

May 5, 2009

Pennsylvania Department of Environmental Protection
Air Quality
400 Waterfront Drive
Pittsburgh, PA 15222-4745
Attn: Mark R. Gorog

RE: GP-5 Application for Springhill #2 Compressor Station

Dear Mr. Gorog:

Enclosed are one original and two copies of the GP-5 application and the Compliance Review Form for the referenced site as well as a check for \$375.00. Atlas Pipeline Pennsylvania, LLC will be installing a gas-fired compressor and a dehy unit at our Springhill #2 Compressor Station.

If you have any questions, call me at 412-865-3180.

Sincerely,

A handwritten signature in black ink that reads "James P. Novacek".

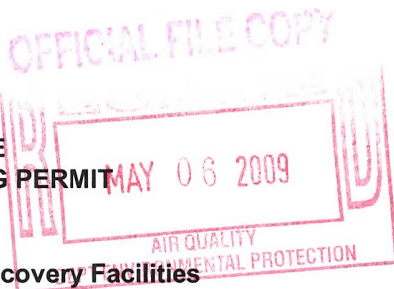
James P. Novacek, P.E.
Senior Facilities Engineer



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

APPLICATION FOR AUTHORIZATION TO USE
GENERAL PLAN APPROVAL & GENERAL OPERATING PERMIT

General Permit BAQ-GPA/GP-5
Natural Gas, Coal Bed Methane or Gob Gas Production or Recovery Facilities



SECTION A.
APPLICATION USAGE INFORMATION

This application is for:

- ☒ A new authorization
 ☐ Renewal of an existing authorization
 ☐ General Plan Approval & General Operating Permit (Both)
- ☐ A General Plan Approval Only
 ☒ A General Operating Permit Only

SECTION B.
OWNER INFORMATION

Owner Atlas Pipeline Pennsylvania, LLC
Address Line1 1550 Coraopolis Heights Road, 2nd Floor
Address Line2 P.O. Box 611
City State Zip+4 Moon Township PA 15108 **Phone** 412-262-2830

SECTION C.
CONTACT INFORMATION

Contact Name James P. Novacek, P.E.
Contact Title Senior Facilities Engineer
Address Line1 1550 Coraopolis Heights Road, 2nd Floor
Address Line2 P.O. Box 611
City State Zip+4 Moon Township PA 15108 **Phone** 412-865-3180

SECTION D.
FACILITY INFORMATION

Facility Name Springhill #2 Compressor Station
Proposed Address Line1 585 Hope Hollow Road
Proposed Address Line2 Lake Lynn, PA 15451
Municipality Springhill Township **County** Fayette

COMPRESSOR ENGINE (S) INFORMATION
Use Extra Page To Describe Additional Engine (s)

No. of Units	1	Manufacturer	Caterpillar
Capacity (BHP)	1340	Date of Manufacture	4/7/06
Model No.	G3516 LE	Date Installed	Pending
Fuel usage metered	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	
Control Type	<input type="checkbox"/> Rich Burn	<input checked="" type="checkbox"/> Lean Burn	
Control make & model		Control Efficiency	

COMPRESSOR ENGINE (S) EMISSIONS

Emission rates	gms/bhp-hr	lbs/hr	TPY	Hrs/Year Operation
NOx	1.50	4.43	19.4	8760
VOC	0.31	0.916	4.01	8760
CO	1.89	5.58	24.4	8760

DEHYDRATOR(S) INFORMATION

Use Extra Page To Describe Additional Unit (s)

No. of Units	<u>1</u>	Manufacturer	<u>Natco</u>
Heat Input (mmBtu/hr)	<u>0.250</u>	Date of Manufacture	<u>7/2008</u>
Control Type	<u></u>	Model No.	<u></u>
Control Efficiency	<u></u>	Date Installed	<u>Pending</u>
Final Exhaust Temperature	<u></u>	Glycol Circulation Rate	<u>1.3 gpm</u>

DEHYDRATOR(S) EMISSIONS

Emission rates	gms/bhp-hr	lbs/hr	TPY	Hrs/Year Operation
NOx	NA	0.025	0.109	8760
VOC	NA	0.045	0.198	8760
CO	NA	0.016	0.071	8760

COMPLIANCE DEMONSTRATION METHODS

- ☐ Performance stack testing
 ☒ Department-approved portable analyzer
 ☐ Department-approved test data for identical engine(s)
 ☐ Vendor guarantee
- ☐ Other Department approved methods, describe:

SECTION E.**TOTAL FACILITY EMISSIONS**

Potential to Emit			Actual Emission Rate	
	lbs/hr	TPY	lbs/hr	TPY
NOx	4.46	19.5	4.46	19.5
VOC	0.96	4.21	0.96	4.21
CO	5.60	24.5	5.60	24.5

SECTION F.**PERMIT INFORMATION**

Is this facility currently permitted? ☐ Yes (Attach copy of current permit) ☒ No

Air Quality Permit No.

Limitation(s) imposed by permit:

Indicate if addition of any unit(s) may result in:

☐ New Source Review (Attach summary)
 ☐ Exceed Title V thresholds (Attach summary)
 ☒ Not Applicable

SECTION G.**APPLICANT'S CHECKLIST**

I have enclosed the following:

- ☐ General Information Form (GIF) (For new plant only)
 ☒ Compliance Review Form
- ☒ Permit Fee for a new authorization; OR
 ☐ Permit fee for renewal of an authorization

SECTION H.**AFFIDAVIT**

I certify that, subject to the penalties of Title 18 Pa. C.S.A. Section 4904 and 35 P.S. Section 4009(b)(2), I am the responsible official having primary responsibility for the design and operation of the facilities to which this application applies and that the information provided in this application is true, accurate and complete to the best of my knowledge, information and belief formed after reasonable inquiry. I further certify that the facility will be operated in conformity with all limitations and conditions of the Natural Gas, Coal Bed Methane or Gob Gas Production or Recovery Facilities General Permit (BAQ-GPA/GP-5)

James P. Novacek

Signature

5/5/09

Date

James P. Novacek, P.E.

Typed/Printed Name

ENGINE SPEED (rpm):	1400	FUEL:	Nat Gas
COMPRESSION RATIO:	8:1	FUEL SYSTEM:	HPG IMPCO with Air Fuel Ratio Control
AFTERCOOLER WATER INLET (°F):	130		
JACKET WATER OUTLET (°F):	210	FUEL PRESSURE RANGE (psig):	35.0-40.0
COOLING SYSTEM:	JW+OC , AC	RATED METHANE NUMBER:	80
IGNITION SYSTEM:	EIS	FUEL LHV (Btu/scf):	905
EXHAUST MANIFOLD:	ASWC	ALTITUDE CAPABILITY (ft):	4900
COMBUSTION:	Low Emission	INLET AIR TEMP. (°F):	77
NOx EMISSION LEVEL (g/bhp-hr):	1.5	APPLICATION:	Gas Compression

RATING	NOTES	%LOAD	100%	75%	50%
ENGINE POWER	(1)	bhp	1340	1005	670
ENGINE EFFICIENCY (ISO 3046/1)	(2)	%	34.4	33.2	31.3
ENGINE EFFICIENCY (NOMINAL)	(2)	%	33.7	32.6	30.7

ENGINE DATA	NOTES	%LOAD	100%	75%	50%
FUEL CONSUMPTION (ISO 3046/1)	(3)	Btu/bhp-hr	7401	7657	8128
FUEL CONSUMPTION (NOMINAL)	(3)	Btu/bhp-hr	7545	7806	8286
AIR FLOW (@ 0 C, 101.3 kPa) (WET)	(4)	Nm3/bkW-hr	4.5	4.64	4.4
AIR FLOW (@ 77 F, 14.7 psia) (WET)	(4)	scfm	2886	2232	1413
AIR FLOW (WET)	(4)	lb/hr	12795	9896	6263
COMPRESSOR OUT PRESSURE		Hg(abs)	79.9	76.2	57.3
COMPRESSOR OUT TEMPERATURE		F	334	306	228
AFTERCOOLER AIR OUT TEMPERATURE		F	132	129	129
INLET MAN.PRESSURE	(5)	Hg(abs)	69.9	55	39.1
INLET MAN. TEMPERATURE (MEASURED IN PLENUM)	(6)	F	139	137	136
TIMING	(7)	BTDC	33	33	33
EXHAUST STACK TEMPERATURE	(8)	F	854	840	842
EXHAUST GAS FLOW (@ 0 C 101.3 kPa) (WET)	(9)	Nm3/bkW-hr	4.8	4.96	4.74
EXHAUST GAS FLOW (@ Stack Temp. 14.5 psia) (WET)	(9)	ft3/min	7651	5853	3738
EXHAUST MASS FLOW (WET)	(9)	lb/hr	13305	10292	6543

EMISSIONS DATA	NOTES	%LOAD	100%	75%	50%
NOx (as NO2) (corr. 5% O2)	(10)	mg/nm3 dry	604	574	598
NOx (as NO2) (uncorrected)	(10)	ppm dry exh	233	226	240
NOx (as NO2)	(10)	ton/year	19.41	14.56	9.7
NOx g/bhp-hr (as NO2)	(10)	g/bhp-hr	1.5	1.5	1.5
NOx g/bkW-hr (as NO2)	(10)	g/bkW-hr	2.01	2.01	2.01
NOx ppm (as NO2) (corr. 5% O2)	(10)	ppm dry exh	294	280	291
CO (corr. 5% O2)	(11)	mg/nm3 dry	759	752	755
CO (uncorrected)	(11)	ppm dry exh	481	486	498
CO	(11)	ton/year	24.41	19.06	12.26
CO g/bhp-hr	(11)	g/bhp-hr	1.89	1.96	1.9
CO g/bkW-hr	(11)	g/bkW-hr	2.53	2.63	2.54
CO ppm (corr. 5% O2)	(11)	ppm dry exh	607	601	604
THC (molecular wt. of 15.84) (corr. 5% O2)	(11)	mg/nm3 dry	1236	1301	1436
THC (molecular wt. of 15.84) (uncorrected)	(11)	ppm dry exh	1386	1488	1674
THC (molecular wt. of 15.84)	(11)	ton/year	39.75	33	23.31
THC g/bhp-hr (molecular wt. of 15.84)	(11)	g/bhp-hr	3.07	3.4	3.6
THC g/bkW-hr (molecular wt. of 15.84)	(11)	g/bkW-hr	4.12	4.56	4.83
THC ppm (molecular wt. of 15.84) (corr. 5% O2)	(11)	ppm dry exh	1749	1841	2032
NMHC (molecular wt. of 15.84) (corr. 5% O2)	(11)	mg/nm3 dry	185	195	215
NMHC (molecular wt. of 15.84) (uncorrected)	(11)	ppm dry exh	208	223	251
NMHC (molecular wt. of 15.84)	(11)	ton/year	5.96	4.95	3.5
NMHC g/bhp-hr (molecular wt. of 15.84)	(11)	g/bhp-hr	0.46	0.51	0.54
NMHC g/bkW-hr (molecular wt. of 15.84)	(11)	g/bkW-hr	0.62	0.68	0.72
NMHC ppm (molecular wt. of 15.84) (corr. 5% O2)	(11)	ppm dry exh	262	276	305
NMNEHC (molecular wt. of 15.84) (corr. 5% O2)	(11)	mg/nm3 dry	124	130	144
NMNEHC (molecular wt. of 15.84) (uncorrected)	(11)	ppm dry exh	139	149	167
NMNEHC (molecular wt. of 15.84)	(11)	ton/year	3.97	3.3	2.33
NMNEHC g/bhp-hr (molecular wt. of 15.84)	(11)	g/bhp-hr	0.31	0.34	0.36
NMNEHC g/bkW-hr (molecular wt. of 15.84)	(11)	g/bkW-hr	0.41	0.46	0.48
NMNEHC ppm (molecular wt. of 15.84) (corr. 5% O2)	(11)	ppm dry exh	175	184	203
HCHO (Formaldehyde) (corr. 5% O2)	(11)	mg/nm3 dry	101	106	120
HCHO (Formaldehyde) (uncorrected)	(11)	ppm dry exh	60	64	74
HCHO (Formaldehyde)	(11)	ton/year	3.24	2.68	1.94
HCHO g/bhp-hr (Formaldehyde)	(11)	g/bhp-hr	0.25	0.28	0.3

EMISSIONS DATA (cont...)	NOTES	%LOAD	100%	75%	50%
HCHO g/bkw-hr (Formaldehyde)	(11)	g/bkW-hr	0.34	0.37	0.4
HCHO ppm (Formaldehyde)	(11) (corr. 5% O2)	ppm dry exh	75	79	89
CO2	(11) (corr. 5% O2)	mg/nm3 dry	156	157	177
CO2	(11)	ton/year	6348	4926	3486
CO2 % Dry	(11) (uncorrected)	% Dry	7.97	7.99	9.01
CO2 g/bhp-hr	(11)	g/bhp-hr	491	508	539
CO2 g/bkw-hr	(11)	g/bkW-hr	658	681	722
EXHAUST O2	(12)	% Dry	8.3	8	7.8
LAMBDA	(12)		1.58	1.57	1.41

ENERGY BALANCE	NOTES	%LOAD	100%	75%	50%
LHV INPUT	(13)	Btu/min	168509	130756	92523
HEAT REJECTION TO JACKET	(14)	Btu/min	41216	34469	29653
HEAT REJECTION TO ATMOSPHERE	(15)	Btu/min	5313	4428	3543
HEAT REJECTION TO LUBE OIL	(16)	Btu/min	6517	5450	4689
HEAT REJECTION TO EXHAUST (LHV to 25C)	(17)	Btu/min	47381	35910	22892
HEAT REJECTION TO EXHAUST (LHV to 177C)	(17)	Btu/min	30096	22591	14530
HEAT REJECTION TO AFTERCOOLER	(18)	Btu/min	10426	7047	2497
PUMP POWER	(19)	Btu/min	838	838	838

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77F, 29.6 in Hg barometric pressure, 500 ft altitude.)

No overload permitted at rating shown. Consult altitude curves for applications above maximum rated altitude and/or temperature. Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than +/- 3. Part load data may require engine adjustment.

FUEL USAGE GUIDE

CAT METHANE NUMBER	25	30	35	40	45	50	55	60	65	70	75	80	100
IGNITION TIMING	0.00	19	21	22	23	24	26	27	28	30	31	33	33
DERATION FACTOR	0.00	0.90	0.90	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

ALTITUDE DERATION FACTORS

AIR TO TURBO °F	130	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.77	0.74	0.71	0.68
	120	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.72	0.70
	110	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71
	100	1.00	1.00	1.00	1.00	0.99	0.96	0.92	0.88	0.85	0.81	0.78	0.75	0.72
	90	1.00	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.86	0.83	0.80	0.76	0.73
	80	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.92	0.88	0.84	0.81	0.78	0.75
	70	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.90	0.86	0.83	0.79	0.76
	60	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.91	0.88	0.84	0.81	0.78
	50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.89	0.86	0.82	0.79
		0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
ALTITUDE (FEET ABOVE SEA LEVEL)														

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS

AIR TO TURBO °F	130	120	110	100	90	80	70	60	50	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
	1.36	1.42	1.48	1.54	1.60	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66
130	1.36	1.42	1.48	1.54	1.60	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66	1.66
120	1.28	1.34	1.40	1.46	1.52	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58	1.58
110	1.21	1.27	1.33	1.39	1.45	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
100	1.14	1.20	1.25	1.31	1.37	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
90	1.07	1.12	1.18	1.23	1.29	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
80	1.00	1.05	1.10	1.16	1.22	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
70	1.00	1.00	1.03	1.08	1.14	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
60	1.00	1.00	1.00	1.01	1.06	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
50	1.00	1.00	1.00	1.00	1.00	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04

ALTITUDE (FEET ABOVE SEA LEVEL)

MINIMUM SPEED CAPABILITY AT MAX SITE TORQUE (RPM)

AIR TO TURBO °F	130	120	110	100	90	80	70	60	50	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
	1110	1190	1340	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
130	1110	1190	1340	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
120	1080	1150	1270	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
110	1050	1120	1190	1350	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
100	1020	1090	1160	1280	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
90	1000	1060	1120	1200	1360	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
80	1000	1030	1090	1160	1290	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
70	1000	1000	1060	1120	1200	1370	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
60	1000	1000	1030	1090	1160	1300	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
50	1000	1000	1000	1060	1120	1200	1370	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400

ALTITUDE (FEET ABOVE SEA LEVEL)

SOUND PRESSURE LEVEL (dB)

100% Load Data			Octave Band Center Frequency (OBCF)									
EXHAUST SOUND	Distance From the Engine(ft.)	3.3	dba	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	5 kHz	
			113.5	102.9	105.5	109.5	105.6	106.9	106.6	107.1	104	
MECHANICAL SOUND	Distance From the Engine(ft.)	23	100.1	88.1	94.6	94.9	91.6	94.3	93.2	93.8	89.1	
		49.2	93.5	81.5	87.9	88.2	84.9	87.6	86.6	87.2	82.5	
		3.3	98.1	93.8	95.3	91.5	90	93.1	92.8	88.8	83.2	
		23	88.5	84.2	85.7	81.9	80.4	83.5	83.2	79.2	73.6	
		49.2	83.2	78.9	80.4	76.6	75.1	78.2	77.9	73.9	68.3	

FUEL USAGE GUIDE NOTE

This table shows the derate factor required for a given fuel. Note that deration occurs as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar Methane Number Calculation program.

ALTITUDE DERATION FACTORS NOTE

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

ACTUAL ENGINE RATING

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2). 1) Fuel Usage Guide Deration 2) $1 - ((1 - \text{Altitude/Temperature Deration}) + (1 - \text{RPC}))$

AFTERCOOLER HEAT REJECTION FACTORS NOTE

Aftercooler heat rejection is given for standard conditions of 77F and 500 ft altitude. To maintain a constant air inlet manifold temperature, as the inlet air temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor to adjust for inlet air temp and altitude conditions. Multiply this factor by the standard aftercooler heat rejection. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

SOUND DATA NOTE

Data determined by methods similar to ISO Standard DIS-8528-10. Accuracy Grade 3.

MINIMUM SPEED CAPABILITY AT MAX SITE TORQUE NOTE

This table shows the minimum allowable engine operating speed for various air inlet temperatures and altitudes.

Notes

1. Engine rating is with two engine driven water pumps. Tolerance is +/- 3% of full load.
2. ISO 3046/1 engine efficiency tolerance is (+)0, (-)5% of full load % efficiency value. Nominal engine efficiency tolerance is +/- 3.0% of full load % efficiency value.
3. ISO 3046/1 fuel consumption tolerance is (+)5, (-)0% of full load data. Nominal fuel consumption tolerance is +/- 3.0% of full load data.
4. Undried air. Flow is a nominal value with a tolerance of +/- 5 %.
5. Inlet manifold pressure is a nominal value with a tolerance of +/- 5 %.
6. Inlet manifold temperature is a nominal value with a tolerance of +/- 9F.
7. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
8. Exhaust stack temperature is a nominal value with a tolerance of (+)63F, (-)54F.
9. Exhaust flow value is on a #wet# basis. Flow is a nominal value with a tolerance of +/- 6 %.
10. NOx tolerances are +11%, -96% of specified value.
11. CO, CO2, THC, NMHC, NMNEHC, and HCHO values are "not to exceed" levels.
12. Exhaust Oxygen tolerance is +/- 0.5; Lambda tolerance is +/- 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
13. LHV rate tolerance is +/- 3.0%.
14. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is +/- 10 % of full load data. Total heat to jacket water circuit = Jacket Heat + Lube Oil Heat
15. Heat rejection to atmosphere based on treated water. Tolerance is +/- 50% of full load data.
16. Lube oil heat rate based on treated water. Tolerance is +/- 20% of full load data.
17. Exhaust heat rate based on treated water. Tolerance is +/- 10% of full load data.
18. A/C Heat (based on treated water) = A/C Heat x A/C Heat Rej. Factor. Tolerance is +/- 5 % of full load data.
19. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.

Value for Firetube Emissions Chart

$$\frac{\frac{250000}{1000} \cdot \frac{1000 \cdot \text{BTU}}{\text{hr}}}{3529.16 \cdot \text{in}^2} = 0.071 \frac{1 \times 10^3 \cdot \text{BTU}}{\text{hr} \cdot \text{in}^2}$$

Value from Firetube Emissions Chart for NOx

$$n := 0.1 \cdot \frac{\text{lb}}{10^6 \cdot \text{BTU}}$$

Value from Firetube Emissions Chart for CO

$$c := 0.065 \cdot \frac{\text{lb}}{10^6 \cdot \text{BTU}}$$

Value from Firetube Emissions Chart for HC

$$h := 0.04 \cdot \frac{\text{lb}}{10^6 \cdot \text{BTU}}$$

$$\text{NOx} := \frac{n \cdot \frac{250000}{10^6} \cdot \frac{10^6 \cdot \text{BTU}}{\text{hr}} \cdot 8760 \cdot \frac{\text{hr}}{\text{yr}}}{2000 \cdot \frac{\text{lb}}{\text{ton}}} \quad \text{CO} := \frac{c \cdot \frac{250000}{10^6} \cdot \frac{10^6 \cdot \text{BTU}}{\text{hr}} \cdot 8760 \cdot \frac{\text{hr}}{\text{yr}}}{2000 \cdot \frac{\text{lb}}{\text{ton}}}$$

$$\text{NOx} = 0.109 \frac{\text{ton}}{\text{yr}}$$

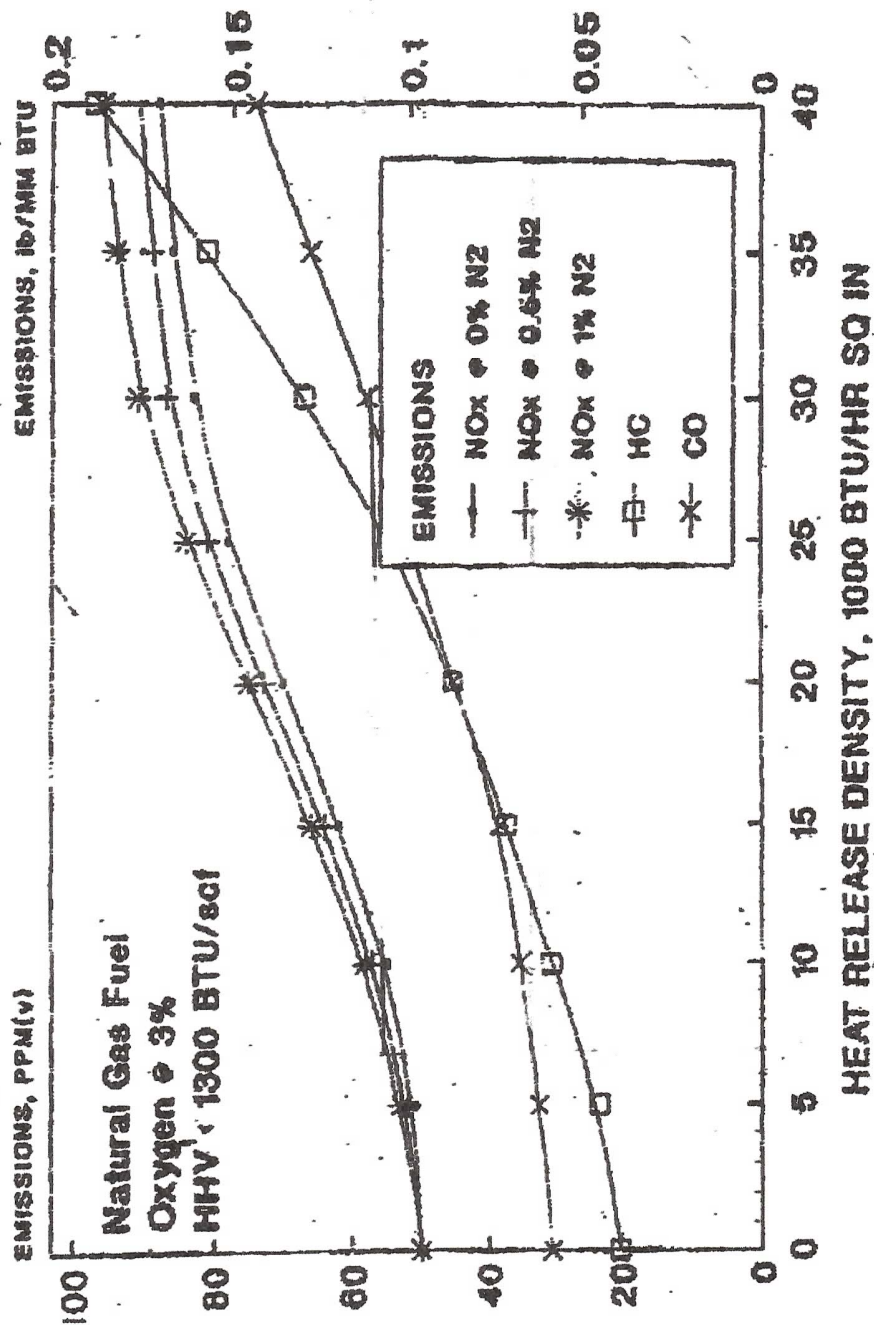
$$\text{CO} = 0.071 \frac{\text{ton}}{\text{yr}}$$

$$\text{HC} := \frac{h \cdot \frac{250000}{10^6} \cdot \frac{10^6 \cdot \text{BTU}}{\text{hr}} \cdot 8760 \cdot \frac{\text{hr}}{\text{yr}}}{2000 \cdot \frac{\text{lb}}{\text{ton}}}$$

$$\text{HC} = 0.044 \frac{\text{ton}}{\text{yr}}$$

FIRETUBE EMISSIONS

NOx, CO, Unburned HC



GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Springhill #2
 File Name: C:\Documents and Settings\jnovacek\My
 Documents\SpringHillDrawings\Springhill #2.ddf
 Date: May 05, 2009

DESCRIPTION:

Description: Adding compressor to site

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	13.5220	324.529	59.2265
Ethane	0.6213	14.911	2.7212
Propane	0.0351	0.843	0.1538
Total Emissions	14.1784	340.282	62.1016
Total Hydrocarbon Emissions	14.1784	340.282	62.1016
Total VOC Emissions	0.0351	0.843	0.1538

EQUIPMENT REPORTS:

ABSORBER

Calculated Absorber Stages: 2.49
 Specified Dry Gas Dew Point: 7.00 lbs. H2O/MMSCF
 Temperature: 115.0 deg. F
 Pressure: 650.0 psig
 Dry Gas Flow Rate: 18.0000 MMSCF/day
 Glycol Losses with Dry Gas: 0.2540 lb/hr
 Wet Gas Water Content: Saturated
 Calculated Wet Gas Water Content: 123.16 lbs. H2O/MMSCF
 Calculated Lean Glycol Recirc. Ratio: 0.90 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	5.67%	94.33%
Carbon Dioxide	99.94%	0.06%
Nitrogen	100.00%	0.00%
Methane	100.00%	0.00%
Ethane	99.99%	0.01%
Propane	99.97%	0.03%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	9.14%	90.86%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%
Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%

STREAM REPORTS:

WET GAS STREAM

Temperature: 115.00 deg. F
 Pressure: 664.70 psia
 Flow Rate: 1.98e+003 #mol/hr

Component	Conc. (mol%)	Loading (#mol/hr)
Water	2.59e-001	5.14e+000
Carbon Dioxide	3.19e-001	6.33e+000
Nitrogen	3.89e-001	7.72e+000
Methane	9.70e+001	1.92e+003
Ethane	1.95e+000	3.86e+001
Propane	5.99e-002	1.19e+000
Total Components	100.00	1.98e+003

DRY GAS STREAM

Temperature: 115.00 deg. F
 Pressure: 664.70 psia
 Flow Rate: 1.98e+003 #mol/hr

Component	Conc. (mol%)	Loading (#mol/hr)
Water	1.47e-002	2.92e-001
Carbon Dioxide	3.20e-001	6.33e+000
Nitrogen	3.90e-001	7.71e+000
Methane	9.73e+001	1.92e+003
Ethane	1.95e+000	3.86e+001
Propane	6.01e-002	1.19e+000


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Total Components      100.00 1.98e+003

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LEAN GLYCOL STREAM

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-----
Temperature:      115.00 deg. F
Flow Rate:       5.31e+000 #mol/hr

```

Component	Conc. (mol%)	Loading (#mol/hr)
TEG	9.08e+001	4.82e+000
Water	9.20e+000	4.88e-001
Carbon Dioxide	7.40e-012	3.93e-013
Nitrogen	6.59e-013	3.50e-014
Methane	5.46e-017	2.89e-018
Ethane	4.87e-008	2.59e-009
Propane	2.52e-010	1.34e-011
Total Components	100.00	5.31e+000

RICH GLYCOL AND PUMP GAS STREAM

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Temperature:      115.00 deg. F
Pressure:         664.70 psia
Flow Rate:       1.10e+001 #mol/hr

```

Component	Conc. (mol%)	Loading (#mol/hr)
TEG	4.36e+001	4.80e+000
Water	4.85e+001	5.34e+000
Carbon Dioxide	5.82e-002	6.42e-003
Nitrogen	3.07e-002	3.39e-003
Methane	7.65e+000	8.43e-001
Ethane	1.88e-001	2.07e-002
Propane	7.23e-003	7.96e-004
Total Components	100.00	1.10e+001

REGENERATOR OVERHEADS STREAM

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-----
Temperature:      212.00 deg. F
Pressure:         14.70 psia
Flow Rate:       5.73e+000 #mol/hr

```

Component	Conc. (mol%)	Loading (#mol/hr)
Water	8.47e+001	4.85e+000
Carbon Dioxide	1.12e-001	6.42e-003
Nitrogen	5.91e-002	3.39e-003
Methane	1.47e+001	8.43e-001
Ethane	3.61e-001	2.07e-002
Propane	1.39e-002	7.96e-004

Total Components 100.00 5.73e+000