLINDER #6 TEMP.	876 °F	GEO. HP	1843 BHP
CYLINDER #7 TEMP.	885 °F	GEO. HP - FUEL TORQUE HP	-110 BHP
CYLINDER #8 TEMP.	893 °F		
MODE	AUTO		



APPENDIX E:
Quality Assurance Activities

Quality Assurance Worksheet
NOx Converter Efficiency, Response Time, THC Calibration Error, Leak Checks, Interference Response

Date: 4/24/2000
Company: Enron/Florida Gas Transmission
Source: Cooper-Bessemer LSG8
Technicians: JT, GM

NOx Analyzer: NO2 to NO Converter Efficiency Test

NO Calibration Gas: 449.1 ppmv
 Diluent Gas: Air- 20.9% O2

	NOx conc. (ppmv)	% NOx Decrease from peak conc.	NO conc. (ppmv)
Peak Concentration:	275.0		
10 minute conc.	275.0	0.00	200
20 minute conc.	271.0	1.45	161
30 minute conc.	273.0	0.73	141.0

Hydrocarbon Calibration Error Check

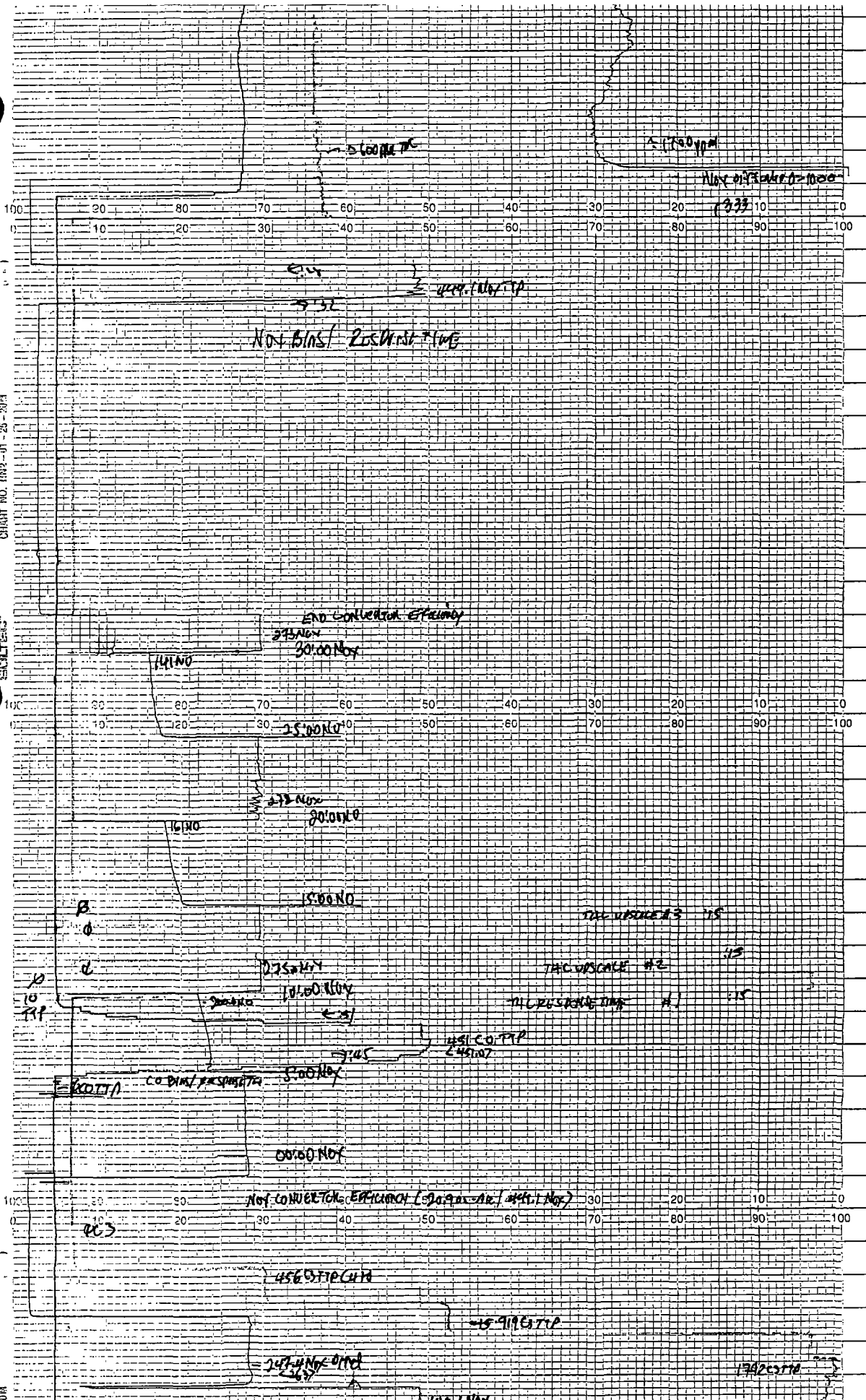
Test Date	concentration (ppmv)	measured value	predicted value	measured value	difference, %
4/24/2000	0.0 THC	0.0 THC			
	456.0 THC		458.0 THC	470.0 THC	2.61%
	919.0 THC		923.1 THC	910.0 THC	1.42%
	1792.0 THC	1784.0 THC			

Response Time

Analyzer	zero gas concentration	span gas concentration	upscale response time	downscale response time	System Response Time
THC	0.0 ppmv	1792.0 THC	:15 :15 :15	n/a n/a n/a	
NOx	0.0 ppmv	893.5 NOx	:32	:28	:32
CO	0.0 ppmv	452.0 CO	:45	:51	:51
O2	0.0%	20.90 O2	:36	:36	:36
CO2	0.0%	4.03 O2	:21	:24	:24

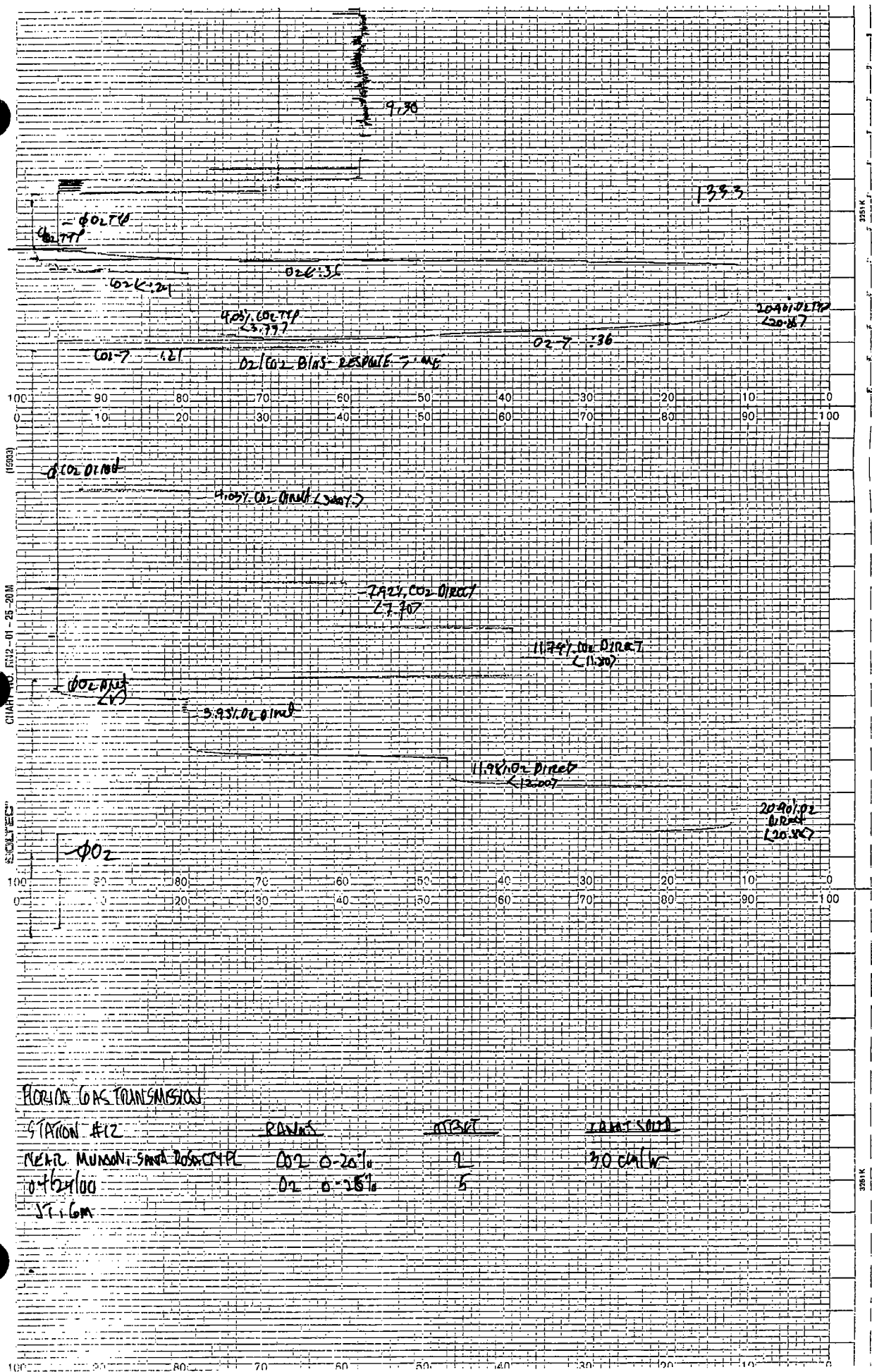
Sample System Leak Check

	Date	Sample System	Vacuum (in. Hg)	Leak Rate (in. Hg/min)
PRE TEST	4/24/2000	A	24.5	0.00
POST TEST	4/24/2000	A	23.0	0.00



351 K

351 K



FLORIDA GAS TRANSMISSION

STATION #12	RANKS	INVERT	TRANSOM
NEAR MUMSON: SANTA ROSA CT PL	O2 0-20%	1	30 CM/W
04624100	O2 0-25%	5	
ST. 6M			

Quality Assurance Worksheet
FGT Compressor Station 12 Unit 1204

Company: Enron/Florida Gas Transmission

Location: Station #12

Source: Cooper-Bessemer LSG8 Unit 1204

	CALIBRATION GAS CONCENTRATIONS		INITIAL CALIBRATION & LINEARITY CHECK		SAMPLE SYSTEM RESPONSE		TEST RUN 1204-C-1	ZERO and SPAN CALIBRATION CHECK				TEST RUN 1204-C-2	ZERO and SPAN CALIBRATION CHECK				TEST RUN 1204-C-3	ZERO and SPAN CALIBRATION CHECK			
	Certified Concentration	Target (% Chart)	Analyzer Response	Calibration Error	Thru Probe Response	System Bias		Initial Response	Final Response	Drift <3%	Bias <5%		Initial Response	Final Response	Drift <3%	Bias <5%		Initial Response	Final Response	Drift <3%	Bias <5%
NOx							Avg. ppmv					Avg. ppmv					Avg. ppmv				
zero	0.0 ppmv	2.0	0.00	0.0%	0.0	0%	1795.0	0.0 ppmv	0.0 ppmv	0.0%	0.00%	1610.0	0.0 ppmv	0.0 ppmv	0.0%	0.00%	1612.5	0.0 ppmv	0.0 ppmv	0.0%	0.00%
low	449.1 ppmv	24.5	462.50	0.7%			Corr. ppmv					Corr. ppmv					Corr. ppmv				
mid	893.5 ppmv	46.7	910.00	0.8%	915.0	0%	1731.1	915.0 ppmv	938.0 ppmv	1.2%	1.15%	1561.1	938.0 ppmv	905.0 ppmv	-1.7%	0.50%	1545.1	905.0 ppmv	960.0 ppmv	2.8%	2.25%
high	1705.0 ppmv	87.3	1737.00	1.6%																	
full scale	2000.0 ppmv																				
CO							Avg. ppmv					Avg. ppmv					Avg. ppmv				
zero	0.0 ppmv	5.0	0.00	0.0%	0.0	0%	218.0	0.0 ppmv	0.0 ppmv	0.0%	0.00%	222.0	0.0 ppmv	0.0 ppmv	0.0%	0.00%	224.0	0.0 ppmv	0.0 ppmv	0.0%	0.00%
low	246.2 ppmv	29.6	253.00	0.7%			Corr. ppmv					Corr. ppmv					Corr. ppmv				
mid	452.0 ppmv	50.2	445.00	-0.7%	451.0	0%	220.4	451.0 ppmv	443.0 ppmv	-0.8%	0.8%	224.7	443.0 ppmv	450.0 ppmv	0.7%	0.10%	226.3	450.0 ppmv	445.0 ppmv	-0.5%	0.60%
high	908.0 ppmv	95.8	901.00	-0.7%																	
full scale	1000.0 ppmv																				
O2							Avg. %					Avg. %					Avg. %				
zero	0.00%	5.00	0.00	0.00%	0.00	0%	9.23	0.00%	0.00%	0.0%	0.00%	9.21	0.00%	0.00%	0.0%	0.00%	9.43	0.00%	0.00%	0.0%	0.00%
low	3.93%	20.72	3.98	0.20%			Corr. %					Corr. %					Corr. %				
mid	11.98%	52.92	12.00	0.08%			9.26					9.23					9.38				
high	20.90%	88.60	20.88	-0.08%	20.88	0%		20.88%	20.78%	-0.4%	0.40%		20.78%	20.94%	0.6%	0.24%		20.94%	21.10%	0.6%	0.88%
full scale	25.00%																				
CO2							Avg. %					Avg. %					Avg. %				
zero	0.00%	2.00	0.00	0.00%	0.00	0%	5.97	0.00%	0.00%	0.0%	0.00%	5.86	0.00%	0.00%	0.0%	0.00%	5.84	0.00%	0.00%	0.0%	0.00%
low	4.03%	22.15	3.80	-1.15%	3.77	0%	Corr. %	3.77%	3.62%	-0.8%	0.75%	Corr. %	3.62%	3.61%	-0.1%	0.80%	Corr. %	3.61%	3.64%	0.2%	0.65%
mid	7.92%	41.60	7.70	-1.10%			6.51					6.53					6.49				
high	11.74%	60.70	11.80	0.30%																	
full scale	20.00%																				
THC			<i>All calibrations through entire system</i>				Avg. ppmv					Avg. ppmv					Avg. ppmv				
zero	0.0 ppmv	7.00	0.00	0.0%	0.0	0%	608.00	0.0 ppmv	0.0 ppmv	0.0%	0.00%	604.00	0.0 ppmv	0.0 ppmv	0.0%	0.00%	594.00	0.0 ppmv	0.0 ppmv	0.0%	0.00%
low	456.0 ppmv	29.80	470.00	0.7%			Corr. ppmv					Corr. ppmv					Corr. ppmv				
mid	919.0 ppmv	52.95	910.00	-0.5%	910.0	0%	616.72	910.0 ppmv	902.0 ppmv	-0.4%	0.40%	607.97	902.0 ppmv	924.0 ppmv	1.1%	0.70%	590.79	924.0 ppmv	924.0 ppmv	0.0%	0.70%
high	1792.0 ppmv	96.60	1784.00	-0.4%																	
full scale	2000.0 ppmv																				

Quality Assurance Worksheet
FGT Compressor Station 12 Unit 1205

Company: Enron/Florida Gas Transmission
Location: Station #12
Source: Cooper-Bessemer LS-8-SG Unit 1205

From Unit 1204, Run 3 Finals

	CALIBRATION GAS CONCENTRATIONS		INITIAL CALIBRATION & LINEARITY CHECK		SAMPLE SYSTEM RESPONSE		TEST RUN 1205-C-4	ZERO and SPAN CALIBRATION CHECK				TEST RUN 1205-C-5	ZERO and SPAN CALIBRATION CHECK				TEST RUN 1205-C-6	ZERO and SPAN CALIBRATION CHECK								
	Certified Concentration	Target (% Chart)	Analyzer Response	Calibration Error	Thru Probe Response	System Bias		Initial Response	Final Response	Drift <3%	Bias <5%		Initial Response	Final Response	Drift <3%	Bias <5%		Initial Response	Final Response	Drift <3%	Bias <5%					
NOx	zero	0.0 ppmv	2.0	0.00	0.0%	0.0	0%	Avg. ppmv 2135.0					Avg. ppmv 1928.0					Avg. ppmv 1805.0					0.0 ppmv	0.0 ppmv	0.0%	0.00%
	low	449.1 ppmv	24.5	462.50	0.7%			Corr. ppmv					Corr. ppmv					Corr. ppmv								
	mid	893.5 ppmv	46.7	910.00	0.8%	915.0	0%	1984.5	960.0 ppmv	962.5 ppmv	0.1%	2.38%	1803.8	962.5 ppmv	947.5 ppmv	-0.8%	1.63%	1711.2	947.5 ppmv	937.5 ppmv	-0.5%	1.13%				
	high	1705.0 ppmv	87.3	1737.00	1.6%																					
	full scale	2000.0 ppmv																								
CO	zero	0.0 ppmv	5.0	0.00	0.0%	0.0	0%	Avg. ppmv 225.0					Avg. ppmv 222.0					Avg. ppmv 221.0					0.1 ppmv	1.0 ppmv	0.1%	0.10%
	low	246.2 ppmv	29.6	253.00	0.7%			Corr. ppmv					Corr. ppmv					Corr. ppmv								
	mid	452.0 ppmv	50.2	445.00	-0.7%	451.0	0%	228.3	445.0 ppmv	446.0 ppmv	0.1%	0.5%	225.0	446.0 ppmv	446.0 ppmv	0.0%	0.50%	223.9	446.0 ppmv	445.0 ppmv	-0.1%	0.60%				
	high	908.0 ppmv	95.8	901.00	-0.7%																					
	full scale	1000.0 ppmv																								
O2	zero	0.00%	5.00	0.00	0.00%	0.00	0%	Avg. % 9.28					Avg. % 9.38					Avg. % 9.44					0.00%	0.00%	0.0%	0.00%
	low	3.93%	20.72	3.98	0.20%			Corr. %					Corr. %					Corr. %								
	mid	11.98%	52.92	12.00	0.08%			9.19					9.36					9.51								
	high	20.90%	88.60	20.88	-0.08%	20.88	0%		21.10%	21.12%	0.1%	0.96%		21.12%	20.75%	-1.5%	0.52%		20.75%	20.75%	0.0%	0.52%				
	full scale	25.00%																								
CO2	zero	0.00%	2.00	0.00	0.00%	0.00	0%	Avg. % 6.04					Avg. % 6.04					Avg. % 6.20					-0.10%	-0.10%	0.0%	0.50%
	low	4.03%	22.15	3.80	-1.15%	3.77	0%	Corr. %					Corr. %					Corr. %					3.82%	3.78%	-0.2%	0.05%
	mid	7.92%	41.60	7.70	-1.10%			6.66					6.47					6.51								
	high	11.74%	60.70	11.80	0.30%																					
	full scale	20.00%																								
THC	zero	0.0 ppmv	7.00	0.00	0.0%	0.0	0%	Avg. ppmv 558.00					Avg. ppmv 550.00					Avg. ppmv 544.00					-9.0 ppmv	-4.0 ppmv	0.3%	0.20%
	low	456.0 ppmv	29.80	470.00	0.7%			Corr. ppmv					Corr. ppmv					Corr. ppmv								
	mid	919.0 ppmv	52.95	910.00	-0.5%	910.0	0%	563.23	924.0 ppmv	902.0 ppmv	-1.1%	0.40%	564.33	902.0 ppmv	900.0 ppmv	-0.1%	0.50%	559.33	900.0 ppmv	896.0 ppmv	-0.2%	0.70%				
	high	1792.0 ppmv	96.60	1784.00	-0.4%																					
	full scale	2000.0 ppmv																								

APPENDIX F:
Calibration Certifications

BOC GASES**EPA PROTOCOL GAS
CERTIFICATE OF ANALYSIS**

ORDER NO. 040188

CUSTOMER
CUBIX CORPORATION
RECEIVING DEPT.
9225 US HIGHWAY 183 SOUTH
AUSTIN, TX 78747 -0

CYLINDER NO: CC18347
EXPIRATION DATE: 09/07/01
CERTIFICATION DATE: 09/07/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: 99251

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY	CALIBRATION STANDARDS USED IN ASSAY			CAS NO.
			TYPE	LOT ID	CYLINDER	
Nitric Oxide	447.1 ppm	+/- 1 %	NTRM 1686b		XC-003340B	10102-43-9
Total Oxides of Nitrogen	449.1 ppm	+/- 1 %				10102-43-9
Nitrogen	Balance Gas					7727-37-9

ANALYZER READINGS

ASSAY LABORATORY: Port Allen

TEST NUMBER: 113785

COMPONENT: Nitric Oxide

Analyzer: THERMO ENVIRONMENTAL Model 42C Chemiluminescence S/N 42CHL-57908-315

Last Multipoint Calibration: 08/18/99

First Tried: 08/30/99 Analyst: R JACARUSO Second Tried: 09/07/99 Analyst: R JACARUSO

Zero	Ref.	Sample	Zero	Ref.	Sample
.1	494	439	.13	493	437
.15	493	439	.2	495	440
.08	493	440	.18	494	441

Mean First Assay: 447.4 ppm

Mean Second Assay: 448.8 ppm

This Calibration Standard has been certified per the September, 1993 EPA Traceability Protocol, Document EPA-600/R83/224, 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. Jacaruso

A410

BOC GASES**EPA PROTOCOL GAS
CERTIFICATE OF ANALYSIS**

ORDER NO. 040125

CUSTOMERCUBIX CORPORATION
RECEIVING DEPT.
9225 US HIGHWAY 183 SOUTH
AUSTIN, TX 78747 - 0CYLINDER NO: CC19199
EXPIRATION DATE: 09/07/01
CERTIFICATION DATE: 09/07/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: 99251

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY	CALIBRATION STANDARDS USED IN ASSAY				CAS NO.
			TYPE	LOT ID	CYLINDER	CONC.	
Nitric Oxide	890.5 ppm	+/- 1 %	NTRM 1687	81687	XN-000483B	957 ppm	10102-43-9
Total Oxides of Nitrogen	893.5 ppm	+/- 1 %					10102-43-9
Nitrogen	Balance Gas						7727-37-9

ANALYZER READINGS

ASSAY LABORATORY: Port Allen

TEST NUMBER: 113788

COMPONENT: Nitric Oxide

Analyzer: THERMO ENVIRONMENTAL Model 42C Chemiluminescence S/N 42CHL-57908-315

Last Multipoint Calibration: 08/18/99

First Triad: 08/30/99 Analyst: R JACARUSO Second Triad: 09/07/99 Analyst: R JACARUSO

Zero	Ref.	Sample	Zero	Ref.	Sample
.02	958	889	0	952	885
.15	961	891	.2	951	889
.2	962	892	.2	952	890

Mean First Assay: 887.8 ppm

Mean Second Assay: 893.2 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



A410



**EPA PROTOCOL GAS
CERTIFICATE OF ANALYSIS**

ORDER NO. 040125

CUSTOMER
CUBIX CORPORATION
RECEIVING DEPT.
9225 US HIGHWAY 183 SOUTH
AUSTIN, TX 78747 - 0

CYLINDER NO: CC12059
EXPIRATION DATE: 09/09/01
CERTIFICATION DATE: 09/09/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: 99251

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY	CALIBRATION STANDARDS USED IN ASSAY			
			TYPE	LOT ID	CYLINDER	CONC.
Nitric Oxide	1704 ppm	+/- 1 %	NTRM XC012	00001	XC-012062B	2907 ppm
Total Oxides of Nitrogen	1705 ppm	+/- 1 %				
Nitrogen	Balance Gas					
						CAS NO.
						10102-43-9
						10102-43-9
						7727-37-9

ANALYZER READINGS

ASSAY LABORATORY: Port Allen

TEST NUMBER: 113787

COMPONENT: Nitric Oxide
Analyzer: NICOLET Model 550 FTIR S/N ADI9603531
Last Multipoint Calibration: 08/24/99

First Triad: 09/02/99 Analyst: R JACARUSO Second Triad: 09/09/99 Analyst: R JACARUSO

Zero	Ref.	Sample	Zero	Ref.	Sample
0	2.628	1.911	0	2.628	1.912
0	2.628	1.911	0	2.629	1.913
0	2.628	1.912	0	2.629	1.913
Mean First Assay: 1703 ppm			Mean Second Assay: 1704 ppm		

This Calibration Standard has been certified per the September, 1993 EPA Traceability Protocol, Document EPA-800/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. J. Caruso
A410

BOC GASES**EPA PROTOCOL GAS
CERTIFICATE OF ANALYSIS**

ORDER NO. 040234

CUSTOMERCUBIX CORPORATION
RECEIVING DEPT.
9225 US HIGHWAY 183 SOUTH
AUSTIN, TX 78747-0CYLINDER NO: CC105626
EXPIRATION DATE: 09/10/02
CERTIFICATION DATE: 09/10/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: 99251

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY
Carbon Monoxide	246.9 ppm	±-1 %
Propane	251.5 ppm	±-1 %
Air	Balance Gas	

CALIBRATION STANDARDS USED IN ASSAY				
TYPE	LOT ID	CYLINDER	CONC.	CAS NO.
GMIS		XC-004228B	295.3 ppm	630-08-0
NTRM 82644	00000514	XC-012047B	248.9 ppm	74-08-6
				7727-37-9/7782-44

ASSAY LABORATORY: Riverlon

ANALYZER READINGS

TEST NUMBER: 115991

COMPONENT: Carbon Monoxide

Analyzer: ECO Model 48H Non-Dispersive Infrared S/N 48H-48045-275
Last Multipoint Calibration: 08/24/99

First Triad: 09/03/99 Analyst: A. Lattanze

Zero	Ref.	Sample
.11	309.06	259.19
.11	309.07	259.06
.1	309.12	259.1

Mean First Assay: 248.9 ppm

Second Triad: 09/10/99 Analyst: P. Long

Zero	Ref.	Sample
.12	309.37	259.82
.17	309.66	259.55
.18	309.44	259.58

Mean Second Assay: 248.9 ppm

COMPONENT: Propane

Analyzer: HP Model 6890 GC S/N 3022A29285
Last Multipoint Calibration: 09/03/99

First Triad: 09/09/99 Analyst: A. Lattanze

Zero	Ref.	Sample
0	27011	27278
0	26977	27270
0	26986	27262

Mean First Assay: 251.5 ppm

This Calibration Standard has been certified per the September, 1993 EPA Traceability Protocol, Document EPA-600/R-93/224, 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

A. Lattanze
10/10

7-3



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 # : 152859
ITEM# : 2
P.O.# : 2000098

CYLINDER # : CC118634
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 4/10/2000
EXPIRATION DATE: 4/6/2003

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	4/3/2000	455.0 ppm	455 ppm	+/- 1%
	4/10/2000	455.8 ppm		
Propane	4/6/2000	451 ppm	451 ppm	+/- 1%

BALANCE Air

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81681	CC55789	994 ppm
Propane	GMIS-1	CC57162	500.3 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	570423011	NDIR	3/27/2000
Propane	H. Packard 6890	US00001434	GC - FID	4/8/2000

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: *FP*
 FRED PIKULA

DATE: 4/10/2000

T3

BOC GASES

**EPA PROTOCOL GAS
CERTIFICATE OF ANALYSIS**

ORDER NO. 040225

CUSTOMER

CUBIX CORPORATION
RECEIVING DEPT.
9225 US HIGHWAY 183 SOUTH
AUSTIN, TX 78747 - 0

CYLINDER NO: CC115066
EXPIRATION DATE: 09/16/02
CERTIFICATION DATE: 09/16/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: 99251

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY	CALIBRATION STANDARDS USED IN ASSAY			CONC.	CAS NO.
			TYPE	LOT ID	CYLINDER		
Carbon Monoxide	908 ppm	+/- 1.0 %	GMIS		CC-13735	970 ppm	630-08-0
Propane	919 ppm	+/- 1.0 %	NTRM 82848	99060708	XC-014188B	960.9 ppm	74-98-6
Air	Balance Gas						7727-37-97782-44

ANALYZER READINGS

ASSAY LABORATORY: Riverton

TEST NUMBER: 113853

COMPONENT: Carbon Monoxide

Analyzer: TECO Model 48H NON-DISPERSIVE INFRARED S/N 48H-43279-289
Last Multipoint Calibration: 09/09/99

First Triad: 09/09/99 Analyst: P. Long

Zero	Ref.	Sample
.86	1033	969
.42	1033	971
1.03	1034	972

Mean First Assay: 910.9 ppm

Second Triad: 09/16/99 Analyst: M. McAveety

Zero	Ref.	Sample
.38	1038	970
.95	1041	971
.86	1039	971

Mean Second Assay: 905.6 ppm

COMPONENT: Propane

Analyzer: HP Model 5890 GC S/N 3022A29285
Last Multipoint Calibration: 09/03/99

First Triad: 09/09/99 Analyst: P. Long

Zero	Ref.	Sample
0	101099	96720
0	101047	96677
0	101108	96607

Mean First Assay: 918.7 ppm

This Calibration Standard has been certified per the September, 1999 EPA Traceability Protocol Document EPA-600/R-99/224, using Procedure G1. All values certified to be +/- 1% NIST Traceable. Do not use this cylinder below 1.0 Megapascal, i.e., 150psig
Comments: This calibration standard has been certified per the 1997 EPA traceability protocol, EPA-600/97/121 procedure G1

QA APPROVED

[Signature] ASTO

BOC GASES**EPA PROTOCOL GAS
CERTIFICATE OF ANALYSIS**

ORDER NO. 040316

CUSTOMER
CUBIX CORPORATION
RECEIVING DEPT.
9225 US HIGHWAY 183 SOUTH
AUSTIN, TX 78747-0

CYLINDER NO: CC84270
EXPIRATION DATE: 09/03/02
CERTIFICATION DATE: 09/03/99
CYLINDER PRESSURE: 2000 psig

PURCHASE ORDER: 99251

COMPONENT	CERTIFIED CONCENTRATION	TOTAL RELATIVE UNCERTAINTY	CALIBRATION STANDARDS USED IN ASSAY			CONC.	CAS NO.
			TYPE	LOT ID	CYLINDER		
Oxygen	3.925 %	+/- 1 %	NTRM 82659	95030915	CC-15268	20.7 %	7782-44-7
Carbon Dioxide	11.74 %	+/- 1 %	NTRM 82746X	97860205	XN-003279B	19.98 %	124-38-9
Nitrogen	Balance Gas						7727-37-9

ASSAY LABORATORY: Port Allen

ANALYZER READINGS

TEST NUMBER: 113826

COMPONENT: Oxygen
Analyzer: ROSEMOUNT Model 755R PARAMAGNETIC S/N 1000379
Last Multipoint Calibration: 09/02/99
First Tried: 09/03/99 Analyst: R JACARUSO

Zero	Ref.	Sample
.03	20.68	3.94
.02	20.68	3.93
.01	20.67	3.93

Mean First Assay: 3.925 %

COMPONENT: Carbon Dioxide
Analyzer: ROSEMOUNT Model 850A Non-Dispersive Infrared S/N 1000288
Last Multipoint Calibration: 09/02/99
First Tried: 09/03/99 Analyst: R JACARUSO

Zero	Ref.	Sample
22	4523	2701
23	4532	2701
22	4533	2708

Mean First Assay: 11.74 %

This Calibration Standard has been certified per the September, 1993 EPA Traceability Protocol, Document EPA-800/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. Jacaruso
A410

CERTIFICATE OF ANALYSIS

EPA Protocol Gas

CUSTOMER DUKE/TETCO PERULACK COMPRESSOR STATION HIGHWAY 75 SOUTH EAST WATERFORD, PA 170210000 CUSTOMER PO NO: 2000051 Previous Certification Date(s):	CYLINDER NO : CC29702 EXPIRATION DATE : 02/21/03 CERTIFICATION DATE : 02/21/00 CYLINDER PRESSURE : 2000 psig PRODUCT ID NO : 03000745 LOT NUMBER : 373241
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------

ANALYTICAL INFORMATION

This calibration standard has been certified per the 1997 EPA Traceability Protocol, Document EPA-600/97/121, Using Procedure G1. All Values certified to be +/-1% NIST Traceable.

Do Not Use This Cylinder below 150 psig. i.e. 1.0 Megapascal

Components	Requested Mixture	Certified Concentration	Analytical Uncertainty	Assay Dates
CARBONDIOXIDE	8.00%	7.92%	+/- 1.00% NIST traceable	02/19/00
OXYGEN	20.0%	19.8%	+/- 1.00% NIST traceable	02/13/00
NITROGEN	BALANCE GAS			

CALIBRATION STANDARDS USED IN ASSAY

Type	LOT ID	Cylinder No	Concentration	Expiration
NTRM 81674	01079404	CC15486	7.06 +/- 0.08 % CO2/N2	04/14/01
NTRM 82659	02109415	CC15268	20.70 +/- 0.23 % O2/N2	12/04/00

ANALYTICAL INSTRUMENTS USED IN ASSAY

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Rosemount/880A	NonDispersive Infrared	02/18/00
Rosemount/755R	Paramagnetic	02/18/00





Assay Laboratory
 BOC GASES
 2009 Bellaire Avenue
 Royal Oak, MI 48067
 (248) 388 9150

CERTIFICATE OF ANALYSIS
 EPA Protocol Gas

CUSTOMER
 BOC DALLAS TX NORTH
 2615 JOE FIELD RD
 DALLAS, TX 752294602

CYLINDER NO : CC1856
 EXPIRATION DATE : 01/04/03
 CERTIFICATION DATE : 01/05/00
 CYLINDER PRESSURE : 2000 psig
 PRODUCT ID NO : 03000059
 LOT NUMBER : 387598

CUSTOMER PO NO: CUBIX C9006

Previous Certification Data(s):

ANALYTICAL INFORMATION

This calibration standard has been certified per the 1997 EPA Traceability Protocol, Document EPA-600/97/121, Using Procedure G1 All Values certified to be +/-1% NIST Traceable.

Do Not Use This Cylinder below 150 psig. i.e. 1.0 Megapascal

Analytical Results

Components	Requested Mixture	Certified Concentration	Analytical Uncertainty	Assay Dates
MON DIOXIDE	4.00%	4.03%	+/-1.00% NIST Traceable	01/04/00
OXYGEN	20.90%	20.90%		
NITROGEN	BALANCE GAS			

CALIBRATION STANDARDS USED IN ASSAY

Type	LOT ID	Cylinder No	Concentration	Expiration
NTRM 81674	95031213	CC15192	7.06 +/- 0.08 % CO2/N2	04/12/01
NTRM 82659	95030903	CC15262	20.70 +/- 0.23 % O2/N2	12/04/00

ANALYTICAL INSTRUMENTS USED IN ASSAY

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Rosemount 880A L3 1000331	NonDispersive Infrared	01/04/00
Rosemount 755R L8 1000314	Paramagnetic	01/03/00

Procedure G2:O2

R. Palmer



Dry Gas Meter Calibration	Date	4/20/2000
Austin Laboratory	Technician	KRH

Reference Meter		Working Meter	
Manufacturer	American Singer	Manufacturer	Equimeter
Meter No.	P164240	Meter No.	1348739
Previous Calibration Date	3/9/1999	Previous Calibration Date	Rebuilt
Calibration Factor	1.012	Previous Calibration Factor	NA
Units of Measure	ft3	Units of Measure	ft3
Run 1			
Start Time			0:00
Stop Time			0:00
Run Time (minutes)	29	Run Time (minutes)	29
Start Temperature °F	75	Start Temperature °F	82
Stop Temperature (°F)	76	Stop Temperature (°F)	88
Average Temperature (°F)	75.5	Average Temperature (°F)	85
Start Meter Reading (ft3)	0.00	Start Meter Reading (ft3)	825.308
Stop Meter Reading (ft3)	16.462	Stop Meter Reading (ft3)	842.33
Net Volume (ft3)	16.656	Net Volume (ft3)	17.022
Meter Rate (ft3/minute)	0.57435	Meter Rate (ft3/minute)	0.58697
Corrected Volume (ft3 @ STP)	16.174	Corrected Volume (ft3 @ STP)	16.241
Calculated Meter Factor	0.9958724		
Run 2			
Start Time			
Stop Time			
Run Time (minutes)	17	Run Time (minutes)	17
Start Temperature °F	76	Start Temperature °F	87
Stop Temperature (°F)	78	Stop Temperature (°F)	92
Average Temperature (°F)	77	Average Temperature (°F)	89.5
Start Meter Reading (ft3)	0.000	Start Meter Reading (ft3)	842.33
Stop Meter Reading (ft3)	12.81	Stop Meter Reading (ft3)	855.746
Net Volume (ft3)	12.961	Net Volume (ft3)	13.416
Meter Rate (ft3/minute)	0.7624	Meter Rate (ft3/minute)	0.7892
Corrected Volume (ft3 @ STP)	12.551	Corrected Volume (ft3 @ STP)	12.696
Calculated Meter Factor	0.9885853		
Run 3			
Start Time			
Stop Time			
Run Time (minutes)	22	Run Time (minutes)	22
Start Temperature °F	78	Start Temperature °F	92
Stop Temperature (°F)	78	Stop Temperature (°F)	98
Average Temperature (°F)	78	Average Temperature (°F)	95
Start Meter Reading (ft3)	0.000	Start Meter Reading (ft3)	855.746
Stop Meter Reading (ft3)	17.844	Stop Meter Reading (ft3)	874.504
Net Volume (ft3)	18.055	Net Volume (ft3)	18.758
Meter Rate (ft3/minute)	0.821	Meter Rate (ft3/minute)	0.852636364
Corrected Volume (ft3 @ STP)	17.451	Corrected Volume (ft3 @ STP)	17.575
Calculated Meter Factor	0.9929127		
AVERAGE DGM FACTOR	0.992457		

Pitot Tube Calibration Sheet

Date: 5/5/1999
Technician: I MM
Calibration pitot tube
 Type: std
 Size (OD): 1/4"
 ID number: 450
 Cp (std): 0.99
S-Type pitot tube
 Size (OD): 1/4"
 Length (in): 36
 ID Number: 301

A-Side Calibration			
Δp std in H2O	Δp s in H2O	Cp(s)	DEV
0.270	0.375	0.840	0.006
0.270	0.375	0.840	0.006
0.273	0.370	0.850	0.005
0.510	0.705	0.842	0.004
0.510	0.704	0.843	0.003
0.508	0.702	0.842	0.003
0.590	0.800	0.850	0.005
0.590	0.799	0.851	0.005
0.592	0.799	0.852	0.007
A-Side Averages		0.846	0.005

B-Side Calibration			
Δp std in H2O	Δp s in H2O	Cp(s)	DEV
0.274	0.369	0.853	0.005
0.270	0.368	0.848	0.000
0.270	0.369	0.847	0.002
0.504	0.690	0.846	0.002
0.502	0.691	0.844	0.005
0.502	0.694	0.842	0.006
0.592	0.795	0.854	0.006
0.587	0.794	0.851	0.003
0.585	0.794	0.850	0.001
B-Side Averages		0.848	0.003

Average DEV =	0.004	must be less \leq 0.
Cp(s) from Side A - Cp(s) from Side B =	0.003	must be less \leq 0.

CO ID: 0945Z AIRDATA MULTIMETER/FLOWMETER CERTIFICATE OF CALIBRATION S/N: M00013
 Customer: CUBIX CORPORATION State: TX Order #: 000066
 Model #: 850-1.0Z PO #: _____ Calibration Due Date: _____ QA Code: 10CFR21

Procedure used: Calibration Procedure for AirData Multimeters Revision: 05 Dated: 05/18/99
 Pressure Standard: Heise #1 S/N: 41739/42449 Calibration Date: 11/25/98 Calibration Due Date: 11/2000 Test 1 Test 2 Test 3
 Pressure Standard: Heise #3 S/N: 41738/42448 Calibration Date: 11/25/98 Calibration Due Date: 11/2000 Test 1 Test 2 Test 3
 Pressure Standard: Heise #5 S/N: 41740/42450 Calibration Date: 11/25/98 Calibration Due Date: 11/2000 Test 1 Test 2 Test 3
 Heise used for 0.05 in wc Differential Pressure Set Point Rated Accuracy: 0.07% fs (0.000175 in wc) Uncertainty: 0.00035

Pressure Standard: AirData Multimeter S/N: M99420 Calibration Date: 09/18/99 Calibration Due Date: 09/2000 Test 1 Test 2 Test 3
 Pressure Standard: AirData Multimeter S/N: M96455 Calibration Date: 09/18/99 Calibration Due Date: 09/2000 Test 1 Test 2 Test 3
 Pressure Standard: AirData Multimeter S/N: M96100 Calibration Date: 09/18/99 Calibration Due Date: 09/2000 Test 1 Test 2 Test 3
 Rated Accuracy: Absolute Pressure $\pm 0.5\% \pm .02$ in Hg; Differential Pressure: $\pm 0.5\% \pm 0.0001$ in wc Uncertainty: As stated at test points.

Temperature Standards: Rated Accuracy: Thermometer .023° F / Thermistor .018° F Total Temperature System Uncertainty: 0.039° F
 Thermometer S/N 92143/Thermistor S/N 871513 Calibration Dates: 02/24/99;02/01/99 Cal Due Date: 02/2001 Set Point: 35° F 95° F 155° F
 Thermometer S/N 8A089/Thermistor S/N 881708 Calibration Dates: 10/09/98;10/28/98 Cal Due Date: 10/2000 Set Point: 35° F 95° F 155° F
 Thermometer S/N 92142/Thermistor S/N 850104 Calibration Dates: 02/16/99;02/01/99 Cal Due Date: 02/2001 Set Point: 35° F 95° F 155° F

Vel/Flow Standard: AirData Multimeter S/N: M99420 Calibration Date: 09/18/99 Calibration Due Date: 09/2000 Test 1 Test 2 Test 3
 Vel/Flow Standard: AirData Multimeter S/N: M96455 Calibration Date: 09/18/99 Calibration Due Date: 09/2000 Test 1 Test 2 Test 3
 Vel/Flow Standard: AirData Multimeter S/N: M96100 Calibration Date: 09/18/99 Calibration Due Date: 09/2000 Test 1 Test 2 Test 3
 Rated Accuracy: Velocity $\pm 2.0\% \pm 3$ fpm; Flow $\pm 2.0\% \pm 3$ cfm Uncertainty: See Uncertainty Table

METER ACCURACY TESTS

Flame Test By JD Test By _____
 Date 1-11-00 Rh 62 Date _____ Rh _____
 Ambient Temperature 71 Ambient Temperature _____
 Within spec YES NO Within spec YES NO Within spec YES NO

TEMPERATURE TEST (° F) TOLERANCE = $\pm 0.2^\circ$ F

Approx Set Point	Master Meter	Test Meter	Diff	Master Meter	Test Meter	Diff	Master Meter	Test Meter	Diff
35°	35.0	35.1	+ .1						
95°	95.0	95.1	+ .1						
155°	155.0	155.0	0						

ABSOLUTE PRESSURE TEST (in Hg) TOLERANCE = $\pm 2.0\% \pm .1$ in Hg

Approx Set Point	Master Meter	Test Meter	% Diff	Master Meter	Test Meter	% Diff	Master Meter	Test Meter	% Diff
14.0	14.09	14.1	.07						
28.4	28.63	28.8	.59						
40.0	40.68	40.9	.54						

DIFFERENTIAL PRESSURE TEST (in wc) TOLERANCE = $\pm 2.0\% \pm 0.001$ in wc

Approx Set Pt	Master Meter	Test Meter	% Diff	Master Meter	Test Meter	% Diff	Master Meter	Test Meter	% Diff
.0500	.0503	.0504	.20						
.1250	.1247	.1250	.24						
.2250	.2248	.2252	.18						
.2700	.2732	.2734	.07						
2.000	2.070	2.074	.19						
3.600	3.635	3.640	.14						
4.400	4.466	4.473	.16						
27.00	27.10	27.14	.15						
50.00	50.26	50.31	.10						
Overrange	✓	✓							

Shortridge Instruments, Inc.
 7855 E. Redfield Rd Scottsdale, AZ 85260

AIRDATA MULTIMETER/FLOWMETER CERTIFICATE OF CALIBRATION

S/N: 1200013
 Order #: _____

LOW VELOCITY/FLOW CONFIRMATION (AIRFOIL/FLOW MODE)
 TEST METER TOLERANCE = $\pm 3.0\% \pm 7$ FPM/CFM

Approx Set Point	Master Meter	Test Meter	Diff	Master Meter	Test Meter	Diff	Master Meter	Test Meter	Diff
100	137.2	132	- .2						
500	543.8	544	+ .2						

ADM-870 and ADM-860 AirData Multimeters are read in AirFoil Mode. ADM-850 and CFM-88 meters are read in air flow.

UNCERTAINTY TABLE (All AirData Multimeter Calibration Standards)

Mode	Differential Pressure (in wc)							Absolute Pressure (in Hg)			Velocity/Flow		
	.1250	.2250	.2700	2.000	3.600	4.400	27.00	50.00	14.0	28.4	40.0	100.0	500.0
2 X U _{max}	< .00022	< .00023	< .00031	< .0005	< .0015	< .0023	< .006	< .007	< .02	< .02	< .02	< 3.99	< 1.82

All Uncertainties are expressed in expanded terms (twice the calculated uncertainty). Uncertainties shown for Low Velocity/Flow Confirmation represent Uncertainty of the Transfer Standard Meter exposed to the pressure source only.

NOTES: _____

This instrument has been calibrated using Calibration Standards which are traceable to NIST (National Institute of Standards and Technology). Quality Assurance Program and calibration procedures meet the requirements for 10CFR50 Appendix B; ANSI/N45.2; ANSI/NCCL Z540-1-1994; MIL-STD 45662A and manufacturers specifications. Calibration accuracy is certified when meters are used with properly functioning accessories only. This report shall not be reproduced, except in full, without the written approval of Shortridge Instruments, Inc. Results relate only to the item calibrated.

Calibration Technician(s): Jon W. Wengard

Calibration Date: 1-11-2005

Calibration Approved by: [Signature]

Title: Proc. MGR

Date: 1-11-2005

Shortridge Instruments, Inc.
 7855 E. Redfield Rd Scottsdale, AZ 85280
 (480) 991-6744 Fax (480) 443-1287

**APPENDIX G:
Strip Chart Records**

NO_x, CO, THC

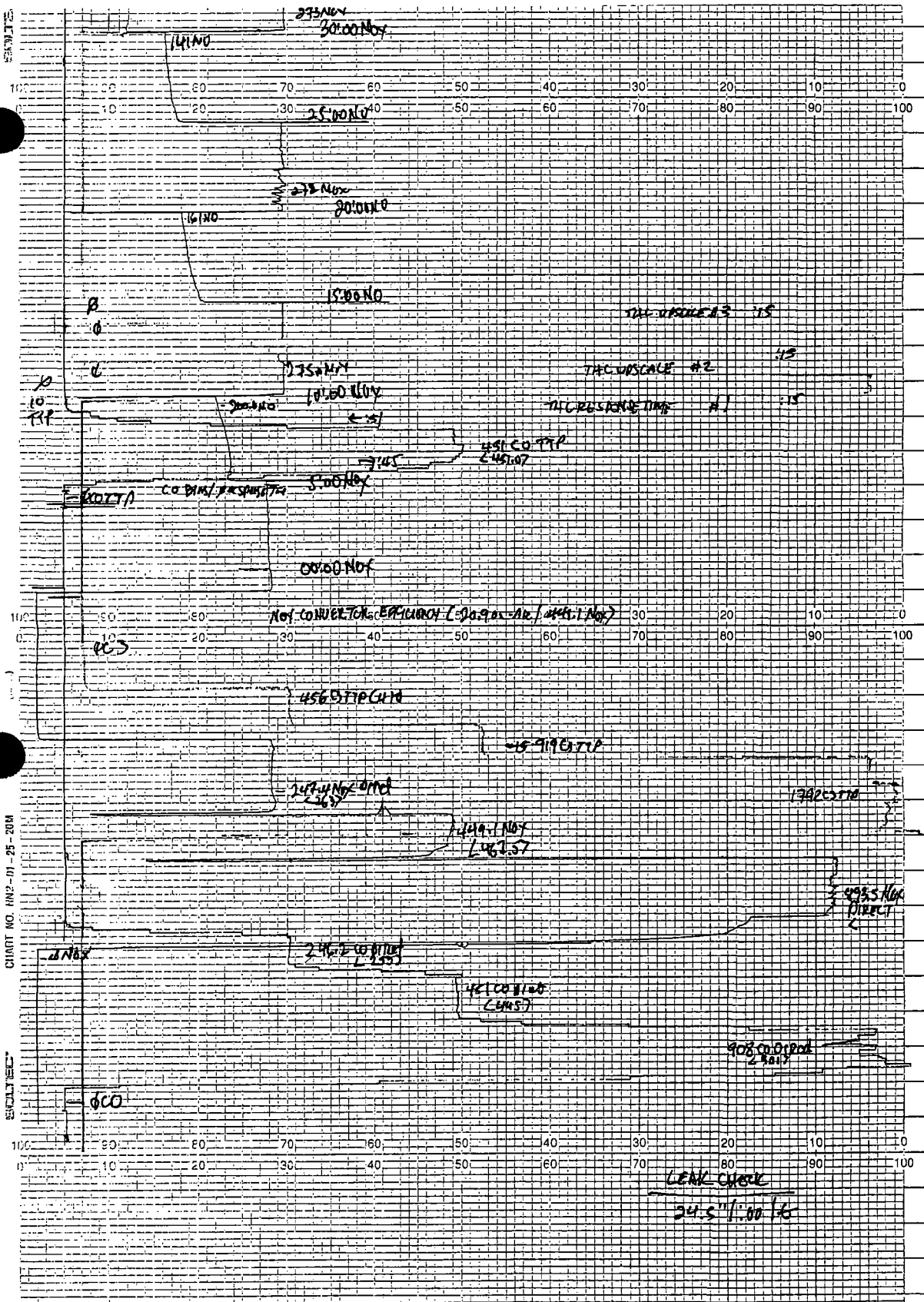


CHART NO. HN2-01-25-20A

SCALE

PROGRAM GAS TRANSMISSION
STATION #12

PROGRAM	RANGE	INJECT	CALIBRATION	ISOTHERMS
1147-1150	NOI-100PPM	2	30616	DATA - ATMOSPHERIC
1151-1154	CO-100PPM	5		TD - DIRECT
1155-1158	TUE-200PPM	7		TW - NETWORK
				MD - DATA

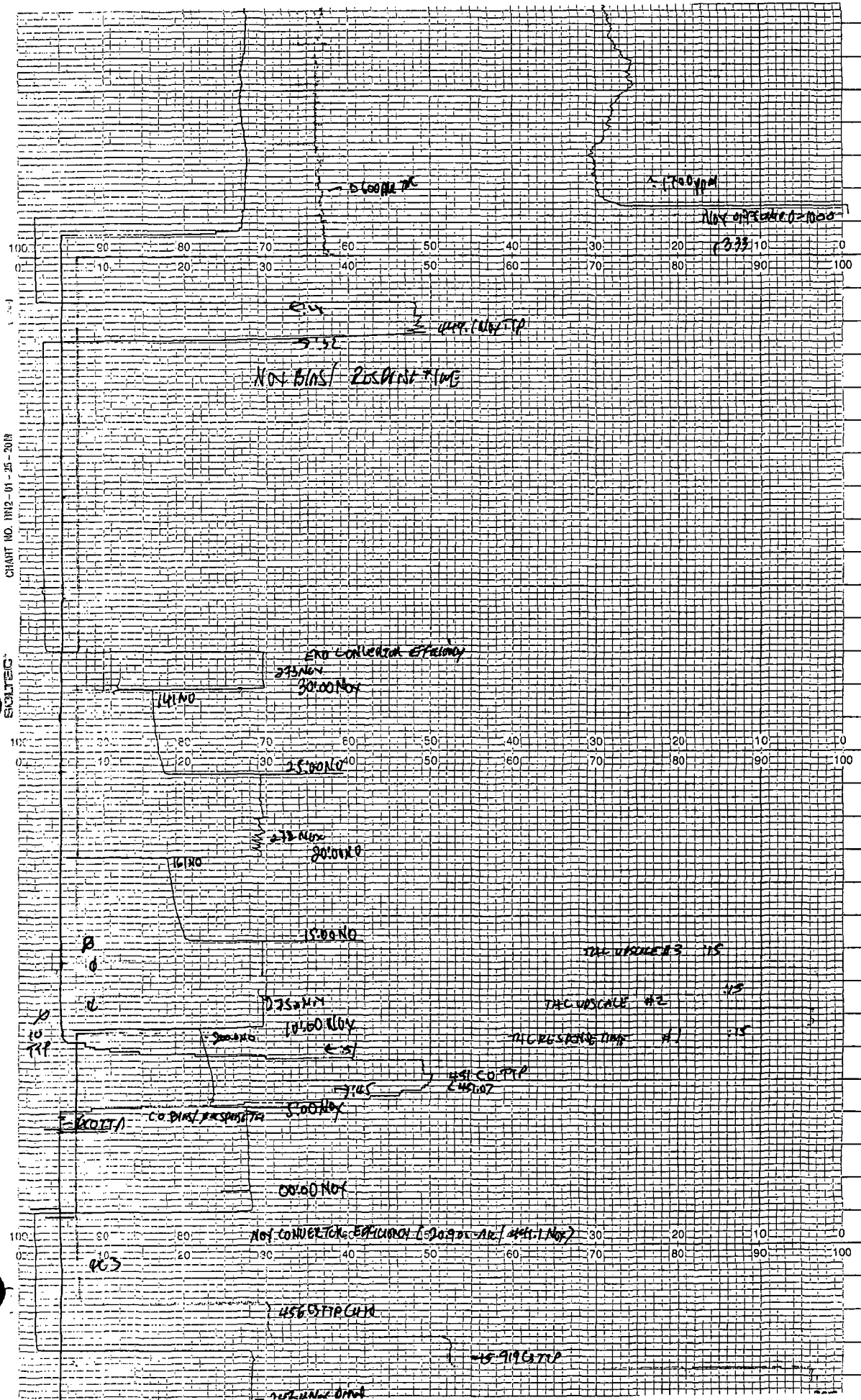
LEAK CHECK
24.5"/1.00 LG

251K

251K

CHART NO. DR2-01-25-20R

SOLTEC



277.1 100-10

456.0-7

456.1 day

843.5 day
4117

412.0511

1745 Day

1745.1070-0-2000

456.1 day

4156.1-7

1745

100 80 60 40 20 0 10 20 30 40 50 60 70 80 90 100

100 80 60 40 20 0 10 20 30 40 50 60 70 80 90 100

1000 ppm

1000 ppm

1000 ppm

100 80 60 40 20 0 10 20 30 40 50 60 70 80 90 100

UNIT NO. 102-01-25-20M

1000 ppm

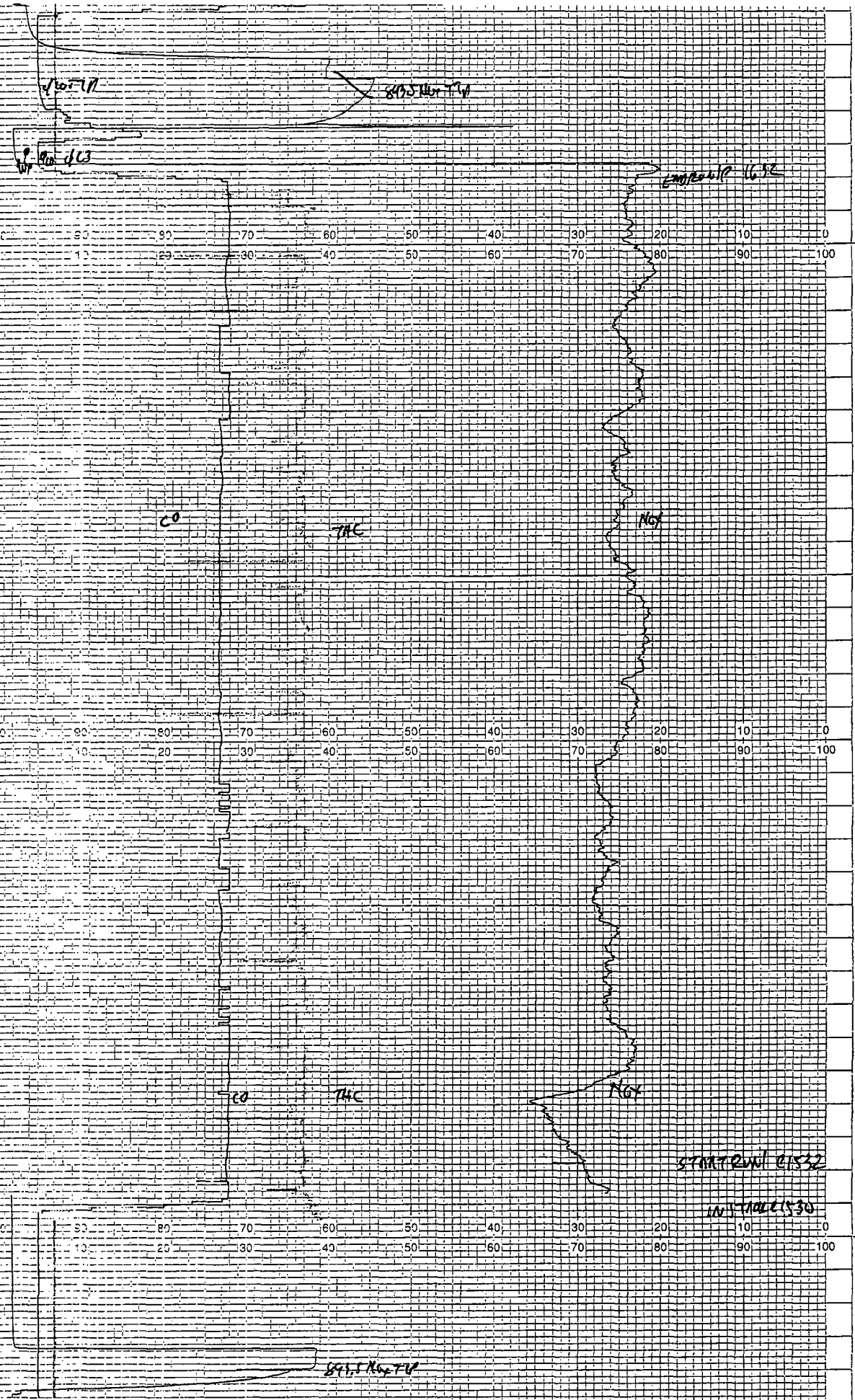
CHART NO. 11

SECRET

(1500)

CHART NO. DR2-01-15-20W

SECRET



INSTOCK 6/508

0.86

4190511

45200750

8935167710

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

0.06

54000201752

(5884)

CHART NO. 012-01-25-2016

SCHEM

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

(5864)

STARTWELL 1653

INSTOCK 6/1

0.00

-2011

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

29-30 NOV-57

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

(15964)

CHART NO. RH2-01-25-20M

ALTEC

W
T
N

W
T
N

01013
Start 2000 LBS

INSIDE 1808

0806

41907V

4326070

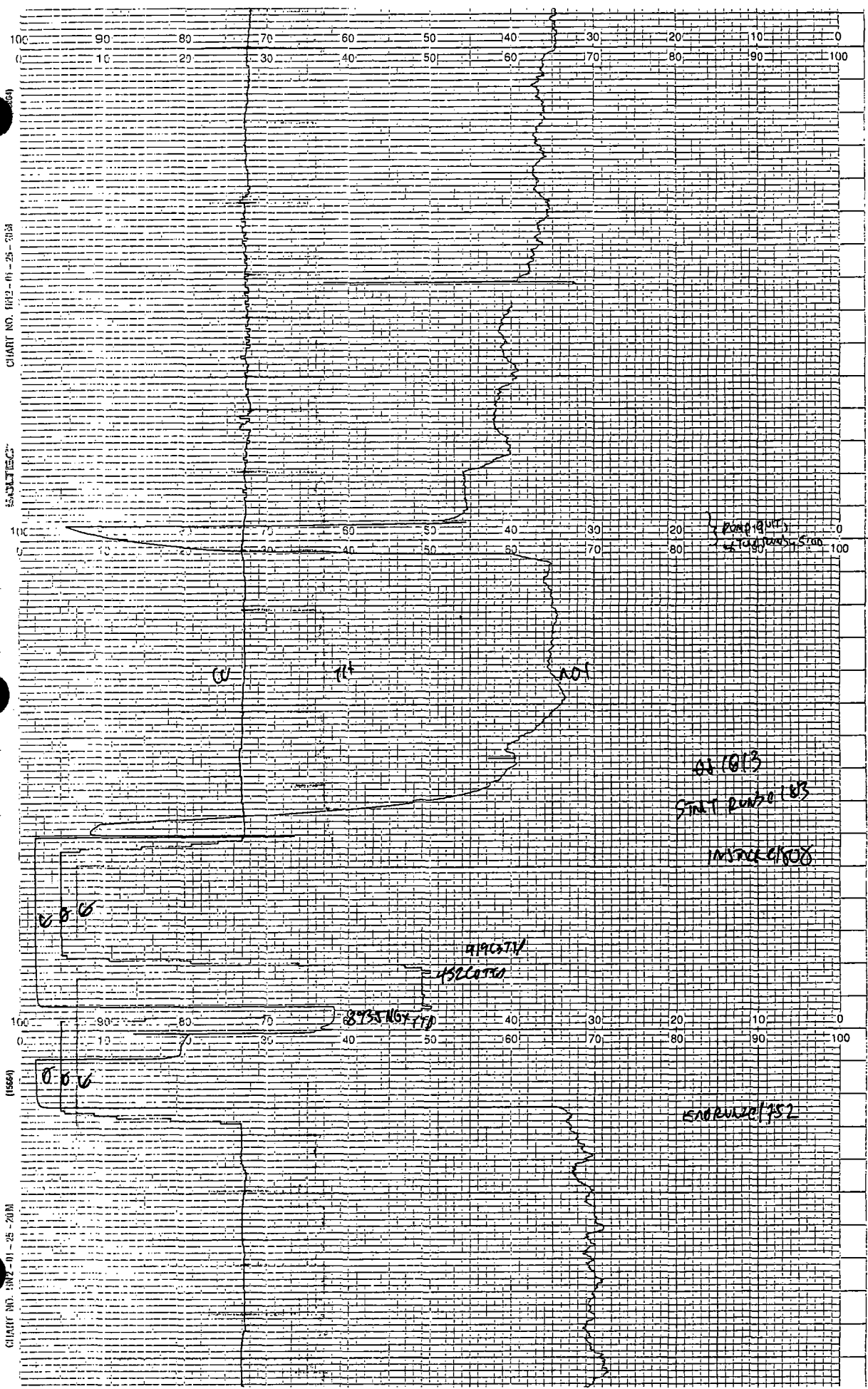


CHART NO. 892-01-25-203A

SALINITY

(892-01-25-203B)

CHART NO. 892-01-25-203B

INSIDE 892-01-25-203B

INSIDE 892-01-25-203B

INSIDE 892-01-25-203B

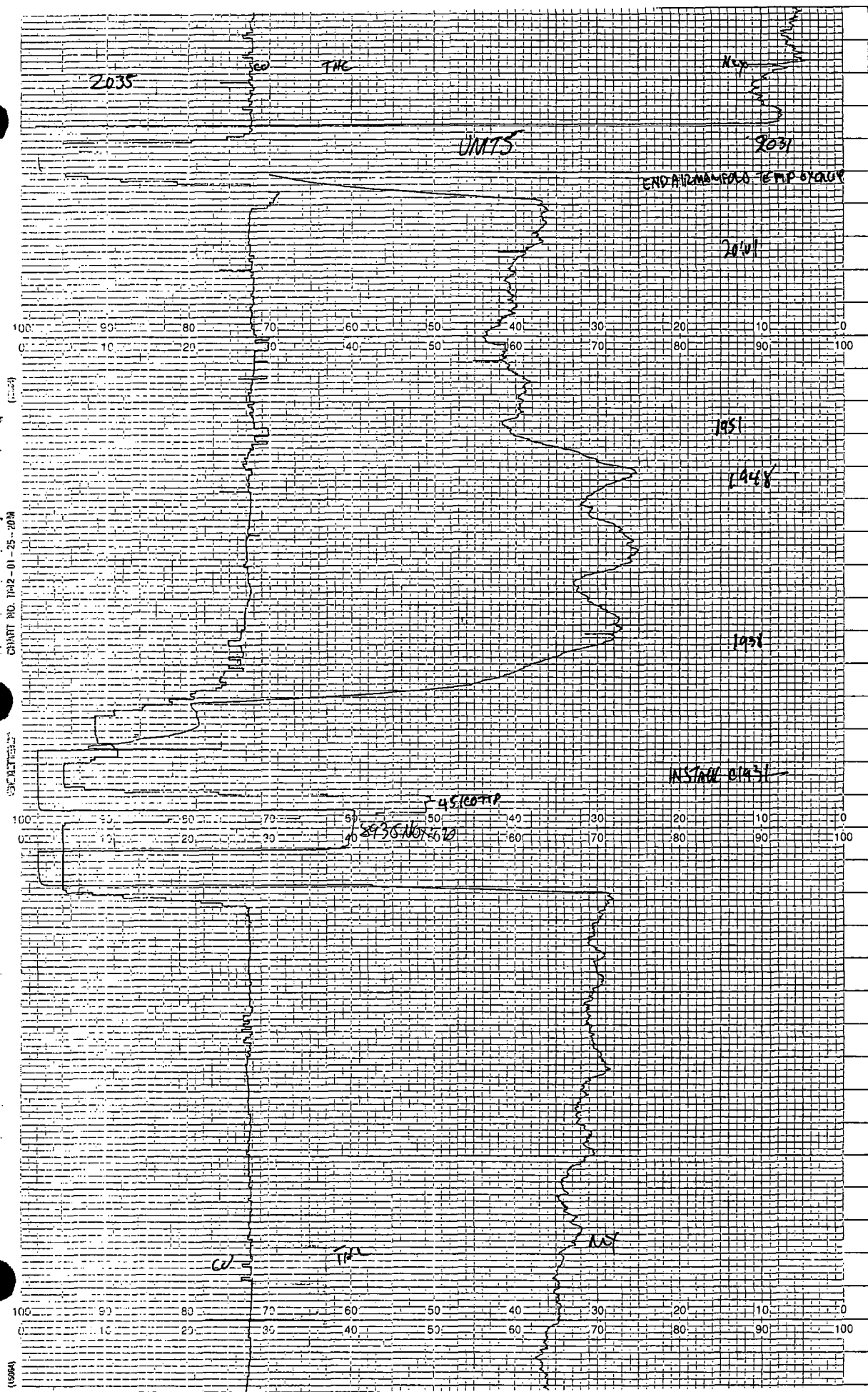
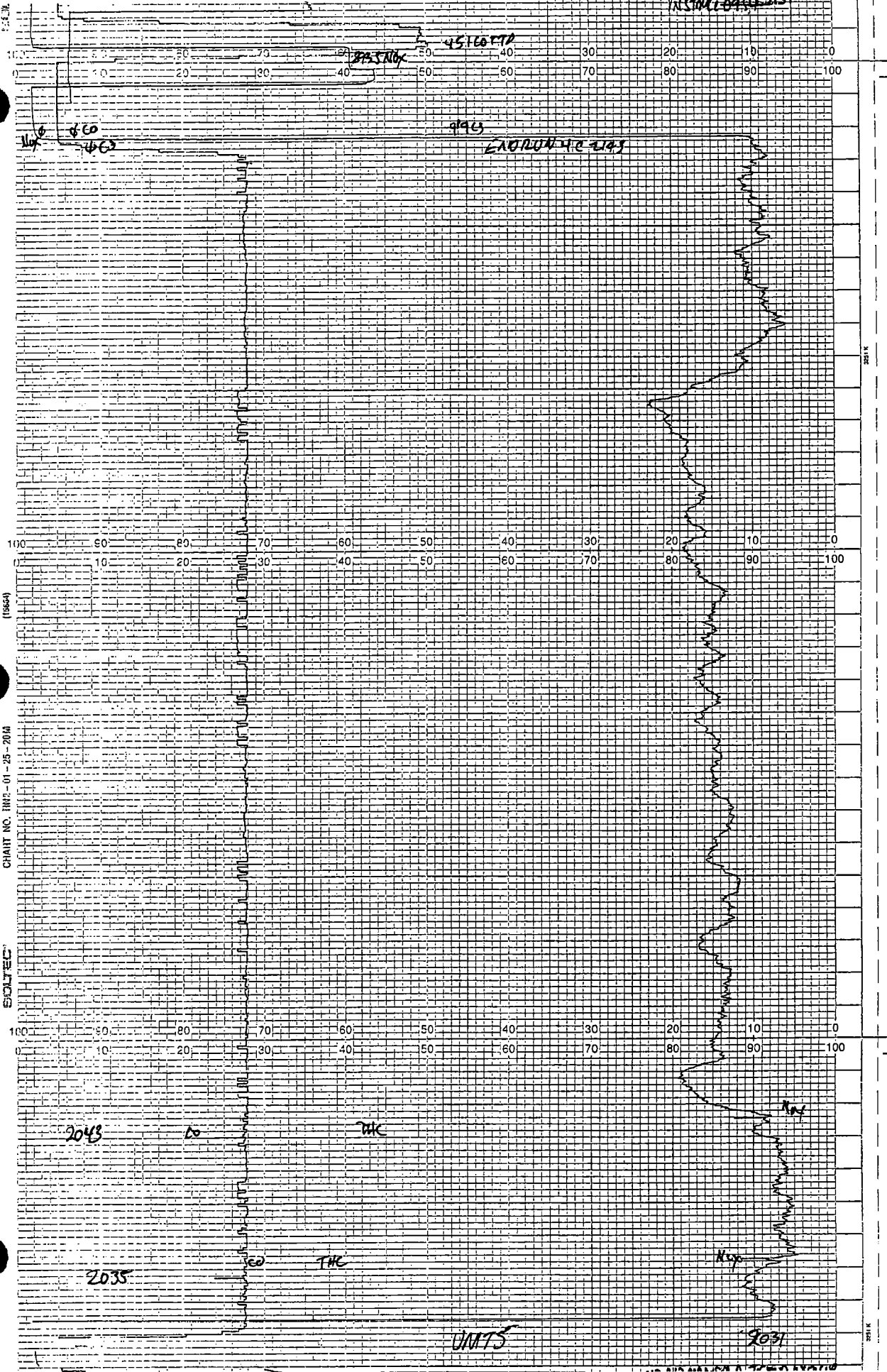


CHART NO. 102-01-25-10M
 (1000)

(1000)



INSTAL 0955

45160 RTA

2035

9993

LADRON 40 2035

660
463

(1864)

CHART NO. IWT-01-25-2014

SOLVED

2043

10

TRC

2035

60

TRC

UNIT 5

2031

2011 K

2011 K

CHART NO. 01-25-20M

RELATES

(cont)

CHART NO. 01-25-20M

RELATES

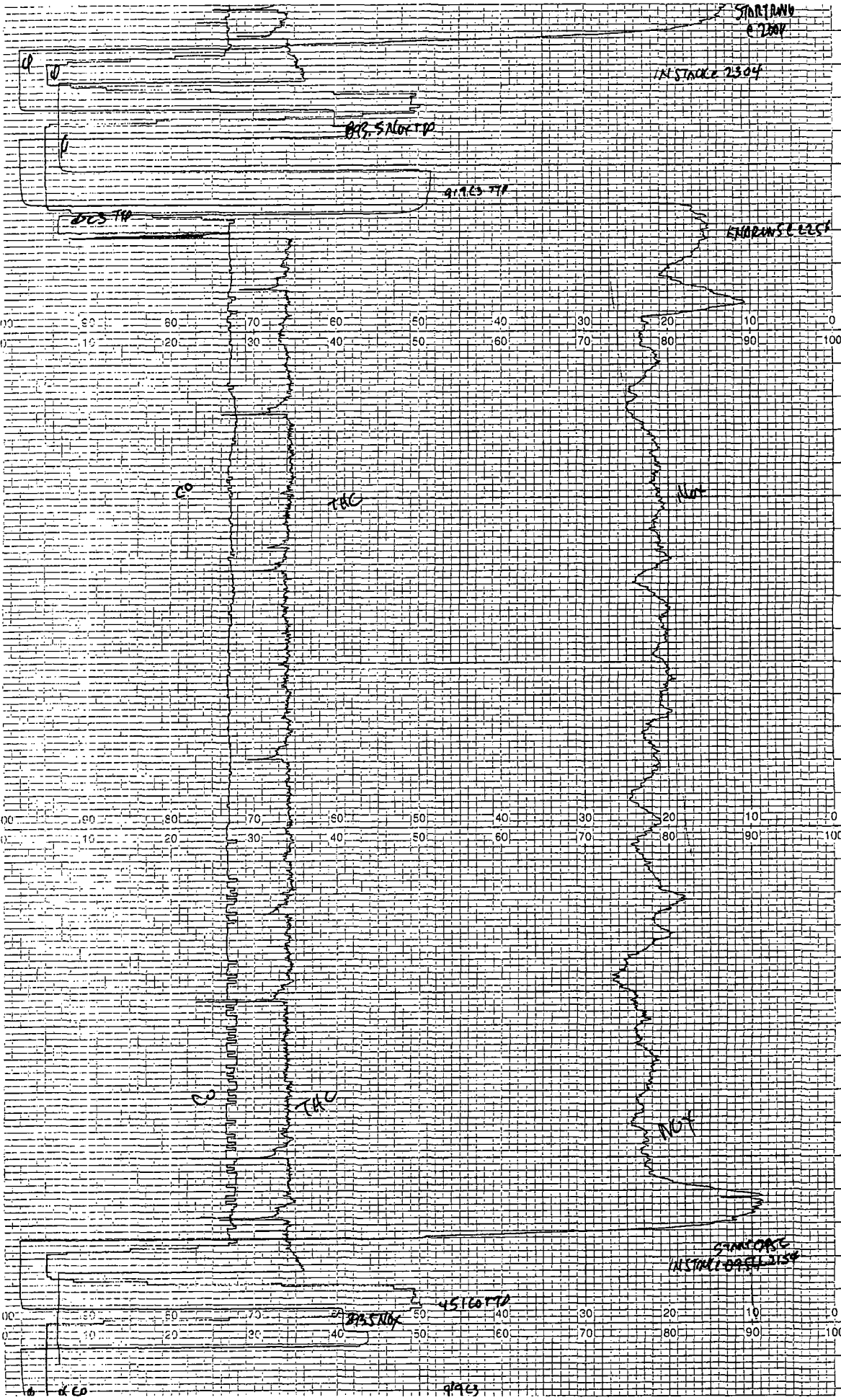


CHART NO. DR2-01-25-20M

SOLTEC

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0 10 20 30 40 50 60 70 80 90 100

CS

TKC

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CS

TKC

TKC

SOLTEC

100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

CHART NO. DR2-01-25-20M

SOLTEC



DR. S. NORRIS

DR. S. NORRIS

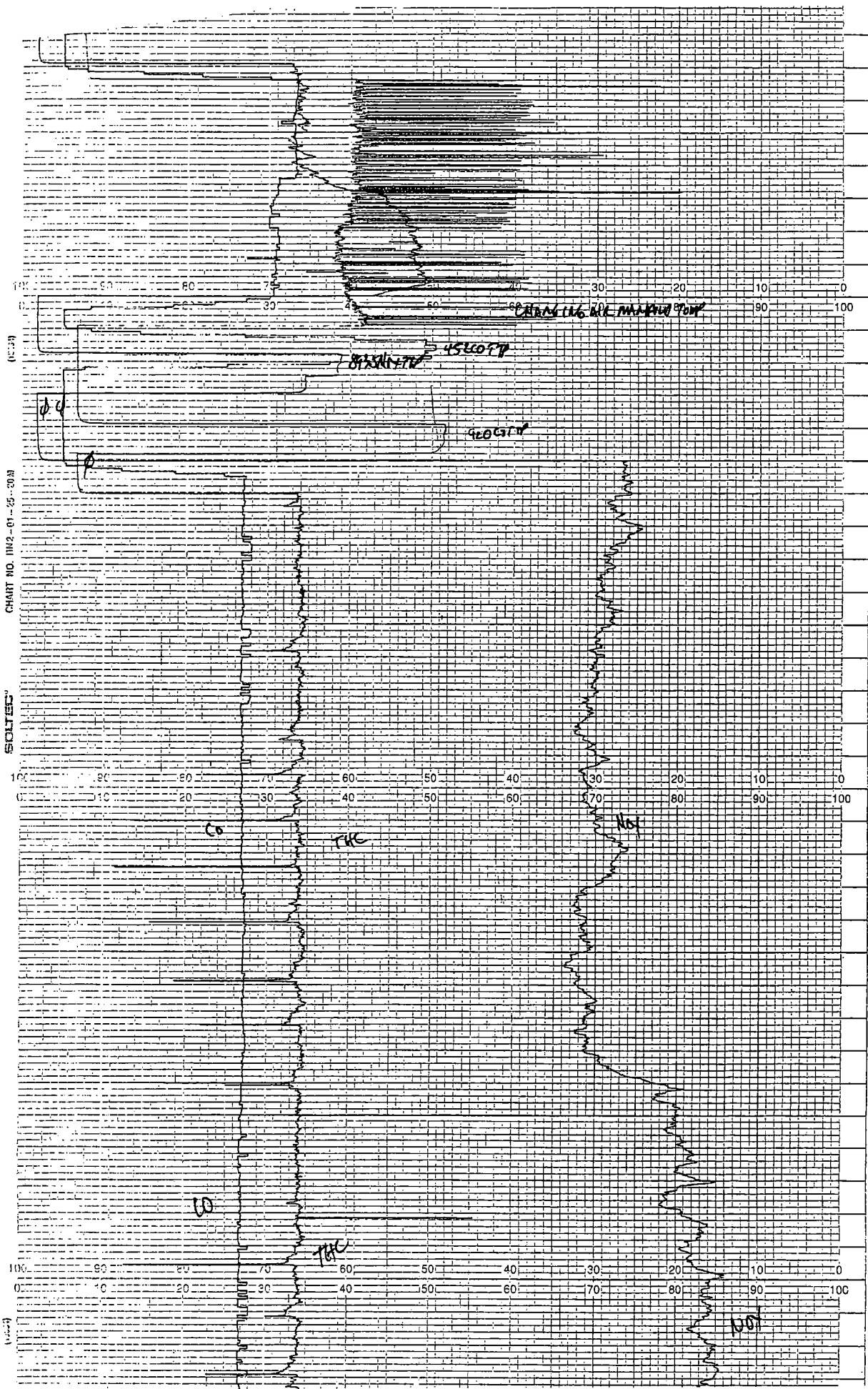
STARTING
C. 2004

ENDING C. 2204

CHART NO. III 2-01-25-2018

SOLTEC

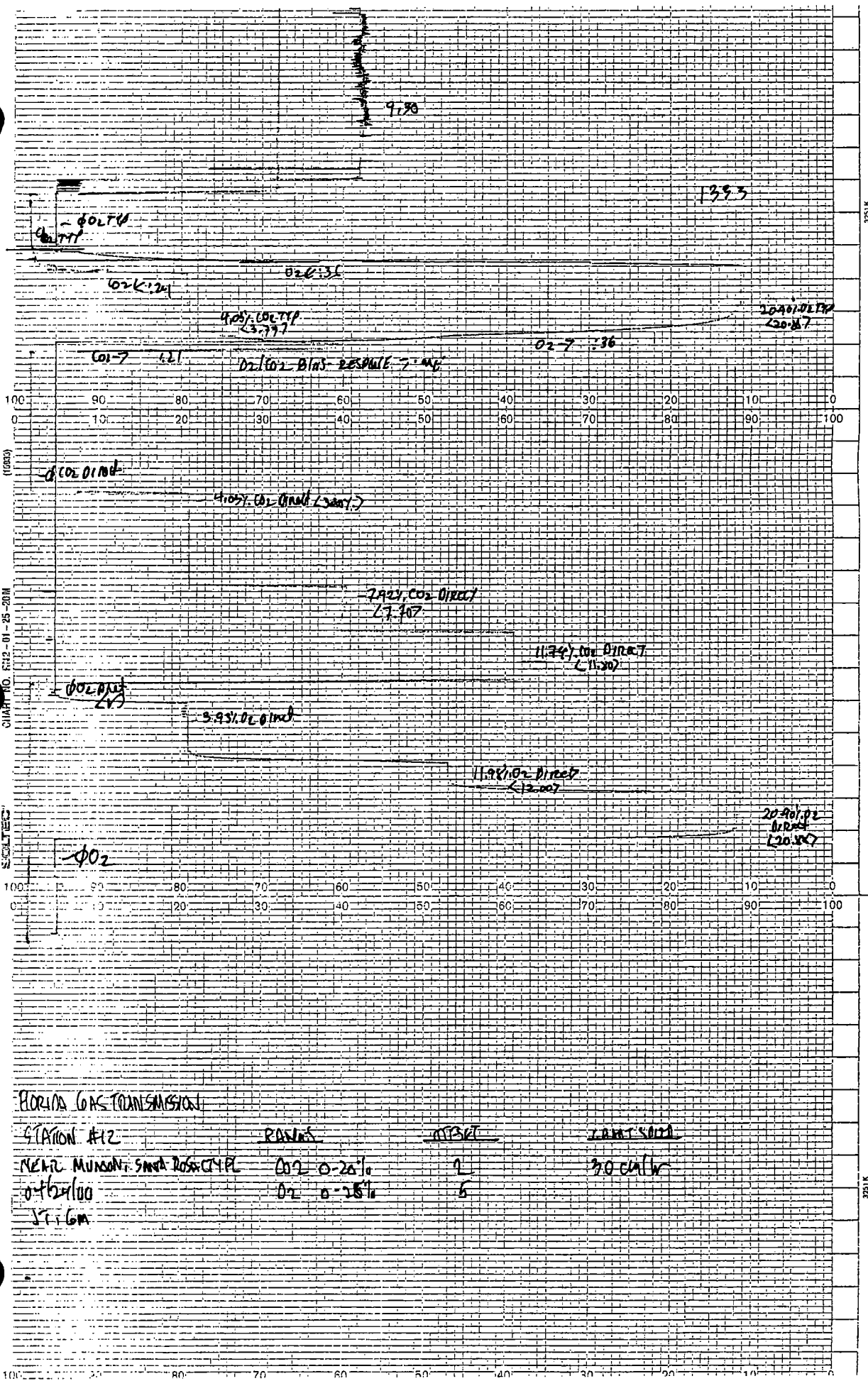
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250 K

250 K

O₂ and CO₂

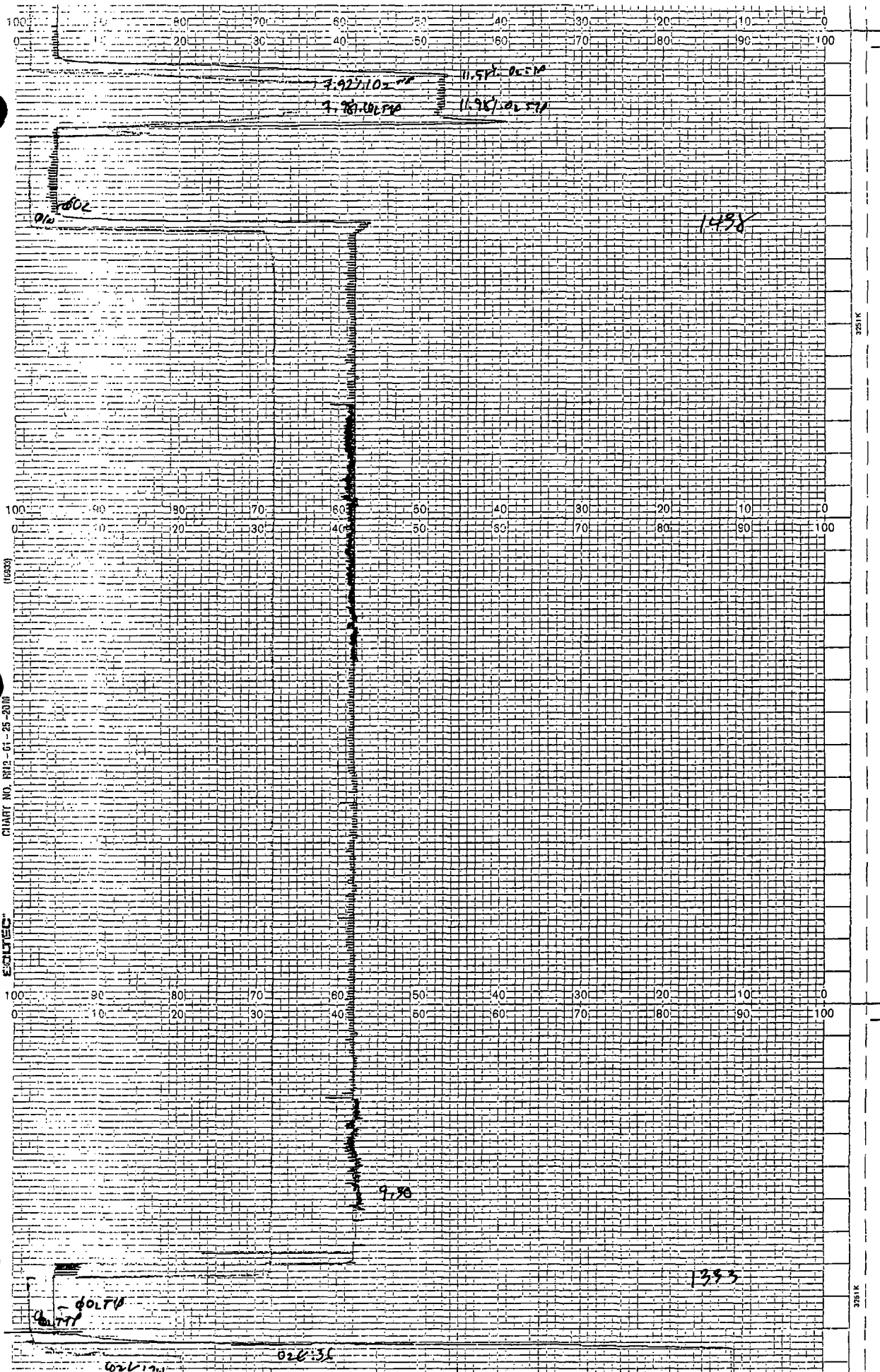


FLORIDA GAS TRANSMISSION

STATION #12	POINTS	MPSEI	TRANSFORM
NEAR MUMSON SAND ROSE CYP	O2 0-25%	1	30 cm/hr
0-16-100	O2 0-25%	5	
ST. GM			

325 K

325 K



7.92 11.57
7.98 11.98

1398

9.78

1393

GOLTP
CHITP

020:55

CHART NO. R12-61-25-200R

EQUITEC

3251K

3251K

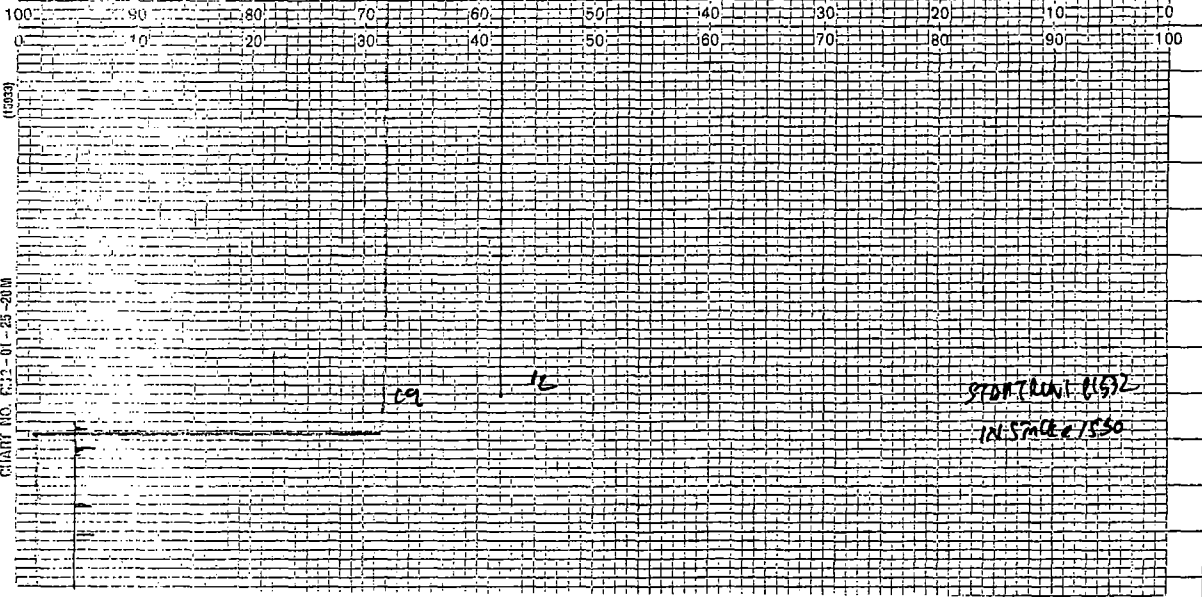
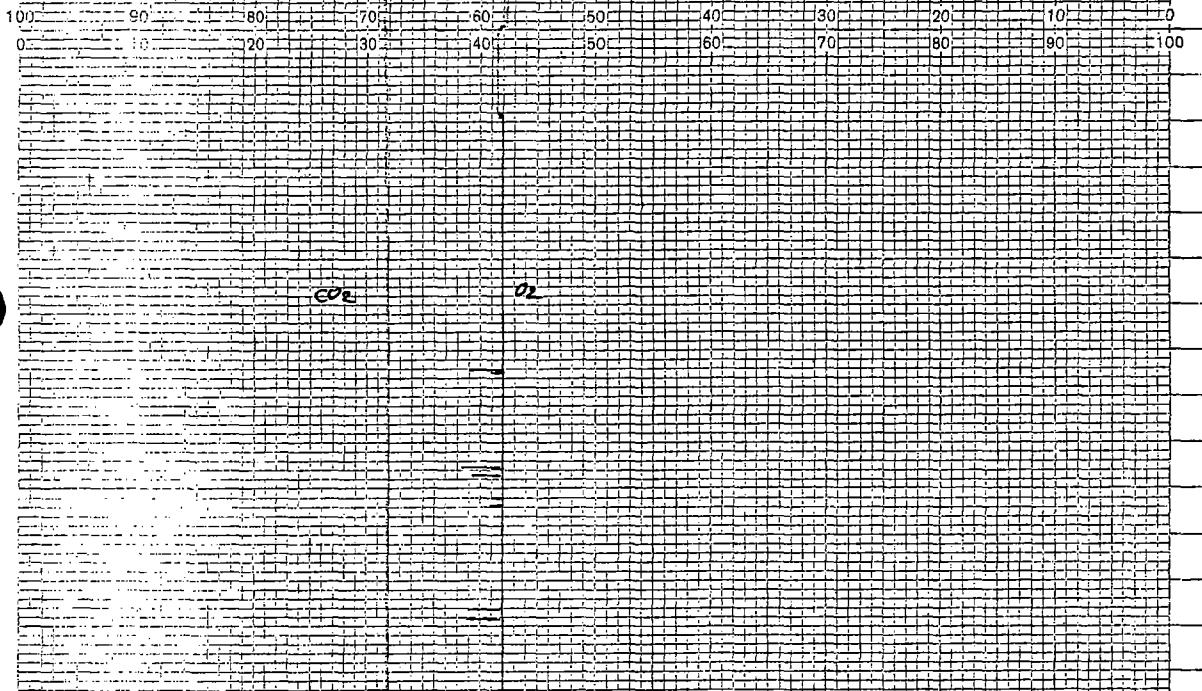
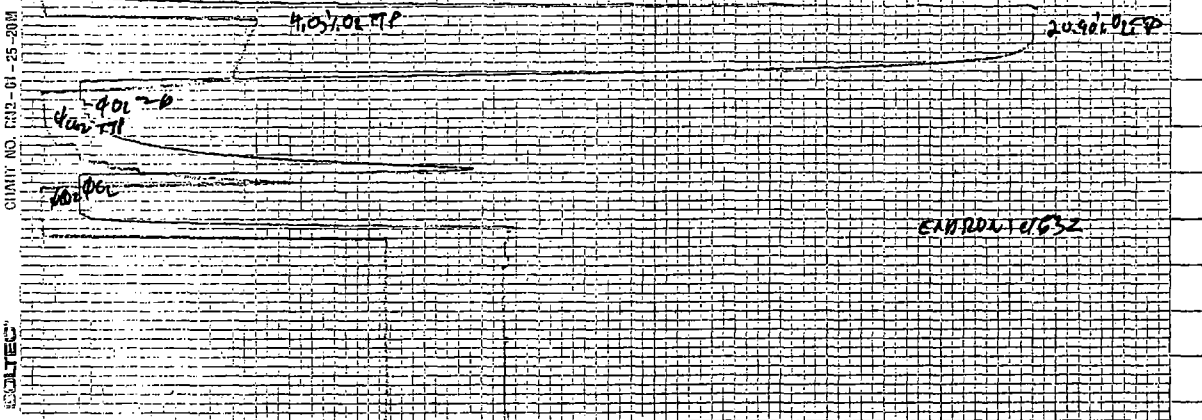
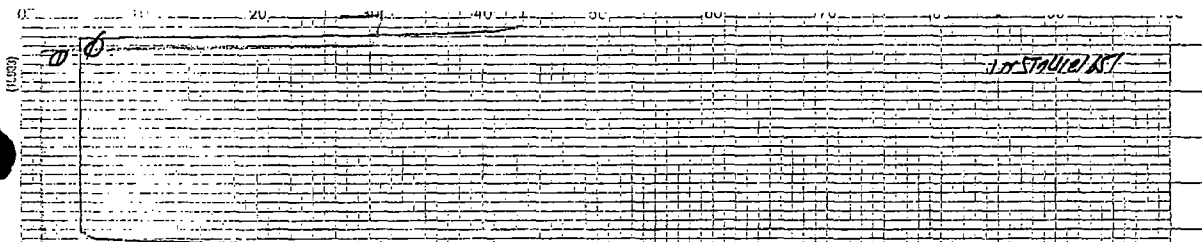


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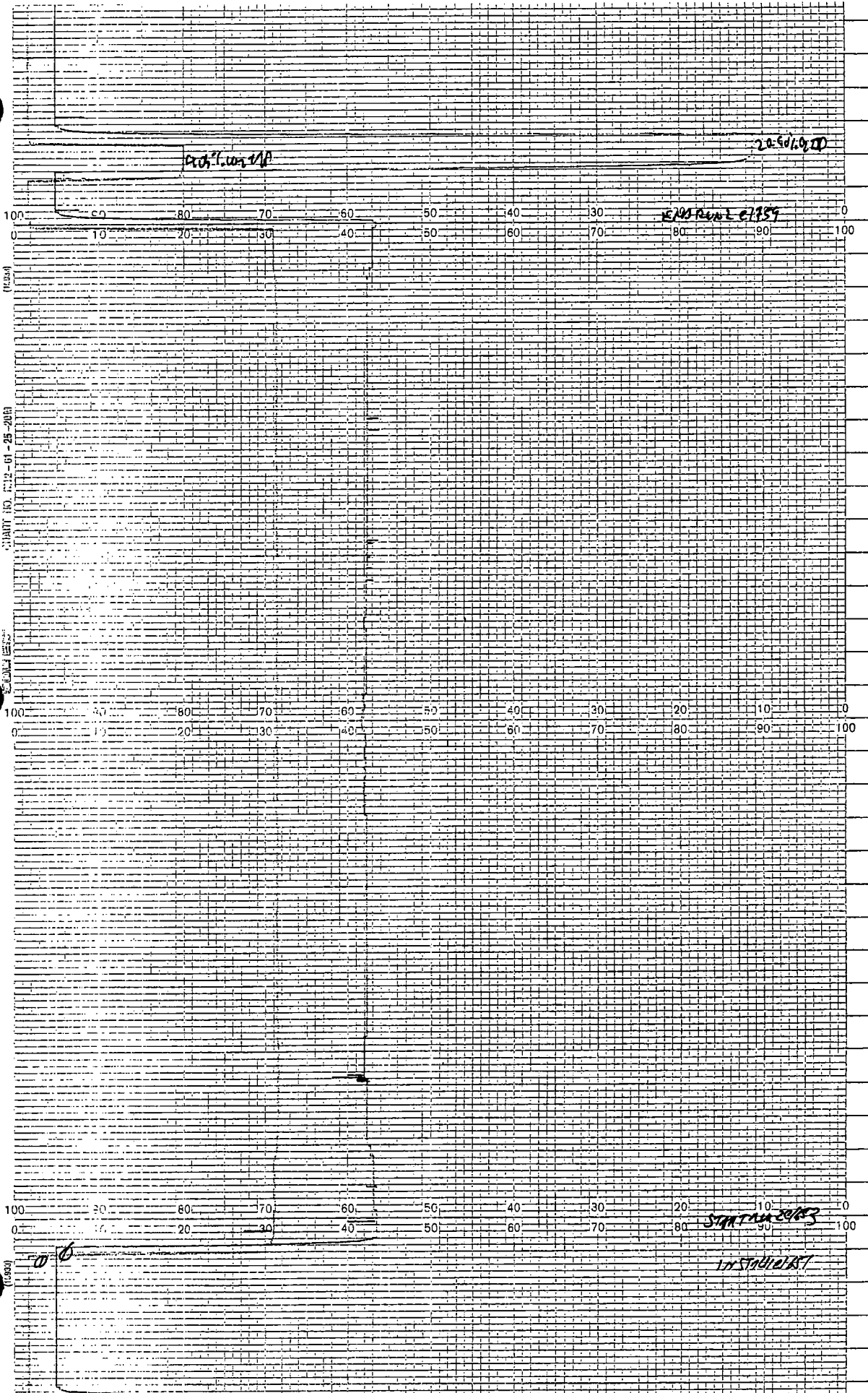
CHART NO. 632-01-25-20M

3251 K

CHART NO. 112-61-25-2019

SCALE 1:1000

(1:500)



321K

321K

12/14/1977

4.57.60.170

4.50.02
112

100	80	70	60	50	40	30	20	10	0
0	20	30	40	50	60	70	80	90	100

Ca

02

100	80	70	60	50	40	30	20	10	0
0	10	20	30	40	50	60	70	80	90

02

02

1813

12/14/1977

CHART NO. NHP-01-25-35M

SCALE: 1"=100'

351K

UNITS

2031

END-A-K-M-W-P-C-T-U-M-D-I-P-T-K

20'01

1955

1948

1958

10-14-1957

10-30-52

9-27-62

Ca

62

100 90 80 70 60 50 40 30 20 10 0

(1033)

CHART NO. NIP-01-25-2018

UNITS

100 90 80 70 60 50 40 30 20 10 0

100 90 80 70 60 50 40 30 20 10 0

533

351K

351K

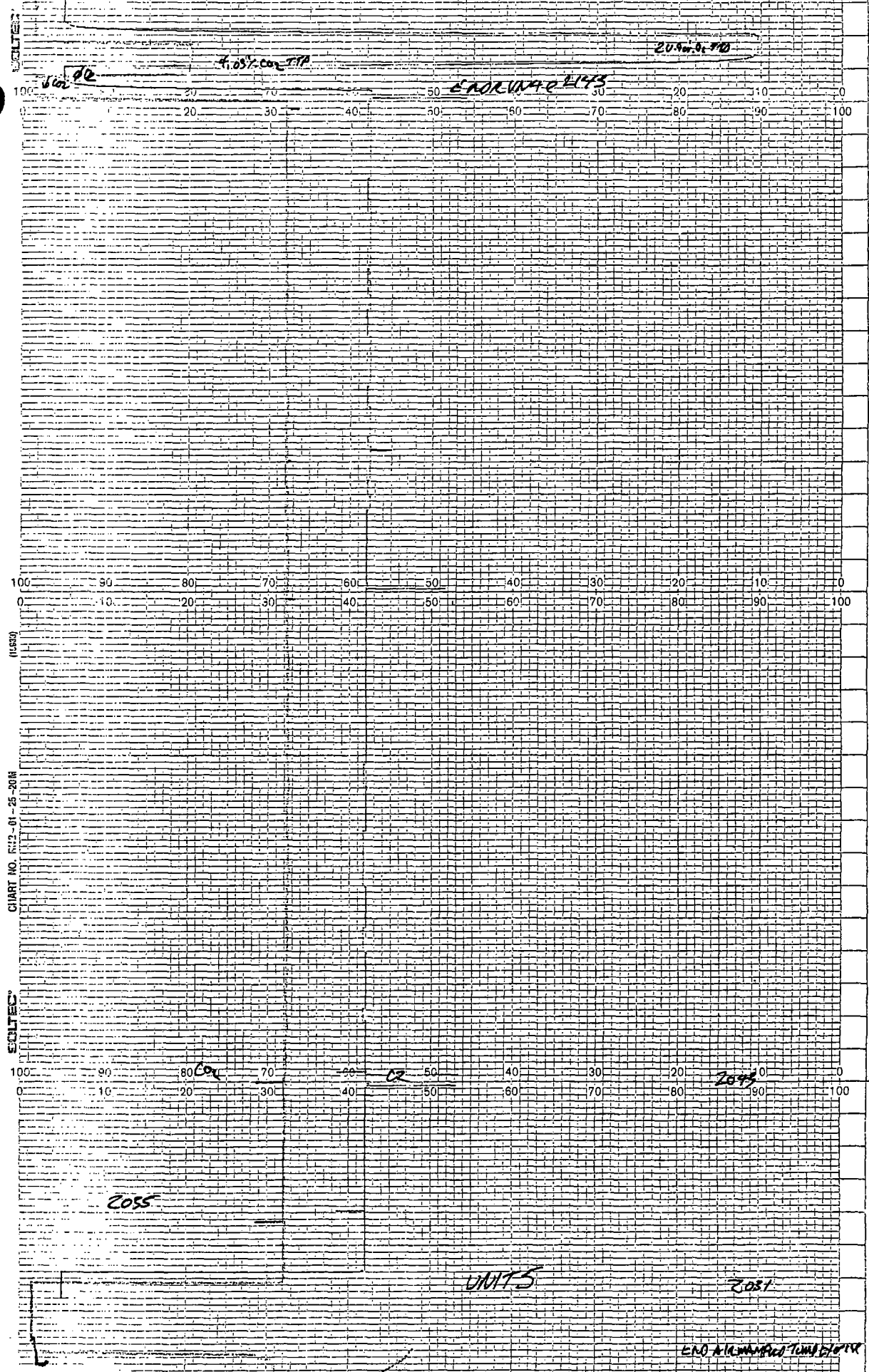


CHART NO. 6:12-01-25-20M

SCALES

UNITS

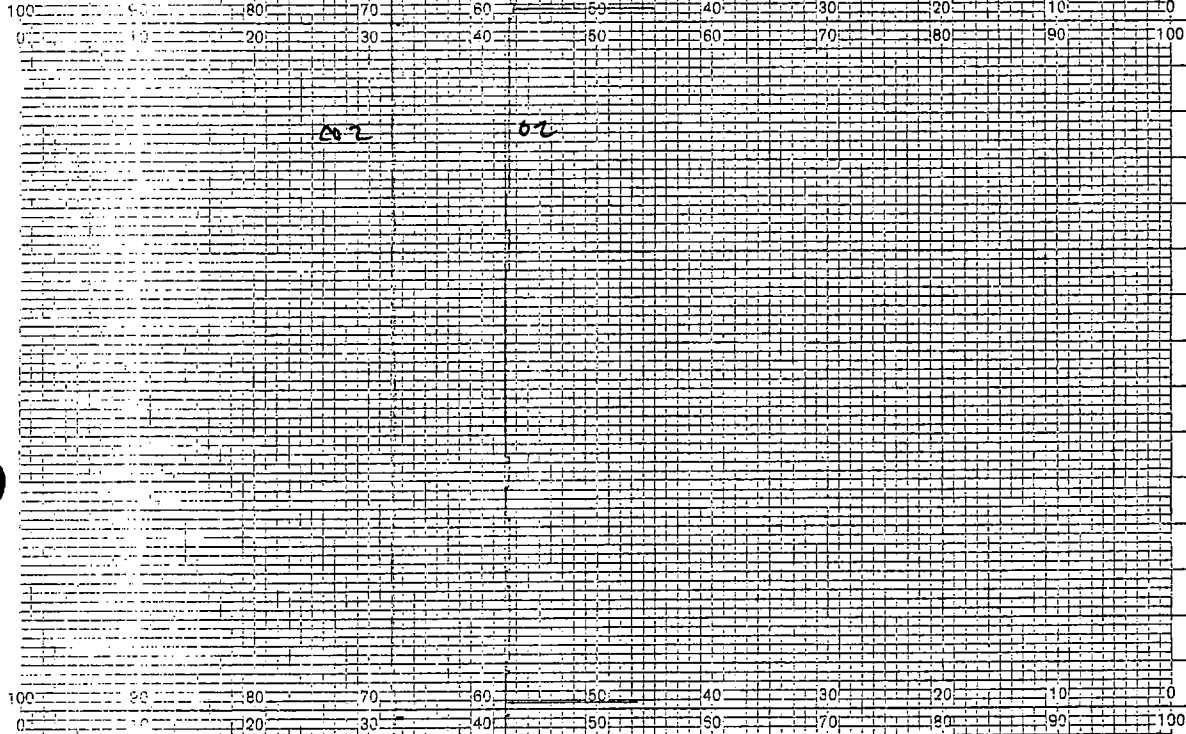
END UNITS

321K

1K

CHART NO. 612-01-25-20M

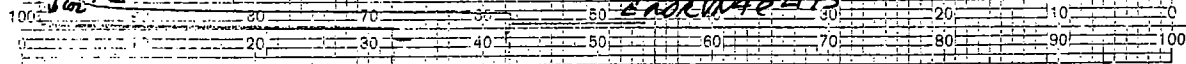
SCALE



(1000)

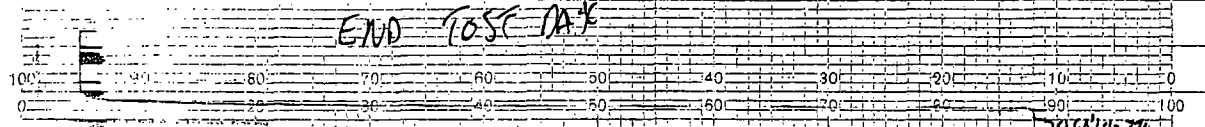
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SCALE



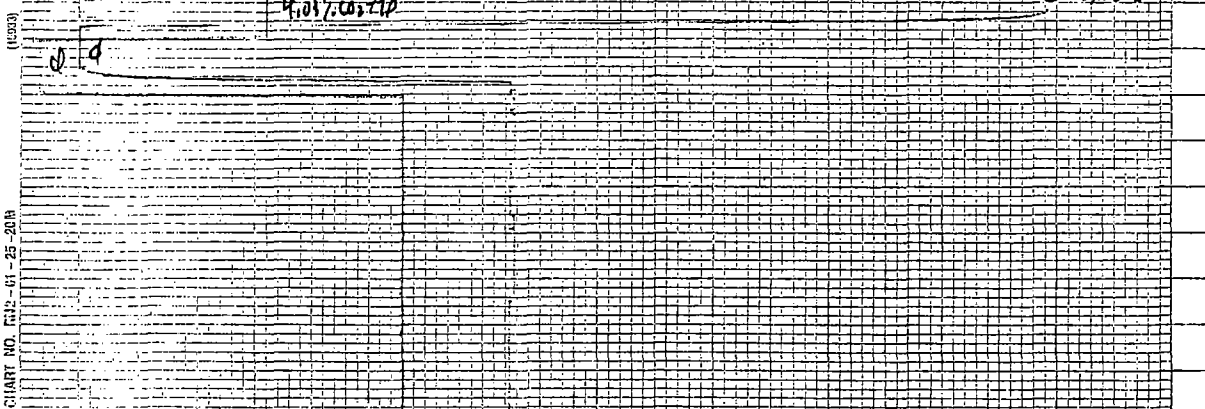
3251K

END TOSC MAX



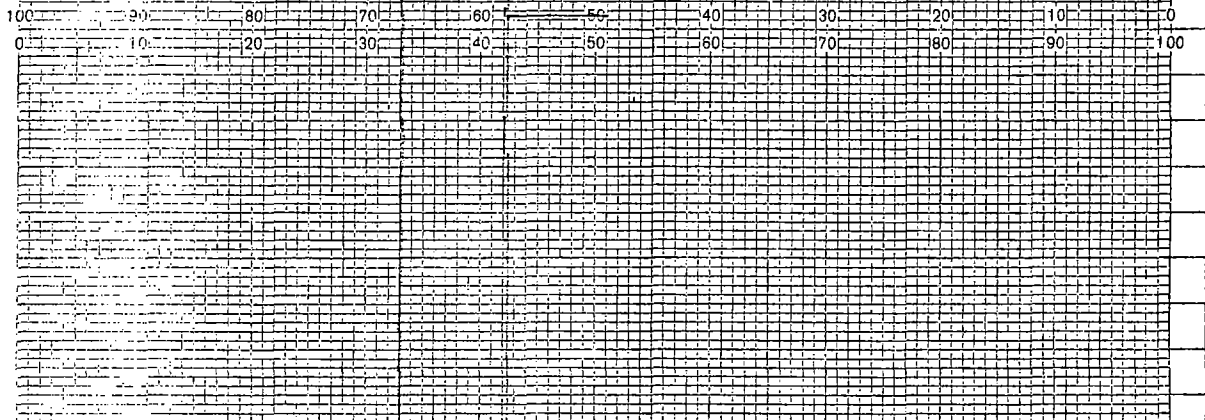
4.01/02/77

20.40/02/77



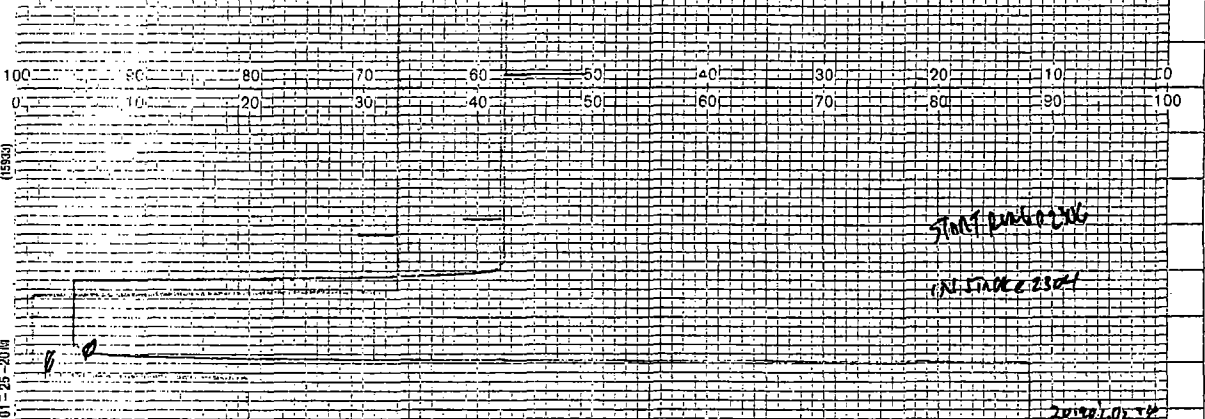
02

02



02

02



START PULSE 2356

END PULSE 2356

20.40/02/77

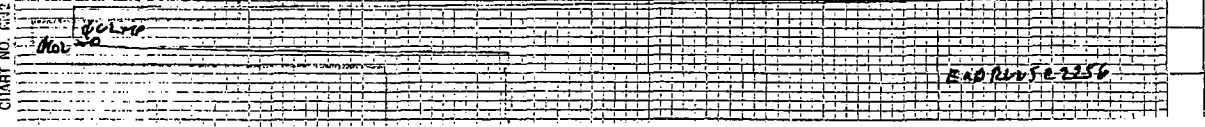


CHART NO. E-12-01-25-2014

3251 K

END PULSE 2356

Summary of Modified 1205 Test Report

Table 3: Unit 1205 Post-Modification

Florida Gas Transmission
Compressor Station No. 12
near Munson on Hwy 191, Santa Rosa County, FL
Cooper-Bessemer LSG8 Compressor Engine
Technicians: JT, GM

2000 bhp @
330 rpm

Test Run No.	1205-C-7	1205-C-8	1205-C-9	
Date	4/26/00	4/26/00	4/26/00	
Start Time	20:52	22:05	23:16	
Stop Time	21:52	23:05	00:29	
Engine/Compressor Operation				Averages
Engine Load (bhp, measured at the compressor)	1905	1905	1905	1905
Fuel Horsepower (bhp, based upon fuel torque)	2072	2081	2088	2080
Engine Speed (rpm)	330	329	329	329
Torque (% full load = 2000 bhp at 330 rpm)	104	104	105	104
Ignition Timing (°BTDC)	24.0	24.0	24.0	-
Air Manifold Pressure (°Hg)	10.7	10.9	10.9	10.8
Air Manifold Temperature (°F)	80	80	80	80
Fuel Manifold Pressure (psig)	9	9	9	9
Station Suction Pressure (psig)	694.0	695.0	696.0	695
Station Suction Temperature (°F)	67	67	67	67
Station Discharge Pressure (psig)	942.0	943.0	945.0	943.3
Unit Discharge Temperature (°F)	112	112	112	112.0
Loading Step Number	5	5	5	-
Compressor Throughput (MMSCFD)	122	122	122	122.0
Engine Fuel Data (Natural Gas)				
Fuel Heating Value (Btu/SCF, HHV)	1027.0	1027.0	1027.0	1027.0
Fuel Specific Gravity	0.5800	0.5800	0.5800	0.5800
O2 "Fd-factor" (DSCFex/MMBtu @ 0% excess air)	8637	8637	8637	8637
CO2 "Fc-factor" (DSCFex/MMBtu @ 0% excess air)	1025	1025	1025	1025
Heat Input (MMBtu/hr)	15	15	15	15
Brake-specific Fuel Consumption (Btu/bhp-hr)	7627.68	7663.25	7702.77	7664.57
Ambient Conditions				
Atmospheric Pressure (°Hg)	29.91	29.91	29.88	29.90
Temperature (°F): Dry bulb	59.0	57.0	55.0	57.0
(°F): Wet bulb	55.0	54.0	52.0	53.7
Humidity (lbs moisture/lb air)	0.0082	0.0081	0.0075	0.0079
Measured Emissions				
NOX (ppmv, dry basis)	526.2	485.8	488.7	500.2
CO (ppmv, dry basis)	287.3	278.2	271.5	279.0
O2 (% volume, dry basis)	10.6	10.6	10.7	10.6
CO2 (% volume, dry basis)	5.72	5.65	5.64	5.67
THC (ppmv)	675.7	646.5	673.7	665.3
VOC (ppmv as % of THC by weight from fuel gas analysis)	12.63	12.08	12.59	12.43
FO (fuel factor, range = 1.600-1.836 for NG)	1.81	1.82	1.81	1.81
Stack Volumetric Flow Rates				
via Pitot Tube (SCFH, dry basis)	2.83E+05	2.80E+05	2.85E+05	2.12E+05
via O2 "F-factor" (SCFH, dry basis)	2.53E+05	2.56E+05	2.60E+05	2.18E+05
via CO2 "F-factor" (SCFH, dry basis)	2.61E+05	2.65E+05	2.67E+05	2.19E+05
Calculated Emission Rates (via pitot tube)				
NOX (lbs/hr)	17.8	16.2	16.6	16.9
CO (lbs/hr)	5.92	5.66	5.63	5.73
VOC (lbs/hr)	0.409	0.387	0.411	0.402
NOX (tons/yr)	78.0	71.1	72.9	74.0
CO (tons/yr)	25.9	24.8	24.6	25.1
VOC (tons/yr)	1.79	1.69	1.80	1.76
NOX (g/bhp-hr)	4.24	3.87	3.97	4.03
CO (g/bhp-hr)	1.41	1.35	1.34	1.37
VOC (g/bhp-hr)	0.10	0.09	0.10	0.10