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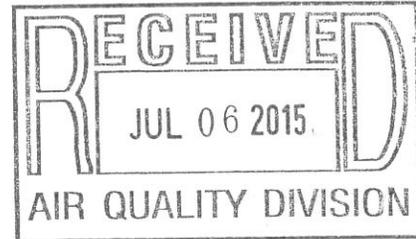
p: 817-447-0098 | f: 855-447-0345

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July 2, 2015



NSR Permitting Program (Application)
WY Dept. of Environmental Quality
Air Quality Division
Herschler Building 2-E
122 West 25th Street
Cheyenne, Wyoming 82002



RE: Temporary GJ230 Compressor #1

Air Quality Division:

The purpose of the application is to authorize the emissions associated with a temporary portable compressor that is to be used by Vanguard Operating, LLC (Vanguard) to test the use of gas lift compression on wells within the state of Wyoming. Initially the testing will likely occur exclusively within Carbon County; however, Vanguard is requesting authorization to test the technology state wide. A preliminary list of wells on which the temporary portable compressor will be placed is included with this submittal in **Table 1**.

The portable Compresso GJ230 Compressor (Serial Number FP-62726) will be placed at each well on a temporary basis to test the effectiveness of the compression device in increasing production at each well. The GJ230 Compressor is driven by a 46 horsepower (HP) engine and is controlled to below 2.0 g/hp-hr NO_x, 4.0 g/hp-hr CO, and 1.0 g/hp-hr VOC with a non-selective catalytic reduction (NSCR) catalyst and an air/fuel ratio controller (AFRC). Although emissions from the compressor engine are likely to be lower, Vanguard requests that the emission limit for the engine be kept at the above-listed controls due to the planned portable use of the compressor and because no supporting documentation that guarantees lower emissions is currently available.

In addition to the emissions associated with the operation of the engine driving the compressor, Vanguard is seeking to authorize the compressor blowdowns that are typically part of the start-up procedure for the compressor during installation and maintenance. An analysis from the Echo Springs 5-2 well was used to represent emissions from the compressor blowdowns for the Echo Springs wells identified on **Table 1**. To estimate maximum anticipated emissions at other locations within the state, we assumed that the gas would not contain more than 25% VOCs. Therefore, Vanguard is requesting the following emission limits for the permit:

NO _x	:	0.89	TPY
CO	:	1.78	TPY
VOCs	:	1.00	TPY
PM ₁₀	:	0.05	TPY
PM _{2.5}	:	0.05	TPY
SO _x	:	0.01	TPY
H ₂ S	:	0.00	TPY
Total HAPs	:	0.10	TPY

Reviewer SB

cc: _____

Modeler _____

D.E. _____

File A0001325

IMP FID 26940

Three (3) paper copies of this application is included in this package. If you have any questions regarding the information presented in this letter, please do not hesitate to contact the undersigned by telephone at (817) 447-0098 ext. 708, or by email at chris@breitlingconsulting.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Breitling". The signature is fluid and cursive, with the first name "Chris" written in a larger, more prominent script than the last name "Breitling".

Chris Breitling

Enclosures:

New Source Review Permit Application Forms

Emission Calculations

General Process Flow

General Site Diagram

Table 1: Potential Well Locations for the Temporary GJ230 Compressor #1

API#	Lease	Well#	County	Legal	Field Name	Reservoir Name
49-007-21894	ECHO SPRINGS	'11-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-20302	ECHO SPRINGS	'1-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-21872	ECHO SPRINGS	'12-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-21268	ECHO SPRINGS	'1-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22553	ECHO SPRINGS	'14-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-21871	ECHO SPRINGS	'21-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-21267	ECHO SPRINGS	'2-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-21895	ECHO SPRINGS	'22-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-20450	ECHO SPRINGS	'2-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22135	ECHO SPRINGS	'5-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22755	ECHO SPRINGS	'5-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22756	ECHO SPRINGS	'6-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22758	ECHO SPRINGS	'6-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22759	ECHO SPRINGS	'7-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22554	ECHO SPRINGS	'8-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22552	ECHO SPRINGS	'9-2	Carbon	S:2, T:19N, R:93W	ECHO SPRINGS	ALMOND
49-007-22757	ECHO SPRINGS	'9-4	Carbon	S:4, T:19N, R:93W	ECHO SPRINGS	ALMOND



Air Quality Division

New Source Review Permit Application Form Cover Sheet

Is this a revision to an existing application?
 Yes _____ No **X** _____
 Previous Application #: _____

Date of Application: 7/1/2015

COMPANY INFORMATION:

Company Name: Vanguard Operating, LLC
 Address: 5847 San Felipe, Suite 300
 City: Houston State: Texas Zip Code: 77057
 Country: USA Phone Number: _____

FACILITY INFORMATION:

Facility Name: Temporary GJ230 Compressor #1
 New Facility or Existing Facility: New
 Facility Description: Temporary Compressor Engine
 Facility Class: Minor Operating Status: Not Yet Installed
 Facility Type: Compressor, Portable

For Oil & Gas Production Sites ONLY:

First Date of Production (FDOP)/Date of Modification: _____
 Single well or multiple well facility? _____
 Does production at this facility contain H2S?* _____
 *If yes, contact the Division.
 API Number(s): _____

NAICS Code: 213112 Support Activities for Oil and Gas Operations

FACILITY LOCATION:

*Enter the facility location in either the latitude/longitude area or section/township/range area. Both are not required.
 Physical Address: Portable compressor will be moving from site to site. To be used State Wide
 City: _____ Zip Code: _____
 State: WY County: _____
OR
 Latitude: _____ Longitude: _____ County: _____
 Quarter Quarter: _____ Quarter: _____
 Section: _____ Township: _____ Range: _____
 For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)

CONTACT INFORMATION:

*Note that an Environmental AND NSR Permitting Contact is required for your application to be deemed complete by the agency.
 Title: Ms. First Name: Swetha
 Last Name: Pingali
 Company Name: Vanguard Operating, LLC.
 Job Title: Compliance Lead
 Address: 5847 San Felipe, Suite 300
 City: Houston State: Texas
 Zip Code: 77057
 Primary Phone No.: 832-327-2255 E-mail: spingali@vnrllc
 Mobile Phone No.: 713-742-3465 Fax No.: _____
 Contact Type: Compliance contact Start Date: _____

***Name of the contact to whom the permit will be issued:**

Additional Contact Type (if needed): _____
 Title: Mr. First Name: _____ Last Name: Donny
 Last Name: Sell
 Company Name: Vanguard Operating, LLC
 Job Title: Superintendent
 Address: 1511 North Gas Hills Road
 City: Powder River State: Wyoming
 Zip Code: 82648
 Primary Phone No.: 1-307-265-3110 E-mail: dsell@vnrllc.com
 Mobile Phone No.: _____ Fax No.: _____
 Contact Type: Responsible Official Start Date: _____

FACILITY APPLICATION INFORMATION:

General Info:

Has the facility changed location or is it a new/ greenfield facility? No
 Has a Land Use Planning document been included in this application? No
 Is the facility located in a sage grouse core area? No
 If the facility is in a sage grouse core area, what is the WER number? _____
 * For questions about sage grouse core area, contact WY Game & Fish Department.

Federal Rules Applicability - Facility Level:

Prevention of Significant Deterioration (PSD): No
 Non-Attainment New Source Review: No

Modeling Section:

Has the Air Quality Division been contacted to determine if modeling is required?
 Is a modeling analysis part of this application? No
 No
 Is the proposed project subject to Prevention of Significant Deterioration (PSD) requirements? No
 Has the Air Quality Division been notified to schedule a pre-application meeting? No
 Has a modeling protocol been submitted to and approved by the Air Quality Division? No
 Has the Air Quality Division received a Q/D analysis to submit to the respective FLMs to determine the need for an AQRV analysis? No

Required Attachments:

- Facility Map
- Process Flow Diagram
- Modeling Analysis (if applicable)
- Land Use Planning Document
- Detailed Project Description
- Emissions Calculations.....

I, Donny Sell Superintendent
 Responsible Official (Printed Name) Title

an Official Representative of the Company, state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the operational information provided and emission rates listed on this application reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all applicable Wyoming Air Quality Standards and Regulations.

Signature: Donny Sell Date: 7-2-15
 (ink)

Specific Emission Unit Attributes:

Engine

Company Equipment ID: COMP-01
Company Equipment Description: 46 HP Compresso GJ230 Compressor Engine

Operating Status: Not Yet Installed
Initial Construction Commencement Date: 3-Aug-15
Initial Operation Commencement Date: 3-Aug-15
Most Recent Construction/ Modification Commencement Date:

Most Recent Operation Commencement Date:

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Temporary Permit

If reason is Reconstruction or Temporary Permit or Other, please explain below:

Requesting a Chapter 6, Section 2(k)(viii) Waiver for installation of a temporary compressor engine on multiple sites.

Name Plate Rating: 46 Units: hp
Site Rating: 46 Units: hp
Primary Fuel Type: Field Gas
Secondary Fuel Type:
Model Name and Number: GJ230
Engine Type: 4 Stroke Rich Burn
Serial Number Tracking Table:
Serial Number: FP-62726 Order Date:
Manufacturer Name: Compresso
Construction/Installation Commencement Date: 8/3/2015
Operation Commencement/ Start-up Date: 8/3/2015
Manufacture Date: 1/7/2008
Btu Content: 1114.4795 Units: BTU/scf
Fuel Sulfur Content: Units:
Type of Service: Compression
Is diesel engine EPA Tier Certified? * If yes, list EPA Tier Rating

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

2-02-002-53

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 24
Hours/year: 8760

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

Yes No

Pollutant: NOx, CO, VOCs

Proposed BACT: AFR & NSCR

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

Yes No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.

NSPS Subpart: JJJJ

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63

Part 63 NESHAP Subpart: ZZZZ

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Specific Emission Unit Attributes:

Blowdown/Venting/Well Completion

Company Equipment ID: COMP-01 (MSS)

Company Equipment Description: Compressor Blowdowns

Operating Status: Operating

Initial Construction Commencement Date: 8/3/2015

Initial Operation Commencement Date: 8/3/2015

Most Recent Construction/ Modification

Most Recent Operation Commencement

Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

Reason: Temporary Permit

If reason is Reconstruction or Temporary Permit or Other, please explain below:

Type of Event: Blow-down

SCC Codes: List all Source Classification Code(s) (SCC) that describe the process(es) performed by the emission source (e.g., 1-02-002-04).

3-10-002-11

Potential Operating Schedule: Provide the operating schedule for this emission unit.

Hours/day: 0.131506849

Hours/year: 48

Control Equipment:

If yes, please fill out and attach the appropriate Control Device and Release Point Information worksheets.

Best Available Control Technology (BACT): Was a BACT Analysis completed for this emission unit?

Yes No

Pollutant: _____

Proposed BACT: _____

*If yes, attach BACT Analysis with this application.

Lowest Achievable Emission Rate (LAER): Was a LAER Analysis completed for this emission unit?

Yes No

Pollutant: _____

Proposed LAER: _____

*If yes, attach LAER Analysis with this application.

Federal and State Rule Applicability:

New Source Performance Standards (NSPS):

New Source Performance Standard are listed under 40 CFR 60- Standards of Performance for New Stationary Sources.

NSPS Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61):

National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

Part 61 NESHAP Subpart: _____

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63):

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63

Part 63 NESHAP Subpart: _____

Prevention of Significant Deterioration (PSD):

These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review:

These rules are found under WAQSR Chapter 6, Section 13.

Pollutant Emissions Form
(submit one for each emission unit)

Emissions Information- The following tables request information needed to determine the applicable requirements and the compliance status of this emission unit with those requirements.

Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
	Potential to Emit (PTE)	Units			

Criteria Pollutants:

1.)	Particulate emissions (PE/PM) (formerly particulate matter, PM)					
2.)	PM #10 microns in diameter (PE/PM10)	0.0421				
3.)	PM #2.5 microns in diameter (PE/PM2.5)	0.0421				
4.)	Sulfur dioxide (SO2)	0.0013				
5.)	Nitrogen Oxides (NOx)	0.8884				
6.)	Carbon monoxide (CO)	1.7767				
7.)	Volatile organic compounds (VOC)	0.9921				
8.)	Lead (Pb)	0				
9.)	Total Hazardous Air Pollutants (HAPs)	0.0496				
10.)	Fluoride (F)	0				
11.)	Hydrogen Sulfide (H2S)	0				
12.)	Mercury (Hg)	0				
13.)	Total Reduced Sulfur (TRS)	0				
14.)	Sulfuric Acid Mist (SAM)	0				

***Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.**

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants

Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
	Potential to Emit (PTE)	Units			

Pollutants:

1.)	Benzene	0.0034				
2.)	Toluene	0.0012				
3.)	Ethylbenzene	0.0001				
4.)	Xylenes	0.0004				
5.)	n-Hexane	0				
6.)	2,2,4-Trimethylpentan	0				
7.)	Formaldehyde	0.0445				
8.)						

Greenhouse Gases (GHGs)

Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
	Potential to Emit (PTE)	Units			

Pollutants:

1.)	Nitrogen Oxides (NOx)	0.8884				
2.)						
3.)						
4.)						
5.)						
6.)						
7.)						
8.)						

Release Point Information:

Complete the table below for *each* release point. Please include release point information for each emission unit. Multiple attachments may be necessary. A release point is a point at which emissions from an emission unit are released into the ambient (outside)air. List each individual release point on a separate pair of lines (release point ID and description). **For longitude and latitude, use NAD 83/WGS84 datum and 5 digits after the decimal (i.e. 41.12345, -107.56789)**

Stack Release Point Information	
Company Release Point ID:	Release Point Type: <input type="text" value="Vertical"/>
COMP STK-01	Release Point Latitude: <u>Multiple Locations</u>
	Release Point Longitude: <u>Multiple Locations</u>
Company Release Point Description:	Base Elevation (ft): <u>Multiple Locations</u>
Engine Stack	Stack Height (ft): <u>7.8</u>
	Stack Diameter (ft): <u>0.2</u>
	Exit Gas Velocity (ft/s): <u>40</u>
	Exit Gas Temp (F): <u>960</u>
	Exit Gas Flow Rate (acfm): <u>66.09</u>
Company Release Point ID:	Release Point Type: <input type="text" value="Horizontal"/>
Compressor Vent	Release Point Latitude: <u>Multiple Locations</u>
	Release Point Longitude: <u>Multiple Locations</u>
Company Release Point Description:	Base Elevation (ft): <u>Multiple Locations</u>
Compressor Vent	Stack Height (ft): <u>7</u>
	Stack Diameter (ft): <u>0.2</u>
	Exit Gas Velocity (ft/s): _____
	Exit Gas Temp (F): _____
	Exit Gas Flow Rate (acfm): _____
Company Release Point ID:	Release Point Type: <input type="text"/>
	Release Point Latitude: _____
	Release Point Longitude: _____
Company Release Point Description:	Base Elevation (ft): _____
	Stack Height (ft): _____
	Stack Diameter (ft): _____
	Exit Gas Velocity (ft/s): _____
	Exit Gas Temp (F): _____
	Exit Gas Flow Rate (acfm): _____
Company Release Point ID:	Release Point Type: <input type="text"/>
	Release Point Latitude: _____
	Release Point Longitude: _____
Company Release Point Description:	Base Elevation (ft): _____
	Stack Height (ft): _____
	Stack Diameter (ft): _____
	Exit Gas Velocity (ft/s): _____
	Exit Gas Temp (F): _____
	Exit Gas Flow Rate (acfm): _____

Vanguard Operating, LLC: Temporary GJ230 Compressor #1

OIL and GAS SITE GENERAL INFORMATION

Company Name:	Vanguard Operating, LLC
Site Name:	Temporary GJ230 Compressor #1
Nearest City/Town:	
County:	Statewide
State:	Wyoming
1/4 Section/Section/Township/Range	
Latitude/Longitude:	
SIC Code:	SIC 1311
API Number:	
Current Applicable Permit Number/Air Quality Waiver:	
Natural Gas Site Throughput (MMSCF/day):	
Oil/Condensate Site Throughput (BBLs/day):	
Produced Water Site Throughput (BBLs/day):	
Are there any sour gas streams at this site?	No

Vanguard Operating, LLC: Temporary GJ230 Compressor #1

ANALYSIS SUMMARY

Gas Analysis

Analysis Identifier/Name:	Gas Analysis	
Site sample is from:	Echo Springs 5-2	
How sample from above site is representative:		
Location in process sample was taken:		
Temperature of sample:		
Pressure of sample:		
Sample analyzed by:	Williams Midstream	
Date of sample:	5/12/2011	
Nitrogen	weight %	0.3304
Carbon Dioxide	weight %	6.1505
Methane	weight %	65.1067
Ethane	weight %	12.8561
VOC	weight % (Total Sample)	15.5563
VOC	weight % (Hydrocarbon Fraction Only)	16.6343
H ₂ S	weight %	0.0000
Benzene	weight %	0.0000
Toluene	weight %	0.0000
Ethylbenzene	weight %	0.0000
Xylene	weight %	0.0000
n-Hexane	weight %	0.0000
2, 2, 4 Trimethylpentane	weight %	0.1353
	Molecular Weight	20.26
	H ₂ S (PPM)	

Gas Analysis - Use if the Inputs are Mole Percents				
Analysis Identifier/Name	Natural Gas Analysis			
Where was the sample taken?	Echo Springs 5-2			
If the sample is from a representative site, explain how this sampled stream is representative of the similar stream at this site (use the notes box provided below if more space is needed).				
Where in the process was the sample taken?				
What is the temperature and pressure of the sample (include units)?				
Who analyzed the sample?				
Date of sample:				
Component	mole %	Molecular Weight (grams/mole, lb/lb-mol)	grams per 100 moles of gas	weight %
hydrogen		2.01588	0	0.0000
helium		4.0026	0	0.0000
nitrogen	0.2390	28.01340	7	0.3304
CO2	2.8320	44.00950	125	6.1505
H2S	0.0000	34.08188	0	0.0000
methane (C1)	82.2400	16.04246	1319	65.1067
ethane (C2)	8.6640	30.06904	261	12.8561
propane (C3)	3.6390	44.09562	160	7.9186
butanes (C4)	1.6000	58.12220	93	4.5892
pentanes (C5)	0.5500	72.14878	40	1.9582
benzene		78.110000	0	0.0000
other hexanes (C6)	0.1420	86.18000	12	0.6039
toluene		92.140000	0	0.0000
other heptanes (C7)	0.0710	100.20000	7	0.3511
ethylbenzene		106.170000	0	0.0000
xylenes (o, m, p)		106.170000	0	0.0000
other octanes (C8)	0.0240	114.23000	3	0.1353
nonanes (C9)	0.0000	128.26000	0	0.0000
decans plus (C10+)	0.0000		0	0.0000
Totals:	100.0010	20.26	2026	100.00
VOC (Non-methane, Non-ethane hydrocarbons)				
VOC content of total sample				
VOC weight% =		15.5563		
VOC weight fraction =		0.1556		
VOC content of hydrocarbon fraction only				
VOC weight% =		16.6343		
VOC weight fraction =		0.1663		
Hydrogen Sulfide				
H2S weight% =		0.0000		
H2S weight fraction =		0.00E+00		
H2S ppm _v =		0		
H2S ppm _{wT} =		0.00		
H ₂ S grains/100 SCF =		0.0000		
		SWEET GAS		
Constants:				
		453.59237 mol/lb-mol		
		0.06479891 grams/grain		
		385.48 scf/lb-mol		
Benzene				
Benzene content of total sample				
Benzene weight% =		0.0000		
Benzene weight fraction =		0.0000		
Benzene content of hydrocarbon fraction only				
Benzene weight% =		0.0000		
Benzene weight fraction =		0.0000		
Constants:				
Gas Molecular Weight =		20.26		
Gas Specific Gravity =		0.70		
		28.97 air mw		
		385.48 scf/lb-mol		
Gas Throughput (MMscf/day) =		#REF!		
Long Tons Sulfur Compounds per Day =		#REF!		

Vanguard Operating, LLC: Temporary GJ230 Compressor #1

ENGINE EMISSIONS

Emission Unit ID#: COMP-01

Emission Unit Name: RICE Engine 1

Engine Data^a

Manufacturer:	<u>Compresso</u>	Manufacture Date / Last Rebuild Date:	<u>1/7/2008</u>
Model Number:	<u>GJ230</u>	Fuel Consumption (Btu/bhp-hr):	<u>10,778</u>
Serial Number:	<u>FP-62726</u>	Engine Type:	<u>4-Stroke Rich Burn</u>
Horse Power (hp):	<u>46</u>	Engine Cycle Type:	<u>Fixed</u>
Hours of Operation (hrs/yr):	<u>8,760</u>		

Fuel Data

Fuel Type:	<u>Natural Gas (Field)</u>	Fuel Use Rate (SCF/hr) ^c :	<u>446.016</u>
High Heat Value (Btu/SCF) ^b :	<u>1114.4795</u>	Fuel Consumption (Btu/hr) ^d :	<u>495,765</u>
Low Heat Value (Btu/SCF) ^b :	<u>1111.5416</u>	Annual Fuel Consumption (MMscf/yr) ^e :	<u>3.9071</u>
H ₂ S content of Fuel ^f (mole %):			

Stack Information

Stack Height (ft):	<u>7.8</u>	Exhaust Stack Temperature (°F):	<u>960</u>
Stack Diameter (ft):	<u>0.20</u>	Exhaust Velocity (ft/sec) ^g :	<u>35.06</u>
Exhaust Flow Rate (ACFM) ^g :	<u>66.09</u>		

Applicable Federal / State Standards

NSPS Subpart JJJJ: No
 MACT Subpart ZZZZ: Yes
 Other Federal / State: _____

Emissions are Controlled: Yes

Catalyst: NSCR Catalyst
 Other: Air/fuel-ratio controller

Pollutant	Emission Factor Source	Units	Emission Factor Used ^{a, g}	Emissions (lb/hr) ^{h, i}	Emissions (TPY) ^j
NOx	Engine Control Specification	g/hp-hr	2.00000	0.2028	0.8884
CO	Engine Control Specification	g/hp-hr	4.00000	0.4057	1.7767
VOC	Engine Control Specification	g/hp-hr	1.00000	0.1116	0.4887
SO ₂ ^k	AP-42; Table 3.2-2	lb/MMBtu	0.00059	0.0003	0.0013
PM ₁₀ ^l	AP-42; Table 3.2-2	lb/MMBtu	0.01941	0.0096	0.0421
PM _{2.5} ^l	AP-42; Table 3.2-2	lb/MMBtu	0.01941	0.0096	0.0421
Formaldehyde	AP-42; Table 3.2-3	lb/MMBtu	0.02050	0.0102	0.0445
Benzene	AP-42; Table 3.2-2	lb/MMBtu	0.00158	0.0008	0.0034
Toluene	AP-42; Table 3.2-2	lb/MMBtu	0.00056	0.0003	0.0012
Ethylbenzene	AP-42; Table 3.2-2	lb/MMBtu	0.00002	0.0000	0.0001
Xylene	AP-42; Table 3.2-2	lb/MMBtu	0.00020	0.0001	0.0004

Notes and Explanation if Controlled Emission Factors were used:

^a Engine Vendor Provided Engine Data and Specifications

^b Echo Springs 5-2 Analysis

^c Fuel Use Rate (scf/hr) = Fuel Consumption (Btu/hr) / Low Heat Value (Btu/scf)

^d Fuel Consumption Rate (Btu/hr) = Fuel Consumption (Btu/hp-hr) * Horsepower (hp)

^e Annual Fuel Consumption (MMscf/yr) = Fuel Use Rate (scf/hr) * 8760 (hrs/yr) / 1,000,000 (scf/MMscf)

^f Exhaust Velocity (ft/sec) = (Exhaust Flow Rate (ACFM) / (PI * Stack Radius (ft)²)) / 60 (sec/min)

^g AP 42, Fifth Edition, Volume 1 Chapter 3: Stationary Internal Combustion Sources, 3.2 Natural Gas-fired Reciprocating Engines, Table 3.2-3, United States

^h lb/hr = Emission Factor (lb/MmBtu) * (Fuel Consumption (Btu/hr)/1,000,000 (scf/MMscf))

ⁱ lb/hr = (Emission Factor (g/hp-hr)) * Horse Power (hp) / 453.5924 (g/lb)

^j TPY = lb/hr * 8760 hrs/yr / 2,000 lbs/ton

^k If H₂S in fuel gas then SO₂ lb/hr = Fuel Consumption (Btu/hp-hr) * Engine Horsepower (Hp) * Molecular Weight of SO₂ (64.06 g/mol) * Fuel H₂S content (mol %)

^l PM = PM filterable + PM Condensable

Vanguard Operating, LLC: Temporary GJ230 Compressor #1
MSS - Compressor Blowdowns

Emission Point Number: MSS-1 (Using Echo-Springs 5-2 Analysis)
Emission Point Name: MSS-Compressor Blowdowns
Explanation of Activity: Purging of compressors prior to start-up

Actual Volume of the Vented Unit (acf - actual cubic feet):	50		
Pressure of Gas Inside the Unit Before Venting (psig):	400		
Final Pressure (psia):	14.7		
Pressure of Gas Inside the Unit Before Venting (psia):	414.7		
Temperature of Gas Inside the Unit Before Venting (°F):	7		
Temperature of Gas Inside the Unit Before Venting (°R):	466.67		
Ideal Gas Constant	10.73159		
Venting Gas Molecular Weight (lb/lb-mol)^a:	20.26		
Number of Events per Hour (events/hour):	1		
Number of Blowdowns per Year (events/year):	48		
Total Vented Gas (lb/hr)^b:	83.8993		
Pollutant	Total Weight Percent^a	Emissions (lb/hr)^c	Emissions (TPY)^d
VOC	15.5563	13.0516	0.3132
H ₂ S	0.0000	0.0000	0.0000

Notes:

^a Echo Springs 5-2 Analysis

^b Total Vented Gas (lb/hr) = (Volume of Vented Unit (acf) * Pressure of Gas Inside Unit Before Venting (psia)) / ((Temperature of Gas Inside Unit Before Venting (°R) * Ideal Gas Constant [(ft³ * psia) / (R * lb-mol)]) / Duration of Event) / Venting Gas Molecular Weight (lb/lb-mol)

^c lb/hr = Total Vented Gas lb/hr * (Weight Percent / 100)

^d TPY = lb/hr * Number of Blowdowns per Year / 2,000 (lb/ton)

Vanguard Operating, LLC: Temporary GJ230 Compressor #1
MSS - Compressor Blowdowns

Emission Point Number: MSS-Other
Emission Point Name: MSS-Compressor Blowdowns
Explanation of Activity: Purging of compressors prior to start-up

Actual Volume of the Vented Unit (acf - actual cubic feet):	50		
Pressure of Gas Inside the Unit Before Venting (psig):	400		
Final Pressure (psia):	14.7		
Pressure of Gas Inside the Unit Before Venting (psia):	414.7		
Temperature of Gas Inside the Unit Before Venting (°F):	7		
Temperature of Gas Inside the Unit Before Venting (°R):	466.67		
Ideal Gas Constant	10.73159		
Venting Gas Molecular Weight (lb/lb-mol) ^a :	20.26		
Number of Events per Hour (events/hour):	1		
Number of Blowdowns per Year (events/year):	48		
Total Vented Gas (lb/hr) ^b :	83.8993		
Pollutant	Total Weight Percent^a	Emissions (lb/hr)^c	Emissions (TPY)^d
VOC	25.0000	20.9748	0.5034
H ₂ S	1.0000	0.8390	0.0201

Notes:

^a Based on "worst-case" emissions estimate

^b Total Vented Gas (lb/hr) = (Volume of Vented Unit (acf) * Pressure of Gas Inside Unit Before Venting (psia)) / ((Temperature of Gas Inside Unit Before Venting (°R) * Ideal Gas Constant [(ft³*psia)/(R*lb-mol)]) / Duration of Event) / Venting Gas Molecular Weight (lb/lb-mol)

^c lb/hr = Total Vented Gas lb/hr * (Weight Percent / 100)

^d TPY = lb/hr * Number of Blowdowns per Year / 2,000 (lb/ton)



Williams Midstream
GQ2 - Certificate of Analysis
Period: July 2012

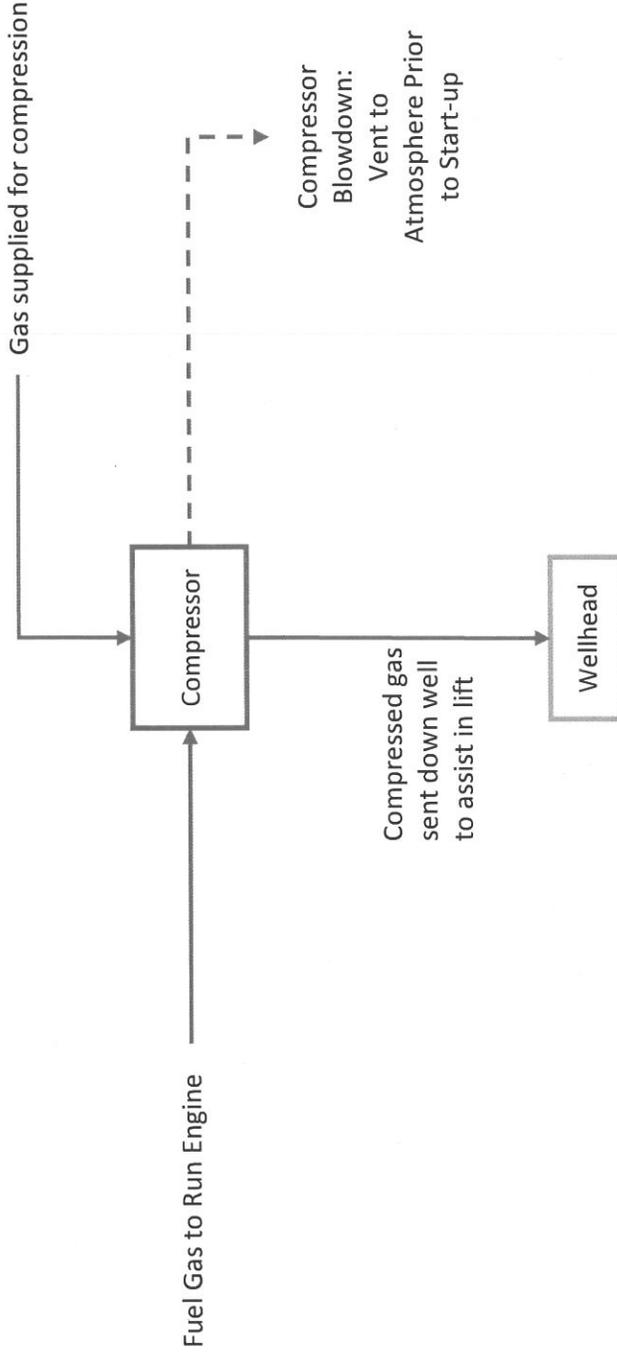
Gas Quality Name:	96196		
Gas Quality Description:	ECHO SPRINGS 5-2		
Lab Code:	Kutz		
Effective Date/Time:	May-20-2011 9:00 AM	Analyzed Date/Time:	May-20-2011 3:51 PM
Sample Date/Time:	May-12-2011 2:52 PM	Sample Type:	
Sampled By:		Sample Number:	1729

Component	Units	GQ Data	GPM 2145 2009
Hydrogen (H2)			
Helium (He)			
Oxygen (O2)			
Carbon Monoxide (CO)			
Argon (Ar)			
Hydrogen Sulfide (H2S)		0.000	
Nitrogen (N2)		0.239	
Carbon Dioxide (CO2)		2.832	
Methane (C1)		82.240	13.983
Ethane (C2)		8.664	2.323
Propane (C3)		3.639	1.005
I-butane (IC4)		0.736	0.241
N-butane (NC4)		0.864	0.273
I-pentane (IC5)		0.268	0.098
N-pentane (NC5)		0.282	0.102
Hexanes (C6)		0.142	0.058
Heptanes (C7)		0.071	0.033
Octanes (C8)		0.024	0.012
Nonanes (C9)		0.000	0.000
Decanes (C10)		0.000	0.000
C6+		0.236	
C5 Plus		0.008	
CO2 + N2		0.031	
Total Composition		100.000	

Calculation Parameters

Sample Pressure:		301.00	
Sample Temperature:		71.00	
Pressure Base	pressure unit	14.73	
Temperature Base	temp unit	60.00	
Heating Value:		1168.110	Specific Gravity: 0.702

Remark:	<tcraig>



Legend

- Raw Feedstock ———
- Oil & Water ———
- Oil ———
- Produced Water ———
- Natural Gas ———
- Alternate Operations - - - -

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www.breitlingconsulting.com

GENERAL PROCESS FLOW DIAGRAM
 Temporary GJ230 Compressor #1
 Wyoming
 Vanguard Operating, LLC

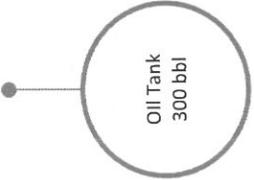
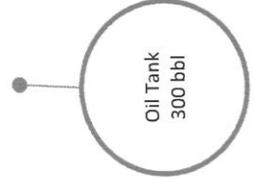
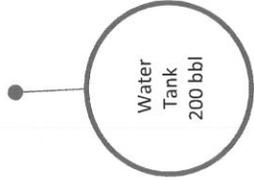
Meter Run

Compressor

Wellhead *

Knock-out

Three-Phase Separator w/ Heater



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GENERAL SITE MAP
Wyoming
Vanguard Operating, LLC



COMPRESSCO PARTNERS, G.P.

*The Natural Choice in
Production Enhancement Services!*

CPE-GJNE-004



GJ230 Natural Gas Engine Performance

With Emission Control Package

Maximum Engine Speed (RPM)	2000	Fuel	Nat Gas
Compression Ratio	10:1	Ignition System	CD
Bore	4.360 in. (110.74mm)	Fuel System	NG IMPCO
Stroke	3.850 in. (97.79mm)	Jacket Water Outlet Temperature	180° F (82.2° C)
Displacement	230 c.i. (3.8L)	Minimum Fuel Pressure (psig)	2 oz.

Engine Rating Data	% Load	100%	50%	10%
Engine Power	bhp	46 (34.3kw)	26 (19.39kw)	10 (7.46 kw)

Engine Data				
Specific Fuel Consumption (BSFC)	Btu/bhp-hr	10,777.5	10,379.2	9,9144.3
Intake Manifold Pressure	"Hg	-0.8	-8.9	-12.3
Timing	° BTDC	38	38	38
Exhaust Stack Temperature	° F	960	N/A	N/A
Stack Flow Rate	SCF/hr	3965.27	N/A	N/A
Stack Height	94"			
Stack Diameter	2 1/4"			

Engine Emissions Data	% Load	g/bhp-hr	lb/hr	TPY
Nitros Oxides (NOx)	100	< 2.0	< 0.20	< 0.88
Carbon Monoxide (CO)	100	< 4.0	< 0.37	< 1.78
Volatile Organic Compounds (VOC)	100	< 1.0	< 0.14	< 0.44
CO2	100	(avg %)		11.73%

Test Gas Data				
Methane	94.827 %	Btu	1014.8	

CGJ230 FI Low Pressure				
Displacement	230 c.i. (3.8L)	Maximum Discharge Pressure	125 psig (861.8kPaG)	
Bore	4.360 in. (110.74mm)	Maximum Suction Pressure	12 psig (82.7kPaG)	
Stroke	3.850 in. (97.79mm)	Maximum Compression Ratio	18: 1	
Number of Throws	4	Valves	Concentric	

Compression on Head End Only

CGJ170 MP Medium Pressure				
Displacement	170 c.i. (2.8L)	Maximum Discharge Pressure	450 psig (3447kPaG)	
Bore	3.750 in. (95.25mm)	Maximum Suction Pressure	60 psig (413.7kPaG)	
Stroke	3.850 in. (97.79mm)	Maximum Compression Ratio	18: 1	
Number of Throws	4	Valves	Concentric	

Compression on Head End Only

The GJ230 complies with 40 CFR 60 Subpart JJJJ for the current model year.

EFFECTIVE DATE: 1/16/12	SUPERSEDES: All Previous
-------------------------	--------------------------

Memorandum

To: File – A0001325

From: Sarah Brown

Date: July 31, 2015

Re: 46 hp Compressco GJ230 temporary portable compressor engine

By phone conversation on July 22, 2015, Mr. Chris Breitling of Breitling Consulting, LLC provided clarification on the temporary timeframe for the proposed 46 hp Compressco GJ230 portable compressor engine. Vanguard Operating, LLC intends for the Compressco GJ230 engine to be at each location between 90 and 180 days. Additionally, Mr. Breitling confirmed that the blowdown emissions calculations represented in the application are based on the provided Echo Springs 5-2 gas analysis.

By email dated July 31, 2015 Mr. Breitling confirmed that the proposed 46 hp Compressco GJ230 portable compressor engine could meet the Division's proposed emission limits of 2.0 g/hp-hr NO_x, 3.0 g/hp-hr CO and 0.7 g/hp-hr VOC.

Attached: Email from Chris Breitling dated July 31, 2015



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BREITLING

CONSULTING, LLC

EHS Management, Compliance & Training

From: Sarah Brown [mailto:sarah.brown1@wyo.gov]
Sent: Thursday, July 30, 2015 11:30 AM
To: Chris Breitling <chris@breitlingconsulting.com>
Subject: Re: Temporary GJ230 Compressor #1

[Quoted text hidden]

Chris Breitling <chris@breitlingconsulting.com>
To: Sarah Brown <sarah.brown1@wyo.gov>
Cc: "Swetha Pingali (spingali@vnrllc.com)" <spingali@vnrllc.com>

Fri, Jul 31, 2015 at 12:59 PM

Per the engine vendor, we should be able to meet the following emissions that you identified below:

- 2.0 g/hp-hr NOx
- 3.0 g/hp-hr CO
- 0.7 g/hp-hr VOC

Vanguard will accept the proposed limits.

Please let me know if there are any other questions.

Sincerely,

Chris Breitling

c: 817-602-2212

o: 817-447-0098

breitlingconsulting.com



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