eog resources

EOG Resources, Inc.
600 Seventeenth Street
Suite 1000N
Denver, CO 80202
Main: 303-572-9000
Fax: 303-824-5400

July 23, 2015

Nathan Henschel
NSR Air Quality Scientist
WY Department of Environmental Quality, Air Quality Division
122 West 25th St. 2nd Floor East
Cheyenne, WY 82002

Subject: **EOG Resources Inc.**
WAQSR Chapter 6, Section 2 Permit Application (A0000325)
I-80 Compressor Station, Laramie County

Dear Mr. Henschel,

EOG Resources Inc. (EOG) is submitting additional information regarding WAQSR Chapter 6, Section 2 air quality construction permit application (A0000325) to request authorization to construct a compressor station, to be named the I-80 Compressor Station, in Laramie County approximately 13 miles east of Cheyenne, on the north side of Interstate 80. EOG is submitting the attached manufacturer specifications for the rod packing seals to be included in the reciprocating compressors installed at the I-80 Compressor Station. Emissions from the rod packing have been determined to be insignificant when rod packing is changed according to the scheduled replacement intervals required under 40 CFR part 60, subpart OOOO. The I-80 Compressor Station will be subject to this subpart and rod packing will be changed per the requirements of OOOO.

Please do not hesitate to call me at (307) 823-6208 or Curtis Rice at (303) 262-9946 if you have any questions or need additional information. We appreciate your prompt attention to this most important project.

Sincerely,

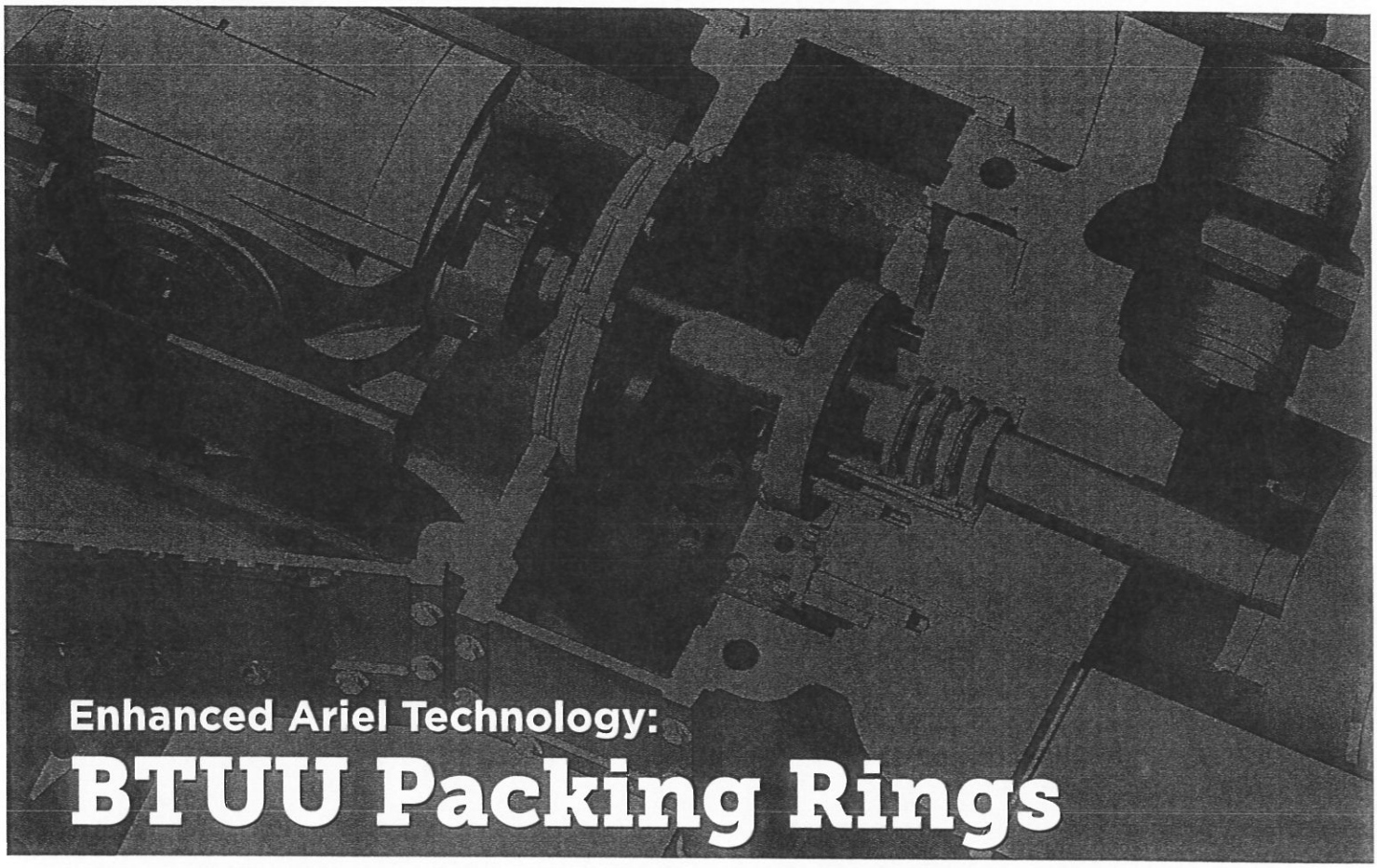
Mark D. Smith
EOG Environmental – Denver Division

cc: File – Well

Attachments: As stated

ARIEL CORPORATION
WORLD STANDARD COMPRESSORS

35 Blackjack Road | Mount Vernon, OH 43050 | www.arielcorp.com

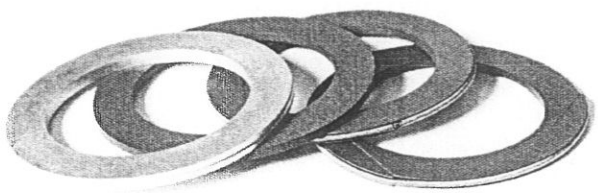


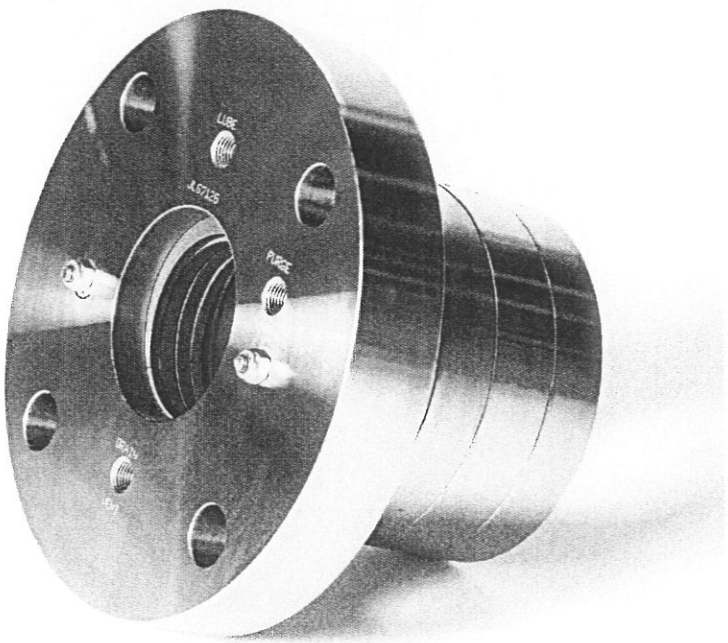
Enhanced Ariel Technology:

BTUU Packing Rings

Uncut Rings Unparalleled Performance

- Less Frictional Heat
- Improved Sealing
- Extended Operating Life
- Lower Maintenance Costs
- Reduced Fugitive Emissions





Genuine Ariel Parts are available through our worldwide network of authorized distributors.

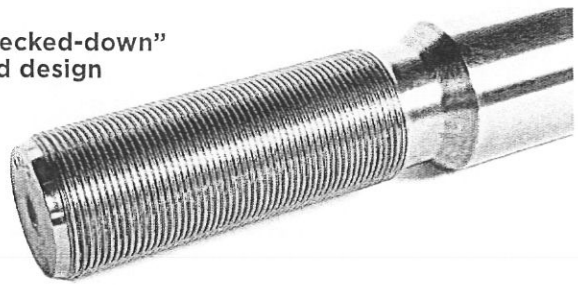
Ariel Packing Ring Technology – Uncut Rings. Unparalleled Performance.

Uncut Ring Technology

The Uncut Ring Technology replaces the radial cut back-up rings in Ariel's standard seal ring set. Uncut rings eliminate the leak paths of conventional segmented rings, and they generate less frictional heat, resulting in superior performance.

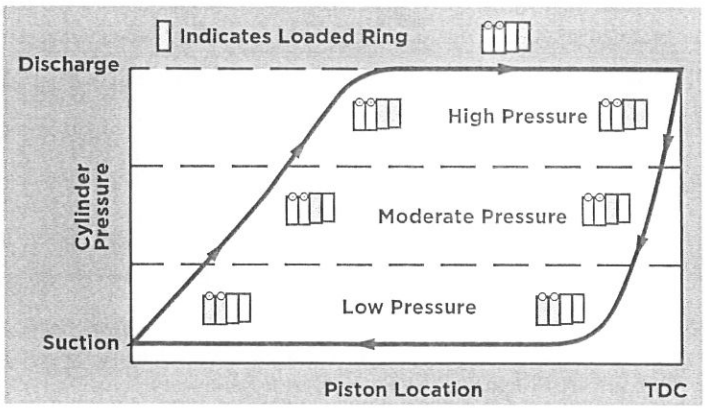
Ariel's unique "necked-down" piston rod design allows for the installation of these patented uncut packing rings by providing clearance over the threading. The BTUU packing ring set is not compatible with other compressor manufacturers' piston rods.

Ariel's "necked-down" piston rod design

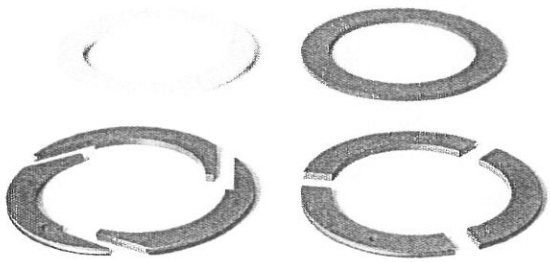


How BTUU Works: Multiple Sealing Rings

Each BTUU ring set includes multiple sealing rings that load at different pressures. The Radial-cut ring is single-acting and allows gas to flow out of the cup on suction stroke. The Tangent-cut ring seals first, and then, as the pressure builds, the first Uncut ring compresses against the rod. As pressure continues to increase, the second Uncut ring will seal against the rod. As pressure decreases, the rings unload.

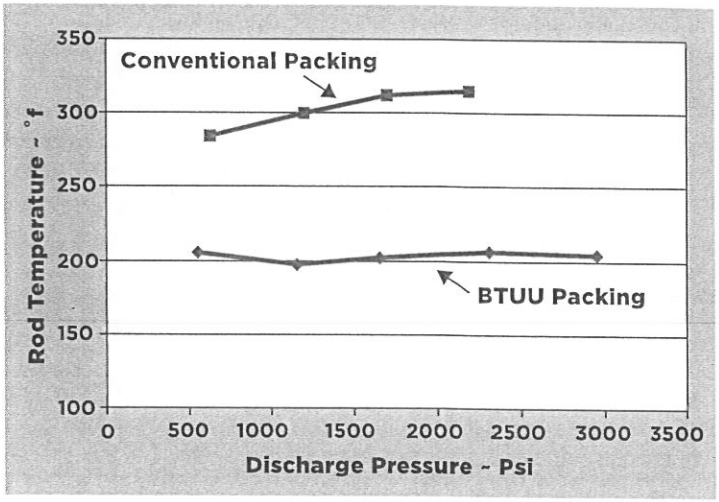


A typical BTUU ring set



The Advantages of Ariel BTUU Technology:

Reduced Temperatures: The increased sealing capacity of each ring set results in fewer cups per packing case. This decreases the frictional heat load by minimizing the number of rings in contact with the rod. The first ring set does the majority of the sealing, greatly reducing the pressure applied to subsequent tangent-cut rings - often eliminating the activation of the remaining uncut rings.



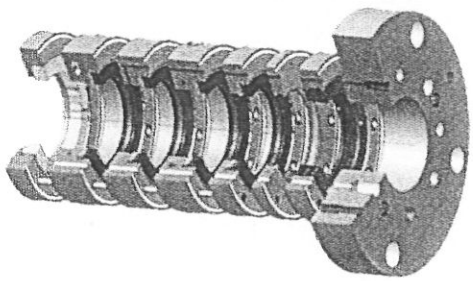
Operational Efficiency

The increased sealing capacity of uncut rings, reduced wear, and improved sealing integrity over the life of the packing means increased overall unit and facility performance.

Reduced Maintenance Costs

Along with longer run-times, improved efficiency, and prevention of downtime, Ariel BTUU technology means fewer cups (and consequently fewer rings) required for each packing assembly, which reduces re-conditioning expenses during overhauls:

	Conventional	Uncut
2000 (+) psi	5-7 rings	4-5 rings
800-2000 psi	4-6 rings	3-4 rings
300-800 psi	3-5 rings	3-4 rings
Below 300 psi	2-4 rings	2-3 rings



ARIEL CORPORATION
Ariel Response Center | P: (888) 397-7766 (Option 1) | arc@arielcorp.com
Ariel Spare Parts | P: (888) 397-7766 (Option 2) | spareparts@arielcorp.com

Genuine Ariel Parts are available through our worldwide network of authorized distributors.

LARAMIE COUNTY PLANNING & DEVELOPMENT DEPARTMENT

Planning • Building

RECEIVED
MAY 1 1 2015
EOG Resources, Inc.

CERTIFICATE OF REVIEW

This certificate is issued pursuant to section 2-2-135 of the Laramie County Land Use Regulations. The owner/agent herein named has received approval based on the Site and Landscape Plans dated **January 14, 2015** for the below-described real property. This Certificate entitles the owner/agent to make application for all relative permits subject to requirements stated below. A COPY OF THIS CERTIFICATE MUST BE PRESENTED AT THE TIME OF APPLICATION FOR PERMITS.

APPLICANT: Barbara Griswold
EOG Resources, Inc.
600 17th Street, Ste 1000N
Denver, CO 80202

PROPERTY OWNER: BSM Farms
1150 Road 137
Cheyenne, WY 82009

LEGAL: SE 1/4 SE 1/4 Sec. 19, T. 14N, R. 64W of the 6th P.M. Laramie County, WY
ZONING: Outside Zoned Boundary
ADDRESS: 1150 Road 137
USE: Compressor Station, I-80
CASE NO.: PZ-14-00179

The following requirements are limited to agencies who have responded to this matter at this time. The owner/agent is advised that they must be aware of and comply with all requirements imposed by law or regulation whether noted herein or not.

1. All applicable building permits must be obtained through the Laramie County Planning and Development Office.
2. A Certificate of Compliance (COC) from this office must be issued prior to beginning full business operation on site. Contact the Planning and Development office at (307) 633-4303 to schedule a site visit once improvements are completed.
3. Prior to issuance of the COC, the applicant must show evidence of a complete submittal of the Letter of Map Revision (LOMR) request to FEMA.
4. A GESC Permit is required.
5. Any change in use or intensity of approved uses may require further review by the County.

No approval of, acceptance or issuance of any documentation, permission, form, or permit associated with the development process by any governmental entity should be construed as either a waiver of any requirement or evidence of complete compliance with applicable law or regulation. Individuals seeking to develop property are bound by all legal and regulatory requirements whether specifically addressed by the governmental or regulatory entities involved in the process or not.

ISSUED BY: _____ **DATE:** 5/5/15
Karen Bryant, Associate Planner

RECEIVED
JUN 23 2015

eog resources

EOG Resources, Inc.
600 Seventeenth Street
Suite 1000N
Denver, CO 80202
Main: 303-572-9000
Fax: 303-824-5400

May 11, 2015

Nathan Henschel
NSR Air Quality Scientist
WY Department of Environmental Quality, Air Quality Division
122 West 25th St.
Cheyenne, WY 82002

Subject: **EOG Resources Inc.**
WAQSR Chapter 6, Section 2 Permit Application (A0000325)
I-80 Compressor Station, Laramie County

Dear Mr. Henschel,

EOG Resources Inc. (EOG) is submitting an update to the WAQSR Chapter 6, Section 2 air quality construction permit application (A0000325) to request authorization to construct a compressor station, to be named the I-80 Compressor Station, in Laramie County approximately 13 miles east of Cheyenne, on the north side of Interstate 80. The original application included one (1) condensate tank and one (1) water storage tank. Upon further discussions, it was determined that the facility will need two (2) condensate storage tanks. The throughput for the condensate storage tanks will remain at 100 barrels per day (BPD) as represented in the application. The additional tank will provide the ability to produce into one tank while the other is being unloaded. Emissions from the storage tank vent streams will be controlled through combustion in the facility flare. Truck loading emissions will be directed back to the storage tank, where they will be handled as part of the tank vent stream and controlled via combustion in the facility flare. The additional tank does not increase any emissions from what was submitted in the original application.

Facility Emissions

The facility emitting equipment list and PTE emission rates are detailed in Table 1. As shown in the table, facility total emissions are less than both PSD and federal Title V permitting thresholds.

Table 1. Proposed Emitting Equipment List & PTE Rates, I-80 Compressor Station.[1]

Source Description	NOx PTE [ton/yr]	CO PTE [ton/yr]	VOC PTE [ton/yr]	HAPs PTE [ton/yr]
TEG Dehydration Unit #1, Still Vent[2]	2.99	0.75	15.32	2.21
TEG Dehydration Unit #1, Flash Tk	5.42	1.36	20.63	0.33
TEG Dehydration Unit #1, Reboiler	0.29	0.24	0.02	$5.3x10^{-3}$
TEG Dehydration Unit #2, Still Vent[2]	2.99	0.75	15.32	2.21
TEG Dehydration Unit #2, Flash Tk	5.42	1.36	20.63	0.33
TEG Dehydration Unit #2, Reboiler	0.29	0.24	0.02	$5.3x10^{-3}$
Two Condensate Storage Tks, 400-bbl	0.44	0.11	7.07	0.64
Produced Water Storage Tk, 400-bbl	negligible	negligible	negligible	negligible
Truck Loading	0.02	0.01	2.58	0.02
Routine Vents (to flare, incl. pilot)	1.02	0.26	3.72	0.08
Equipment Leak Fugitives	0	0	6.54	0.64
Facility Total	**18.88**	**5.06**	**91.84**	**6.46**

Notes
1. Potential-to-Emit emission rates, which considers emission controls.
2. Emissions shown here represent condensing followed by combustion of the still vent stream.

Permit Application Forms

Please find enclosed the WAQSR Chapter 6, Section 2 permit application forms (IMPACT version) for the storage tanks at the facility.

Please do not hesitate to call me at (307) 823-6208 or Curtis Rice at (303) 262-9946 if you have any questions or need additional information. We appreciate your prompt attention to this most important project.

Sincerely,

Mark D. Smith
EOG Environmental – Denver Division

cc: File – Well

Attachments: As stated

Revised 11/3/2014

Specific Emission Unit Attributes:

Storage Tank/Silo

Company Equipment ID: TNK1, TNK2

Company Equipment Description: two (2) 400-bbl condensate storage tanks (controlled by facility flare)

Operating Status: Not Yet Installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

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: Construction (Greenfield/New Facility)

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

Material Type: Liquid

Description of Material Stored: condensate

Capacity: 400 Units: barrels

Maximum Throughput: 100 Units: barrels/day

Maximum Hourly Throughput: 4.16667 Units: barrels/hr

Operating Pressure (psig): 0.5

Vapor Pressure of Material Stored (psig): 7.94

Is Tank Heated?: No

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).

4-04-003-15

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

Hours/day: 24

Hours/year: 8760

Control Equipment: Yes

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): Subject to subpart

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

NSPS Subpart: *40 CFR, part 60, subpart JJJJ*

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

Revised 11/3/2014

Specific Emission Unit Attributes:

Storage Tank/Silo

Company Equipment ID: TNK3

Company Equipment Description: one (1) 400-bbl water storage tank (controlled by facility flare)

Operating Status: Not Yet Installed

Initial Construction Commencement Date: TBD

Initial Operation Commencement Date: TBD

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: Construction (Greenfield/New Facility)

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

Material Type: Liquid

Description of Material Stored: water

Capacity: 400 Units: barrels

Maximum Throughput: 50 Units: barrels/day

Maximum Hourly Throughput: 2.08 Units: barrels/hr

Operating Pressure (psig): 0.5

Vapor Pressure of Material Stored (psig): 0.1

Is Tank Heated?: No

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).

4-04-003-15

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

Hours/day: 24

Hours/year: 8760

Control Equipment: Yes

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): Subject to subpart

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

NSPS Subpart: *40 CFR, part 60, subpart JJJJ*

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

Specific Emission Unit Attributes:

Blowdown/Venting/Well Completion

Company Equipment ID: N/A

Company Equipment Description: Routine compressor blowdown activities

Operating Status: Not Yet Installed

Initial Construction Commencement Date: 1Q2015

Initial Operation Commencement Date: 2Q2015 or 3Q2015

Most Recent Construction/ Modification: N/A

Most Recent Operation Commencement Date: N/A

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

Reason: Emission-generating activity associated with new construction

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).

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

Hours/day:

Hours/year: 8, assumed

Control Equipment: Plant Flare

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): Not Affected

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): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

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: Vertical
TBD	Release Point Latitude: 41.161233
	Release Point Longitude: -104.582406
Company Release Point Description:	Base Elevation (ft): 5848
Plant Flare	Stack Height (ft): TBD
	Stack Diameter (ft): TBD
	Exit Gas Velocity (ft/s): TBD
	Exit Gas Temp (F): TBD
	Exit Gas Flow Rate (acfm): TBD
Company Release Point ID:	Release Point Type: Vertical
TBD	Release Point Latitude: 41.160664
	Release Point Longitude: -104.582206
Company Release Point Description:	Base Elevation (ft): 5836
TEG Dehydrator #1 Reboiler	Stack Height (ft): 25' 3"
	Stack Diameter (ft): 12.75" OD
	Exit Gas Velocity (ft/s): TBD
	Exit Gas Temp (F): 800-1000 °F
	Exit Gas Flow Rate (acfm): TBD
Company Release Point ID:	Release Point Type: Vertical
TBD	Release Point Latitude: 41.160661
	Release Point Longitude: -104.582008
Company Release Point Description:	Base Elevation (ft): 5836
TEG Dehydrator #2 Reboiler	Stack Height (ft): 25' 3"
	Stack Diameter (ft): 12.75" OD
	Exit Gas Velocity (ft/s): TBD
	Exit Gas Temp (F): 800-1000 °F
	Exit Gas Flow Rate (acfm): TBD
Company Release Point ID:	Release Point Type:
	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):

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)***

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	Exit Gas Velocity (ft/s): TBD
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TBD	Release Point Latitude: 41.160661
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	Exit Gas Flow Rate (acfm): TBD
Company Release Point ID:	Release Point Type:
	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):

eog resources

EOG Resources, Inc.
600 Seventeenth Street
Suite 1000N
Denver, CO 80202
Main: 303-572-9000
Fax: 303-824-5400

December 5, 2014

Josh Nall
NSR Permitting Supervisor
WY Department of Environmental Quality, Air Quality Division
122 West 25th St.
Cheyenne, WY 82002

Subject: **EOG Resources Inc.**
WAQSR Chapter 6, Section 2 Permit Application
I-80 Compressor Station, Laramie County

Dear Mr. Nall,

EOG Resources Inc. (EOG) is submitting a WAQSR Chapter 6, Section 2 air quality construction permit application to request authorization to construct a compressor station, to be named the I-80 Compressor Station, in Laramie County approximately 13 miles east of Cheyenne, on the north side of Interstate 80. EOG plans to begin construction on the facility during the first quarter of 2015 and hopes to start operation at the end of the second quarter or the start of third quarter, 2015. Potential to emit (PTE) emission rates (considering emission controls) for the proposed facility are under thresholds for Prevention of Significant Deterioration (PSD) permitting; thus, the facility will be a synthetic minor emission source.

Facility Description

The proposed compressor station will be part of EOG's ongoing development in Laramie County. EOG began drilling wells in this area in 2013 and will continue drilling wells through 2015. Gas and hydrocarbon liquids from nearby wells will be directed to the compressor station where gas, condensate, and produced water will be separated. Gas and condensate will be dehydrated in TEG dehydration units (two separate dehydration units are planned), then recombined in the pipeline, compressed, and directed to a third party gas treatment facility. Produced water will be directed via pipeline to a disposal facility.

Emission sources at the facility include two TEG dehydration units, each with a still vent stream and a glycol flash separator overhead stream. One, 400-barrel condensate storage tank, and one, 400-barrel produced water tank will be constructed at the facility. EOG plans for condensate to be sent directly to the pipeline, but will use the condensate tank on occasion. Product will be removed from the condensate tank via truck. A flare will be installed at the site, and with the exception of a few intermittent vent streams, will be used only for emergency, unplanned, or malfunction

situations. The four compressors at the facility will be electrically-driven and thus will not be emission sources.

Facility Emissions

The facility emitting equipment list and PTE emission rates are detailed in Table 1. As shown in the table, facility total emissions are less than both PSD and federal Title V permitting thresholds.

Table 1. Proposed Emitting Equipment List & PTE Rates, I-80 Compressor Sation.[1]

Source Description	NOx PTE [ton/yr]	CO PTE [ton/yr]	VOC PTE [ton/yr]	HAPs PTE [ton/yr]
TEG Dehydration Unit #1, Still Vent[2]	2.99	0.75	15.32	2.21
TEG Dehydration Unit #1, Flash Tk	5.42	1.36	20.63	0.33
TEG Dehydration Unit #1, Reboiler	0.29	0.24	0.02	$5.3x10^{-3}$
TEG Dehydration Unit #2, Still Vent[2]	2.99	0.75	15.32	2.21
TEG Dehydration Unit #2, Flash Tk	5.42	1.36	20.63	0.33
TEG Dehydration Unit #2, Reboiler	0.29	0.24	0.02	$5.3x10^{-3}$
Condensate Storage Tk, 400-bbl	0.44	0.11	7.07	0.64
Produced Water Storage Tk, 400-bbl	negligible	negligible	negligible	negligible
Truck Loading	0.02	0.01	2.58	0.02
Vents (to flare, incl. pilot)	1.02	0.26	3.72	0.08
Equipment Leak Fugitives	0	0	6.54	0.64
Facility Total	**18.88**	**5.06**	**91.84**	**6.46**

Notes
1. Potential-to-Emit emission rates, which considers emission controls.
2. Emissions shown here represent condensing followed by combustion of the still vent stream.

EOG plans for the dehydration units' still vent (glycol regenerator) emissions to be primarily controlled with a condenser (aka, BTEX Unit) followed by combustion, meaning that the still vent stream will be directed to the condenser and the overhead vapors from the condenser will then be directed to the facility flare. EOG would like to consider two alternatives to handling the condenser overhead stream, in addition to directing it to flare:

1. Direct the condenser overhead stream to the reboiler fuel line for combustion as part of the reboiler fuel. In that case, during times when the reboiler is not firing the condenser overhead stream would be directed to flare.
2. Direct the condenser overhead stream to the compressors' inlet stream, which would represent a 100% control situation, with no emissions from the dehydration units. During times when this is not possible, the condenser overhead stream would be directed to flare.

The dehydration systems will include glycol flash separators for the rich glycol streams, prior to entering their respective regenerators. The glycol flash separator overhead streams will be controlled by combustion in the facility flare.

Emissions from the storage tank vent streams will be controlled through combustion in the facility flare.

Truck loading emissions will be directed back to the storage tank, where they will be handled as part of the tank vent stream and controlled via combustion in the facility flare.

Greater Sage-Grouse Impact

Wyoming Executive Order 2011-5 for Greater Sage-Grouse Core Area Protection requires state agencies to have a focus on the maintenance and enhancement of Greater Sage-Grouse habitats, populations, and connectivity areas. To that end, new development or land uses within Greater Sage-Grouse Core Population Areas should be authorized or conducted only when it can be demonstrated that the activity will not cause declines in Greater Sage-Grouse populations.

EOG has reviewed the location of the proposed I-80 Compressor Station with respect to known Greater Sage-Grouse population areas and has determined that the proposed compressor station will not be located in a Greater Sage-Grouse Core Population Area, Connectivity Area, or Non-Core Occupied Lek Area. Attached is a map issued by the Wyoming Game and Fish Department, showing Greater Sage-Grouse Core Population Areas, Connectivity Areas, and 2-Mile Buffers for Non-Core Occupied Leks; as seen on the map, the proposed compressor station location will not be in any of these areas.

Land Use

EOG is working with Laramie County to obtain the proper land use permissions for the proposed compressor station location. EOG previously discussed this with you in a pre-application meeting and will remain in communication with you and your staff on the progress with land use permits. EOG understands and appreciates WDEQ willingness to run the air permitting process concurrent and parallel with the County permitting process so as to enhance time efficiency. Appropriate documentation related to County permits will be forwarded to the WDEQ in a future separate submittal.

Permit Application Forms

Revised WAQSR Chapter 6, Section 2 permit application forms (IMPACT version) are included as attachments to this letter, along with a copy of the facility location map, plot plan, and process flow diagram. Emission calculations, back-up documentation, and manufacturer specifications are also provided as attachments.

Timeline and Conclusion

EOG is planning to start construction during the first quarter of 2015 and will work quickly with WDEQ to answer questions in order to have a construction permit issued as soon as possible. Please contact Jason Rauen of my staff at (303) 262-9914 or via email to Jason_Rauen@eogresources.com with any questions. Alternatively, you may contact me at (303) 262-9491.

Best Regards,

John Watson
Division Facilities and Pipeline Manager

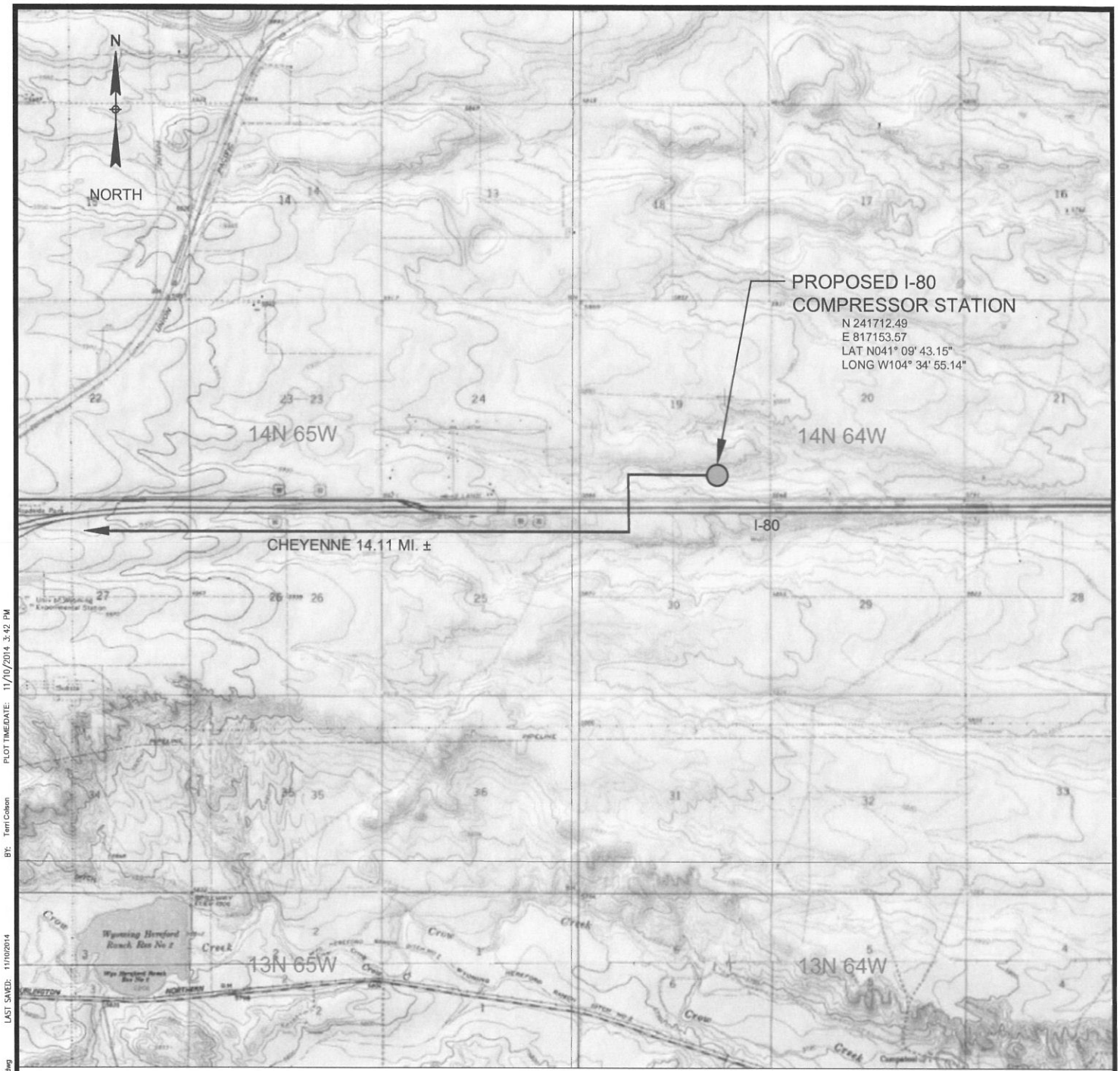
JW/kaw

Cc: Jason Rauen, EOG Resources Inc
Katrina Winborn, Kahuna Ventures

Enclosures

Attachment 1

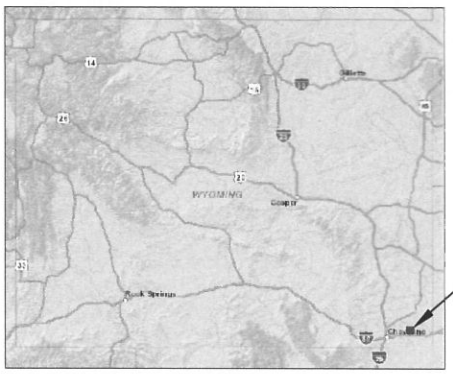
Location Map, Plot Plan, and Process Flow Diagram



EOG RESOURCES, INC.

I-80 COMPRESSOR STATION

SECTION 19, T14N, R64W

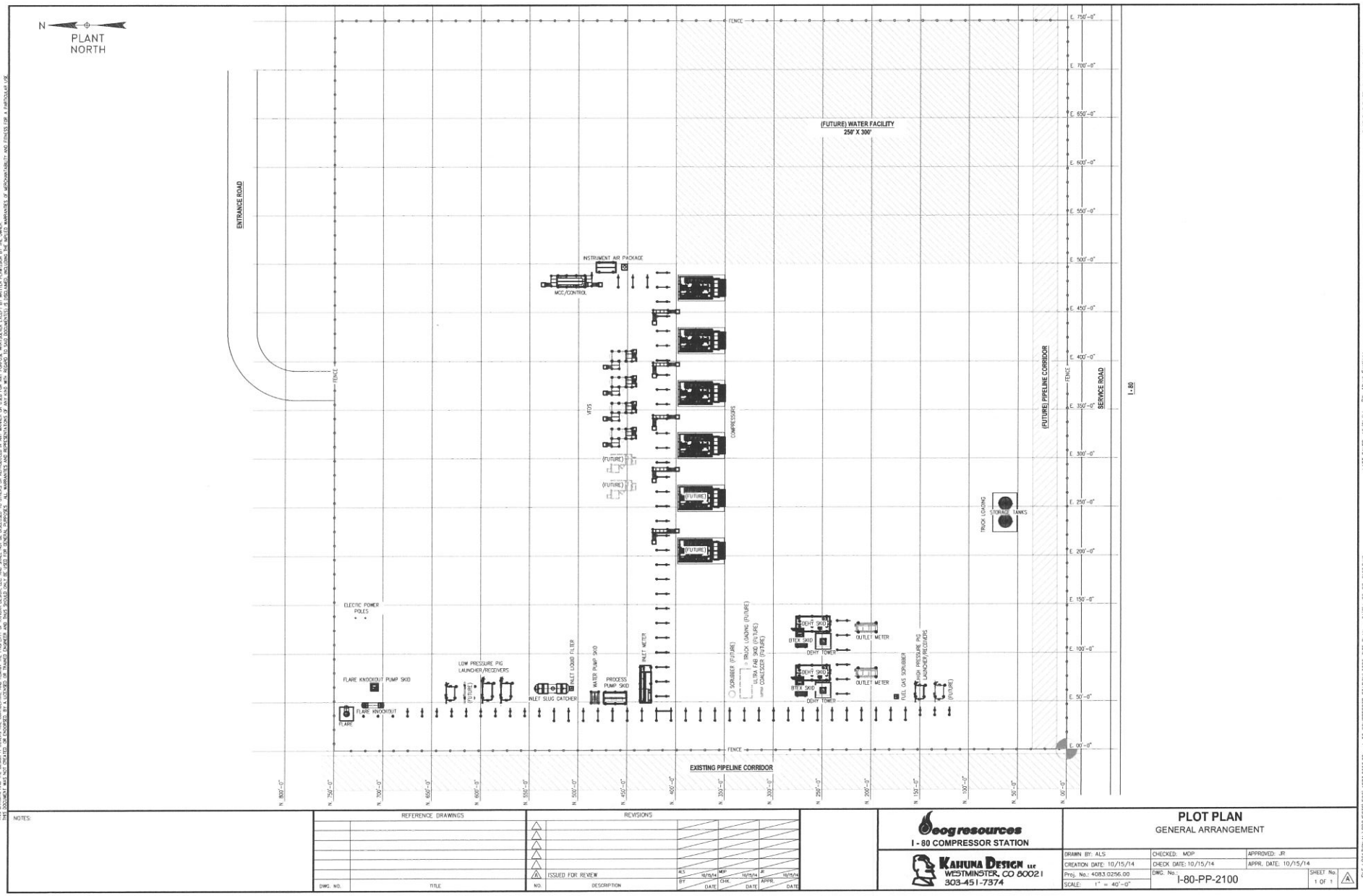


WYOMING

KAHUNA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7374
BY: KAHUNA DESIGNS LLC.

DRAWN BY: TMC	CREATION DATE: 11/10/14	DWG. No.:	SHEET No.	A
APPROVED: KW	APPR. DATE:	FIGURE 1-1 LOCATION MAP	1 OF 1	
SCALE: NA				

FILE LOCATION: N:\PROJECTS\EOG\4083.0256.00 - I-80 Compressor Station\8000-Maps & Surveys\CM-01_recover.dwg
LAST SAVED: 11/10/2014 BY: Terri Colson PLOT TIME/DATE: 11/10/2014 3:42 PM



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PLOT TIME/DATE: October 21, 2014
LAST SAVED: 10/21/14 BY: Albert Santiago
FILE LOCATION IN: \PROJECTS\2014\4083.0256.00 - I-80 COMPRESSOR STATION\2000-SITE PLAN - GA'S\I-80-PP-2100.DWG

NOTES:

REFERENCE DRAWINGS	
DWG. NO.	TITLE

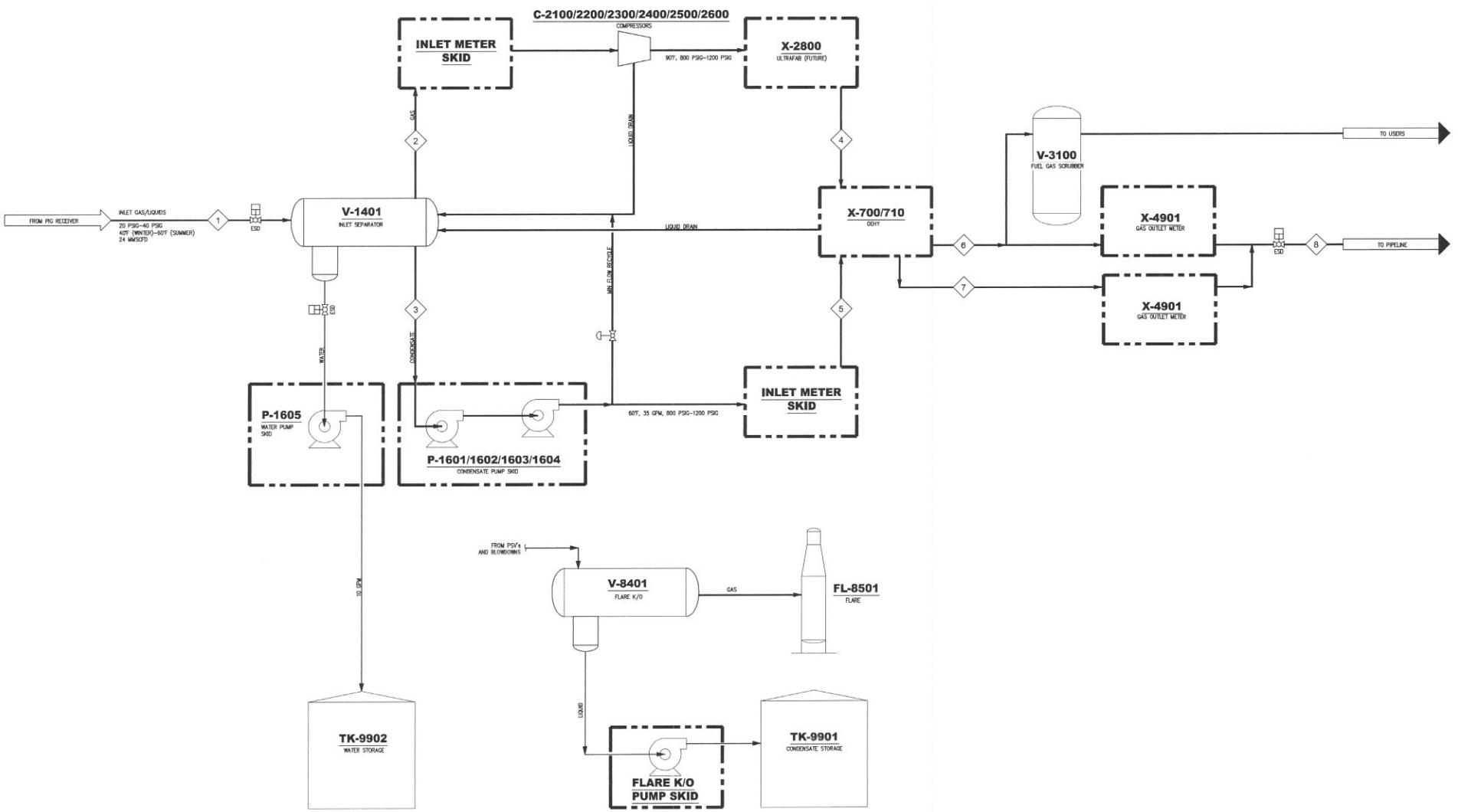
REVISIONS					
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE
1	ISSUED FOR REVIEW	ALS	10/15/14	MOP	10/15/14	JR	10/15/14

eog resources
I - 80 COMPRESSOR STATION

KAHUNA DESIGN LLC
WESTMINSTER, CO 80021
303-451-7374

PLOT PLAN
GENERAL ARRANGEMENT

DRAWN BY: ALS	CHECKED: MOP	APPROVED: JR
CREATION DATE: 10/15/14	CHECK DATE: 10/15/14	APPR. DATE: 10/15/14
Proj. No.: 4083.0256.00	DWG. No. I-80-PP-2100	SHEET No. 1 OF 1
SCALE: 1" = 40'-0"		1



NOTES:

REFERENCE DRAWINGS	
DWG. NO.	TITLE

REVISIONS					
NO.	DESCRIPTION	BY	DATE	CHK.	DATE	APPR.	DATE
A	ISSUED FOR REVIEW	CE	12/01/2014	MK	12/01/2014	MM	12/01/2014

eog resources

I-80 COMPRESSOR STATION

KAHUNA VENTURES LLC
WESTMINSTER, CO 80021
303-451-7374
BY: KAHUNA DESIGN LLC.

PROCESS FLOW DIAGRAM

DRAWN BY: C. EWING	CHECKED: N. KOSTELECKY	APPROVED: M. MILLER
CREATION DATE: 12/01/2014	CHECK DATE: 12/01/2014	APPR. DATE: 12/01/2014
Proj. No.:	DWG. No.: I8 P D	SHEET No. 1 OF 1
SCALE: NONE		A

PLOT TIME/DATE: December 1, 2014

LAST SAVED: 12/01/14 BY: Christine Ewing

FILE LOCATION: N:\PROJECTS\EOG\A063.0256.00 - I-80 COMPRESSOR STATION\V00-PFD-PID\I-80-PFD-1001.DWG

Attachment 2

Permit Application Forms

Revised 11/3/2014

WYOMING

Department of Environmental Quality Air Quality Division

Permit Application Form

Is this a revision to an existing application?

Yes _____ No X

Previous Application #:

Date of Application: 12/3/2014

COMPANY INFORMATION:

Company Name: EOG Resources

Address: 600 17th St., Suite 1000N

City: Denver State: CO Zip Code: 80202

Country: USA Phone Number: (303) 572-9000

FACILITY INFORMATION:

Facility Name: I-80 Compressor Station

New Facility or Existing Facility: New

Facility Description: Oil & Gas, Compressor Station

Facility Class: Operating Status:

Facility Type:

For Oil & Gas Production Sites ONLY:

First Date of Production (FDOP)/Date of Modification: N/A

Does production at this facility contain H2S?*

If yes, contact the Division.

API Number(s):

NAICS Code:

FACILITY LOCATION:

Enter the facility location in either the latitude/longitude area or section/township/range area. Both are not required.

Physical Address:

City: Zip Code:

State: WY County:

OR

Latitude: 41° 9' 43.15" N Longitude: 104° 34' 55.14" W County: Laramie

Quarter Quarter: SE Quarter: SE

Section: 19 Township: 14N Range: 64W

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: Mr. First Name: Jason

Last Name: Rauen

Company Name: EOG Resources

Job Title: Sr. Environmental Specialst

Address: 600 17th St., Suite 1000N

City: Denver State: CO

Zip Code: 80202

Primary Phone No.: (303) 262-9914 E-mail: Jason.Rauen@eogresources.com

Mobile Phone No.: (970) 270-8733 Fax No.:

Contact Type: Environmental Start Date:

Revised 11/3/2014

Additional Contact Type (if needed): NSR Permitting

Title: Mr. First Name: David

Last Name: Long

Company Name: EOG Resources

Job Title: Environmental Manager

Address: 600 17th St., Suite 1000N

City: Denver State: CO

Zip Code: 80202

Primary Phone No.: (303) 262-9448 E-mail: David.Long@eogresources.com

Mobile Phone No.: Fax No.:

Contact Type: NSR Permitting Start Date:

FACILITY APPLICATION INFORMATION:

General Info:

Has the facility changed location or is it a new/ greenfield facility?	New
Has a Land Use Planning document been included in this application?	No In Process
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):	NA
Non-Attainment New Source Review:	NA

Modeling Section:

Has the Air Quality Division been contacted to determine if modeling is required?	No
Is a modeling analysis part of this application?	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?	NA
Has the Air Quality Division received a Q/D analysis to submit to the respective FLMs to determine the need for an AQRV analysis?	NA

Required Attachments:

Facility Map	☑	
Process Flow Diagram	☑	
Modeling Analysis (if applicable)	☐	NA
Land Use Planning Document	☐	In Process
Detailed Project Description	☑	
Emissions Calculations	☑	

I, John Watson, Division Facilities and Pipeline Manager

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: (ink) Date: 5 Dec 14

Revised 11/3/2014

Specific Emission Unit Attributes:

Boiler

Company Equipment ID: TBD

Company Equipment Description: TEG Dehydration Unit #1 Reboiler

Operating Status: Not Yet Installed

Initial Construction Commencement Date: 1Q2015

Initial Operation Commencement Date: 3Q2015

Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

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

Reason: This will be an emission source.

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

Heat Input Rating (MMBtu/hr): 0.6

Primary Fuel Type: Dry Gas

Secondary Fuel Type: N/A

Model Name and Number: 600,000 BTU/HR TEG Reconcentrator

Serial Number Tracking Table:

Manufacturer Name: Alco Gas & Oil Production Equipment Ltd.

Serial Number: 2014-8597-06A/B

Boiler Type: Direct-fired, natural draft

Btu Content:

Fuel Sulfur Content: 0

Fuel Ash Content (%): 0

Effective Date:

Type of Service:

Units:

Units:

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).

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: _____

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): Not Affected

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): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

Revised 11/3/2014

Specific Emission Unit Attributes:

Boiler

Company Equipment ID: TBD

Company Equipment Description:
TEG Dehydration Unit #2 Reboiler

Operating Status: Not Yet Installed

Initial Construction Commencement Date: 1Q2015

Initial Operation Commencement Date: 3Q2015

Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

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

Reason: This will be an emission source.

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

Heat Input Rating (MMBtu/hr): 0.6

Primary Fuel Type: Dry Gas

Secondary Fuel Type: N/A

Model Name and Number: 600,000 BTU/HR TEG Reconcentrator

Serial Number Tracking Table:

Manufacturer Name: Alco Gas & Oil Production Equipment Ltd.

Serial Number: 2014-8597-06A/B

Boiler Type: Direct-fired, natural draft

Btu Content:

Fuel Sulfur Content: 0

Fuel Ash Content (%): 0

Effective Date:

Type of Service:

Units:

Units:

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).

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: _____

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): [Not Affected]

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): [Not Affected]

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): [Not Affected]

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): [Not Affected]

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

Non-Attainment New Source Review: [Not Affected]

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

Revised 11/3/2014

Specific Emission Unit Attributes:

Dehydration Unit

Company Equipment ID: TBD
Company Equipment Description: TEG Dehydration Unit No. 1

Operating Status: Not Yet Installed
Initial Construction Commencement Date: 1Q2015
Initial Operation Commencement Date: 3Q2015
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: This will be an emission source.

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

Dehydration Type: Glycol (TEG)
Design Capacity (MMscf/day): 20
Temperature of Wet Gas (F): 100 (max)
Water Content of Dry Gas (lbs H2O/MMscf): 4 (max)
Pressure of Wet Gas (psig): 800 (min)
Manufacturer Name of Glycol Circulation Pump: Kimray
Model Name and Number of Glycol Circulation Pump: 21020PV x 3 (two running at once to meet circ rate)
Water Content of Wet Gas (lbs H2O/MMscf): 71 max (saturated at inlet conditions)
Flow Rate of Dry Gas (MMscfd): 20
Type of Glycol Circulation Pump: Energy Exchange
Pump Volume Ratio (acfm/gpm): 61 (based on conditions above)
Actual LEAN Glycol Circulation Rate (gpm): 3.75
Maximum LEAN Glycol Circulation Rate (gpm): 7
Source of Motive Gas for Pump: Gas (from contactor)
Include Glycol Flash Separator?: Yes
Flash Tank Off Gas Stream (scf/hr): 271 + pump gas usage
Flash Tank Operating Temperature (F): 120
Flash Tank Operating Pressure (psig): 50
Where are Flash Vapors Routed?: Inlet Gas Compressor Suction (?)
Is Vessel Heated?: No
Additional Gas Stripping?: Yes
Strippping Gas Rate (scf/min): 20 (max)
Source of Stripping Gas: Dry Gas

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).

Potential Operating Schedule: Provide the operating schedule for this emission unit.
Hours/day: 24
Hours/year: 8760

Control Equipment: Yes

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): Subject to subpart

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

NSPS Subpart: *HH*

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

Revised 11/3/2014

Specific Emission Unit Attributes:

Dehydration Unit

Company Equipment ID: TBD
Company Equipment Description: TEG Dehydration Unit No. 2

Operating Status: Not Yet Installed
Initial Construction Commencement Date: 1Q2015
Initial Operation Commencement Date: 3Q2015
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: This will be an emission source.

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

Dehydration Type: Glycol (TEG)
Design Capacity (MMscf/day): 20
Temperature of Wet Gas (F): 100 (max)
Water Content of Dry Gas (lbs H2O/MMscf): 4 (max)
Pressure of Wet Gas (psig): 800 (min)
Manufacturer Name of Glycol Circulation Pump: Kimray
Model Name and Number of Glycol Circulation Pump: 21020PV x 3 (two running at once to meet circ rate)
Water Content of Wet Gas (lbs H2O/MMscf): 71 max (saturated at inlet conditions)
Flow Rate of Dry Gas (MMscfd): 20
Type of Glycol Circulation Pump: Energy Exchange
Pump Volume Ratio (acfm/gpm): 61 (based on conditions above)
Actual LEAN Glycol Circulation Rate (gpm): 3.75
Maximum LEAN Glycol Circulation Rate (gpm): 7
Source of Motive Gas for Pump: Gas (from contactor)
Include Glycol Flash Separator?: Yes
Flash Tank Off Gas Stream (scf/hr): 271 + pump gas usage
Flash Tank Operating Temperature (F): 120
Flash Tank Operating Pressure (psig): 50
Where are Flash Vapors Routed?: Inlet Gas Compressor Suction (?)
Is Vessel Heated?: No
Additional Gas Stripping?: Yes
Strippping Gas Rate (scf/min): 20 (max)
Source of Stripping Gas: Dry Gas

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).

Potential Operating Schedule: Provide the operating schedule for this emission unit.
Hours/day: 24
Hours/year: 8760

Control Equipment: Yes

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): Subject to subpart

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

NSPS Subpart: *HH*

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

Revised 11/3/2014

Specific Emission Unit Attributes:

Flare

Company Equipment ID: TBD
Company Equipment Description: Facility Flare

Operating Status: Not Yet Installed
Initial Construction Commencement Date: 1Q2015
Initial Operation Commencement Date: 3Q2015
Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

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

Reason: This will be a control device & emission unit.

If reason is ***Reconstruction*** or ***Temporary Permit*** or ***Other,*** please explain below:
Note - primary purpose will be emergency use, but some routine maintenance-related vents and emission stream vents will routinely be directed to flare.

Maximum Design Capacity (MMSCF/hr): 40 MMscfd
Minimum Design Capacity (MMSCF/hr):
Pilot Gas Volume (scf/min): 400 scfh
Emergency Flare Only: Yes
Ignition Device Type: Pilot
Btu Content (Btu/scf):
Smokeless Design: Yes
Assist Gas Utilized? Yes
Continuously Monitored? Yes
Waste Gas Volume:
Units:
Installation Date: 1Q2015

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).

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: _____

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): [Subject to subpart]

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

NSPS Subpart: Subpart A, via Subpart OOOO

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): [Not Affected]

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): [Subject to subpart]

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

Part 63 NESHAP Subpart: Subpart A, via Subpart HH

Prevention of Significant Deterioration (PSD): [Not Affected]

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

Non-Attainment New Source Review: [Not Affected]

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

Revised 11/3/2014

Specific Emission Unit Attributes:

Fugitives

Company Equipment ID: NA

Company Equipment Description: Equipment Leak Fugitives

Operating Status: Not Yet Installed

Initial Construction Commencement Date: 1Q2015

Initial Operation Commencement Date: 3Q2015

Most Recent Construction/ Modification Commencement Date: NA

Most Recent Operation Commencement Date: NA

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

Reason: This will be an emission source.

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

Type of Fugitive Emission: Fugitive Leaks at O&G

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).

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

Hours/day: 24

Hours/year: 8760

Control Equipment: No

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): Subject to subpart

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

NSPS Subpart: *OOOO*

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

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

			Efficiency Standards				
		Pre-Controlled Potential Emissions (tons/yr)	Potential to Emit (PTE)	Units	Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
Criteria Pollutants:							
1.)	Particulate emissions (PE/PM) (formerly particulate matter, PM)	Negligible				Negligible	
2.)	PM #10 microns in diameter (PE/PM10)	Negligible				Negligible	
3.)	PM #2.5 microns in diameter (PE/PM2.5)	Negligible				Negligible	
4.)	Sulfur dioxide (SO2)	Negligible				Negligible	
5.)	Nitrogen Oxides (NOx)	0.57				18.88	See attached calculations
6.)	Carbon monoxide (CO)	0.48				5.06	See attached calculations
7.)	Volatile organic compounds (VOC)	4149.22				91.84	See attached calculations
8.)	Lead (Pb)	0				0	
9.)	Total Hazardous Air Pollutants (HAPs)	290.37				6.46	See attached calculations
10.)	Fluoride (F)	0				0	
11.)	Hydrogen Sulfide (H2S)	0				0	
12.)	Mercury (Hg)	0				0	
13.)	Total Reduced Sulfur (TRS)	0				0	
14.)	Sulfuric Acid Mist (SAM)	0				0	

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

Revised 11/3/2014

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminents

Pollutants:		Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards: Potential to Emit (PTE)	Efficiency Standards: Units	Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
1.)	Benzene	166.73				3.34	
2.)	Toluene	30.79				0.64	
3.)	Ethylbenzene	2.31				0.05	
4.)	Xylenes	10.61				0.22	
5.)	n-Hexane	77.48				2.17	
6.)							
7.)							
8.)							

Greenhouse Gases (GHGs)

Pollutants:		Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards: Potential to Emit (PTE)	Efficiency Standards: Units	Potential to Emit (lbs/hr)	Potential to Emit (tons/yr)	Basis for Determination
1.)	GHGs	2,288				17,876	
2.)	GHG - CO_2e	35,515				18,580	
3.)							
4.)							
5.)							
6.)							
7.)							
8.)							

Revised 11/3/2014

Control Equipment:

Condenser

Manufacturer: Jatco
Date Installed: 1Q2015
Model Name and Number:
Company Control Equipment ID: TBD
Company Control Equipment Description: Condenser for Dehy #1 Regenerator Overhead Stream

Pollutant(s) Controlled:

☐ CO	☐ NOx	☐ Pb	☐ SO2	☑ VOC	☐ PM						
☐ PM (FIL)	☐ PM Condensible	☐ PM 10 (FIL)	☐ PM 2.5 (FIL)	☐ PM 10	☐ PM 2.5						
☑ Other HAP											

NOTE: The following fields require numeric values unless otherwise denoted with an asterisk*

Design Control Efficiency (%):
Capture Efficiency (%): 100
Operating Control Efficiency (%): 40-50%, assumed
Condenser Type:* Indirect Contact
Coolant Type:*
Design Coolant Temp. Range (F):
Design Coolant Flow Rate (gpm):
Max. Exhaust Gas Temp (F): 100
Inlet Gas Flow Rate (acfm):
Outlet Gas Flow Rate (acfm):
Inlet Gas Temp (F):
Operating Pressure (psia):
Outlet Gas Temp (F):

☐ This is the only control equipment on this air contaminant source

If not, this control equipment is: ☑ Primary ☐ Secondary ☐ Parallel

List all other emission units that are also vented to this control equipment:* None

List all release point IDs associated with this control equipment:* Condenser overhead vent to be directed to combustion device/flare, or compressor inlet, or to reboiler burner fuel line.

Revised 11/3/2014

Control Equipment:

Condenser

Manufacturer: Jatco

Date Installed: 1Q2015

Model Name and Number:

Company Control Equipment ID: TBD

Company Control Equipment Description: Condenser for Dehy #2 Regenerator Overhead Stream

Pollutant(s) Controlled:

☐ CO	☐ NOx	☐ Pb	☐ SO2	☑ VOC	☐ PM						
☐ PM (FIL)	☐ PM Condensible	☐ PM 10 (FIL)	☐ PM 2.5 (FIL)	☐ PM 10	☐ PM 2.5						
☑ Other HAP											

NOTE: The following fields require numeric values unless otherwise denoted with an asterisk*

Design Control Efficiency (%):

Capture Efficiency (%): 100

Operating Control Efficiency (%): 40-50%, assumed

Condenser Type:* Indirect Contact

Coolant Type:*

Design Coolant Temp. Range (F):

Design Coolant Flow Rate (gpm):

Max. Exhaust Gas Temp (F): 100

Inlet Gas Flow Rate (acfm):

Outlet Gas Flow Rate (acfm):

Inlet Gas Temp (F):

Operating Pressure (psia):

Outlet Gas Temp (F):

☐ This is the only control equipment on this air contaminant source

If not, this control equipment is: ☑ Primary ☐ Secondary ☐ Parallel

List all other emission units that are also vented to this control equipment:* None

List all release point IDs associated with this control equipment:* Condenser overhead vent to be directed to combustion device/flare, or compressor inlet, or to reboiler burner fuel line.

Revised 11/3/2014

Control Equipment:

Flare/Combustor

Manufacturer:	TBD	Date Installed:	1Q2015
Model Name and Number:	TBD	Company Control Equipment ID:	TBD
Company Control Equipment Description:	Facility Emergency Flare; Type, TBD		

Pollutant(s) Controlled:	☐ CO	☐ NOx	☐ Pb	☐ SO2	☑ VOC	☐ PM	
☐ PM (FIL)	☐ PM Condensible	☐ PM 10 (FIL)		☐ PM 2.5 (FIL)		☐ PM 10	☐ PM 2.5
☑ Other	HAPs						

NOTE: The following fields require numeric values unless otherwise denoted with an asterisk*

Maximum Design Capacity (MMSCF/hr):	40 MMscfd		
Minimum Design Capacity (MMSCF/hr):			
Design Control Efficiency (%):	98	Capture Efficiency (%):	100
Operating Control Efficiency (%):			
Flare Type:*	Enclosed	**Elevated Flare Type:***	Air-Assisted
Ignition Device:*	Yes	**Flame Presence Sensor:***	Yes
Inlet Gas Temp (F):		**Flame Presence Type:***	Thermocouple
Gas Flow Rate (acfm):		Outlet Gas Temp (F):	

☐ This is the only control equipment on this air contaminant source

If not, this control equipment is: ☑ Primary ☑ Secondary ☐ Parallel

List all other emission units that are also vented to this control equipment:* Dehys #1 & #2, Storage Tanks, Compressor Blowdowns, PiggingVent

List all release point IDs associated with this control equipment:*

Specific Emission Unit Attributes:

Blowdown/Venting/Well Completion

Company Equipment ID: N/A

Company Equipment Description: Routine compressor blowdown activities

Operating Status: Not Yet Installed

Initial Construction Commencement Date: 1Q2015

Initial Operation Commencement Date: 2Q2015 or 3Q2015

Most Recent Construction/ Modification: N/A

Most Recent Operation Commencement Date: N/A

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

Reason: Emission-generating activity associated with new construction

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).

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

Hours/day:

Hours/year: 8, assumed

Control Equipment: Plant Flare

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): Not Affected

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): Not Affected

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): Not Affected

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): Not Affected

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

Non-Attainment New Source Review: Not Affected

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

Attachment 3

Wet Gas Extended Analysis

PRECISION ANALYSIS

GAS MEASUREMENT EMISSIONS TESTING LABORATORY

307.856.0866
www.precision-labs.com

Client:	EOG Resources	**Analysis Date:**	4/9/2013
Sample ID:	Windy 1-18 H	**Date Sampled:**	04/08/2013
Unique #:	0	**Purpose:**	NI
Sample Temperature:	128 DEG F	**Sample Pressure:**	31 PSI
Sampled By:	Erik Hollaway	**Type Sample:**	SPOT
County:	Laramie		

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide.....	2.3600	3.427	1.802
Hydrogen Sulfide.....	0.0000	0.000	0.000
Nitrogen.....	0.4575	0.423	0.225
Methane.....	54.0930	28.636	41.030
Ethane.....	13.0025	12.902	15.558
Propane.....	15.7900	22.976	19.464
iso-Butane.....	1.6827	3.227	2.464
n-Butane.....	6.4682	12.406	9.124
iso-Pentane.....	1.5533	3.698	2.542
n-Pentane.....	2.0134	4.794	3.265
Cyclopentane.....	0.1545	0.358	0.205
n-Hexane.....	0.2542	0.723	0.468
Cyclohexane.....	0.5992	1.664	0.912
Other Hexanes	0.7302	2.076	1.343
Heptanes.....	0.5780	1.911	1.193
Methylcyclohexane.....	0.0733	0.238	0.132
2,2,4-Trimethylpentane...	0.0000	0.000	0.000
Benzene.....	0.1397	0.360	0.175
Toluene.....	0.0220	0.067	0.033
Ethylbenzene.....	0.0015	0.005	0.003
Xylenes.....	0.0054	0.019	0.009
Octanes.....	0.0096	0.036	0.022
Nonanes.....	0.0038	0.016	0.010
Decanes+.....	0.0079	0.037	0.022
Totals	100.000	100.000	100.000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.155	0.358	0.205
Cyclohexane	0.599	1.664	0.912
2-Methylpentane	0.460	1.307	0.846
3-Methylpentane	0.271	0.770	0.498
n-Hexane	0.254	0.723	0.468
Methylcyclohexane	0.073	0.238	0.132
2,2,4-Trimethylpentane	0.000	0.000	0.000
Benzene	0.140	0.360	0.175
Toluene	0.022	0.067	0.033
Ethylbenzene	0.002	0.005	0.003
m-Xylene	0.001	0.003	0.001
p-Xylene	0.004	0.013	0.006
o-Xylene	0.001	0.003	0.002

SPECIFIC GRAVITY @ 60/60 F, calculated	1.0463
TOTAL GPM (Ethane Inclusive)	12.685
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1717.926
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1688.742
AVERAGE MOLECULAR WEIGHT	30.304
MOLAR MASS RATIO	1.0457
RELATIVE DENSITY (G x Z (Air) / Z), calculated	1.0548
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1700.138
COMPRESSIBILITY FACTOR (Z)	0.99192

PROPANE GPM	4.3390
BUTANE GPM	2.5832
GASOLINE GPM (PENTANE AND HEAVIER)	2.2941

TOTAL ACID GAS MOLE %	2.3600
H2S MOLE %	0.0000
H2S PPM	0

VOC WEIGHT FRACTION	0.546

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

Attachment 4

Emission Calculations

EOG Resources
I-80 Compressor Station, Laramie County
Facility Potential Emissions

	NOx [tpy]	CO [tpy]	VOC [tpy]	Benzene [tpy]	Toluene [tpy]	Ethylbenzene [tpy]	Xylenes [tpy]	n-Hexane [tpy]	Total HAPs [tpy]	GHGs [tpy]	GHG- CO_{2e} [tpy]
Dehydration Unit #1 - Still Vent	2.99	0.75	15.32	1.56	0.29	0.02	0.10	0.23	2.21	2,577	2,679
Dehydration Unit #1 - Flash Tank	5.42	1.36	20.63	0.09	0.01	0.00	0.00	0.22	0.33	5,117	5,339
Dehydration Unit #1 - Reboiler	0.29	0.24	0.02	0.00	0.00	0.00	0.00	0.01	0.01	307	307
Dehydration Unit #2 - Still Vent	2.99	0.75	15.32	1.56	0.29	0.02	0.10	0.23	2.21	2,577	2,679
Dehydration Unit #2 - Flash Tank	5.42	1.36	20.63	0.09	0.01	0.00	0.00	0.22	0.33	5,117	5,339
Dehydration Unit #2- Reboiler	0.29	0.24	0.02	0.00	0.00	0.00	0.00	0.01	0.01	307	307
Condensate Tank	0.44	0.11	7.07	0.01	0.00	0.00	0.00	0.59	0.64	1,063	1,064
Truck Loadout	0.02	0.01	2.58	0.00	0.00	0.00	0.00	0.01	0.02	Negl	Negl
Equipment Leak Fugitives	0	0.00	6.54	0.00	0.02	0.00	0.01	0.60	0.64	1	16
Routine Vents to Flare	1.02	0.26	3.72	0.02	0.00	0.00	0.00	0.05	0.08	810	849
TOTAL	18.88	5.06	91.84	3.34	0.64	0.05	0.22	2.17	6.46	17,876	18,580

EOG Resources
I-80 Compressor Station, Laramie County
Facility Uncontrolled Emissions, at Design Max Rates (Potential, Uncontrolled Basis)

Uncontrolled Emissions

	NOx [tpy]	CO [tpy]	VOC [tpy]	Benzene [tpy]	Toluene [tpy]	Ethylbenzene [tpy]	Xylenes [tpy]	n-Hexane [tpy]	Total HAPs [tpy]	GHGs [tpy]	GHG- CO_{2e} [tpy]
Dehydration Unit #1 - Still Vent	0.00	0.00	765.88	78.00	14.72	1.11	5.20	11.37	110.39	256	5,366
Dehydration Unit #1 - Flash Tank	0.00	0.00	1031.50	4.64	0.49	0.02	0.06	11.16	16.37	554	11,637
Dehydration Unit #1 - Reboiler	0.29	0.24	0.02	0.00	0.00	0.00	0.00	0.01	0.01	307.19	307.49
Dehydration Unit #2 - Still Vent	0.00	0.00	765.88	78.00	14.72	1.11	5.20	11.37	110.39	256	5,366
Dehydration Unit #2 - Flash Tank	0.00	0.00	1031.50	4.64	0.49	0.02	0.06	11.16	16.37	554	11,637
Dehydration Unit #2- Reboiler	0.29	0.24	0.02	0.00	0.00	0.00	0.00	0.01	0.01	307.19	307.49
Condensate Tank	0.00	0.00	353.74	0.32	0.14	0.03	0.03	29.28	32.21	0	6
Truck Loadout	0.00	0.00	8.23	0.00	0.00	0.00	0.00	0.05	0.10	Negl	Negl
Equipment Leak Fugitives	0.00	0.00	6.54	0.00	0.02	0.00	0.01	0.60	0.64	0.95	16.02
Routine Vents to Flare	0.00	0.00	185.92	1.14	0.21	0.02	0.06	2.46	3.89	53	872
TOTAL	0.57	0.48	4149.22	166.73	30.79	2.31	10.61	77.48	290.37	2,288	35,515

EOG Resources
I-80 Compressor Station, Laramie County
StorageTank PTE Calculation

Emission Unit Number	TBD	
Tank Usage	Storage Tank	
Tank Contents	Condensate	
Emission Controls	Combustor Unit (Flare)	
Control Efficiency	98%	Destruction Efficiency
Tank Orientation	Vertical Fixed Roof	
Shell Height/Length	20	ft
Max Operable Height	19	ft (assumed)
Shell Diameter	12	ft
Potential Operation	8760	hr/yr
Tank Capacity	400	bbl
Tank Capacity	16,800	gal
Condensate Throughput	100	bbls/day
Tank Vent Stream	0.00630	MMscfd (ProMax calculation)[1]
	2775	Btu/scf (ProMax calculation)[1]
	0.73	MMBtu/hr

Potential Uncontrolled *Criteria and HAP Emissions*

Pollutant	Emission Factor	Estimated Emissions		Source of Emission Factor
	(lb/MMbtu)	(lb/hr)	(tpy)	
NOx	--	0.00	0.00	n/a; not flared
CO	--	0.00	0.00	n/a; not flared
VOC - working & breathing	--	1.56	6.81	ProMax®, using AP-42[2]
VOC - flashing	--	79.21	346.93	ProMax®
SO2	--	0.00	0.00	n/a; not flared
PM10	--	0.00	0.00	n/a; not flared
Benzene	--	0.07	0.32	ProMax® , using AP-42[2]
Toluene	--	0.03	0.14	
Ethylbenzene	--	0.01	0.03	
Xylenes	--	0.01	0.03	
2,2,4 TMP	--	0.55	2.41	
n-Hexane	--	6.69	29.28	
Total HAPs[6]	--	7.3539	32.21	

EOG Resources
I-80 Compressor Station, Laramie County
StorageTank PTE Calculation

Emission Unit Number	TBD	
Tank Usage	Storage Tank	
Tank Contents	Condensate	
Emission Controls	Combustor Unit (Flare)	
Control Efficiency	98%	Destruction Efficiency
Tank Orientation	Vertical Fixed Roof	
Shell Height/Length	20	ft
Max Operable Height	19	ft (assumed)
Shell Diameter	12	ft
Potential Operation	8760	hr/yr
Tank Capacity	400	bbl
Tank Capacity	16,800	gal
Condensate Throughput	100	bbls/day
Tank Vent Stream	0.00630	MMscfd (ProMax calculation)[1]
	2775	Btu/scf (ProMax calculation)[1]
	0.73	MMBtu/hr

Potential **Controlled** *Criteria and HAP Emissions*

Pollutant	Emission Factor	Estimated Emissions		Source of Emission Factor
	(lb/MMbtu)	(lb/hr)	(tpy)	
NOx (from flaring)	0.14	0.10	0.44	WDEQ[3]
CO (from flaring)	0.035	0.03	0.11	WDEQ[3]
VOC - working & breathing	--	0.03	0.14	ProMax®/AP42, flare eff
VOC - flashing		1.58	6.94	ProMax®, flare eff
VOC, total	--	--	7.07	--
SO2 (from flaring)	0.00	0.00	0.00	no S present
PM10 (from flaring)	0.00	0.00	0.00	assume smokeless
Benzene	--	0.0014	0.0063	ProMax®, flare control efficiency
Toluene	--	0.0007	0.0029	
Ethylbenzene	--	0.0001	0.0006	
Xylenes	--	0.0001	0.0005	
2,2,4 TMP	--	0.0110	0.0481	
n-Hexane	--	0.1337	0.5857	
Total HAPs	--	0.1471	0.6442	

Notes

1. See attached ProMax® output report for additional detail.
   Working & breathing losses were calculated in ProMax®, using AP-42 calculation methodology in the ProMax® "Tank Loss Stencil."
   The working/breathing calculation is the same as if the calculation were performed in the EPA's Tanks 4.09d program.
2. AP-42, Chapter 7, Chapter 1, Organic Liquid Storage Tanks; also, the same calculation method used by EPA Tanks 4.09d program.
3. Wyoming Department of Environmental Quality Oil and Gas Guidance for flaring emission factors (Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance, Rev. September 2013)

EOG Resources
I-80 Compressor Station, Laramie County
StorageTank PTE Calculation

Emission Unit Number	TBD	
Tank Usage	Storage Tank	
Tank Contents	Condensate	
Emission Controls	Combustor Unit (Flare)	
Control Efficiency	98%	Destruction Efficiency
Tank Orientation	Vertical Fixed Roof	
Shell Height/Length	20	ft
Max Operable Height	19	ft (assumed)
Shell Diameter	12	ft
Potential Operation	8760	hr/yr
Tank Capacity	400	bbl
Tank Capacity	16,800	gal
Condensate Throughput	100	bbls/day
Tank Vent Stream	0.00630	MMscfd (ProMax calculation)[1]
	2775	Btu/scf (ProMax calculation)[1]
	0.73	MMBtu/hr

Potential GHG Emissions

	Flare inlet[3] [lb/hr]	# C atoms (molar ratio for combustion rx)	GWP	GHG/yr [tons]	GHG_{CO2e}/yr [tons]
CO_2, from flare combustion of:	NA		1	1063	1063
Methane (C1):	0.61	1		7	
Ethane (C2)	5.50	2		69	
Propane (C3)	21.90	3		281	
Butanes (C4)	28.50	4		371	
Pentanes (C5)	18.82	5		246	
Hexanes (C6)	6.75	6		89	
CH_4, uncombusted	0.61		25	0.01	0.31
total GHGs				**1063**	**1,064**

EOG Resources
I-80 Compressor Station, Laramie County
Truck Loadout PTE Calculation

Emission Unit Number	TBD	
Source Description	Truck Loading Losses	
Volume Loadout	100	bbl/day
	36,500	bbl/yr
	1,533,000	gal/yr
Potential operation	365	days/yr
AP-42 Calculation Variables		
Saturation Factor (S)	1	Dedicated Vapor Balance service
Liquid True Vapor Pressure	7.94	psia, calculated by ProMax®
Vapor Molecular Weight	55.87	calculated by ProMax®
Liquid Temperature	55.43	F, determined by ProMax®
Emission Controls	Vapor Return to Tank; Combustion through tank vent	
VOC/HAP Control Efficiency	68.60%	combination of collection & combustion efficiencies
capture efficiency	*70%*	*non-NSPS or MACT trucks*
combustion efficiency	*98%*	*manufacturer specification*
Truck Loading Vent Stream to Tank & Flare	309.76	MMBtu/yr
calculated, assuming BTU value of tank vent stream and as ideal gas (379 scf/lbmol)		

Potential Uncontrolled Criteria and HAP Emissions

Pollutant	Emission Factor (lb/MMbtu)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	--		0.00	n/a; not flared
CO	--		0.00	n/a; not flared
VOC	--		8.23	ProMax®, using AP-42
SO2	--		0.00	n/a; not flared
PM10	--		0.00	n/a; not flared
Benzene	--		4.50E-04	ProMax®, using AP-42
Toluene	--		4.46E-04	
Ethylbenzene	--		1.86E-04	
Xylenes	--		2.10E-04	
2,2,4 TMP	--		0.05	
n-Hexane	--		0.05	
Total HAPs[6]	--		0.1032	

Potential **Controlled** *Criteria and HAP Emissions*

Pollutant	Emission Factor (lb/MMbtu)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NOx	0.14		0.02	WDEQ[2]
CO	0.035		0.01	WDEQ[2]
VOC	--		2.58	Control Efficiency
SO2	--		0.00	no S present
PM10	--		0.00	assume smokeless
Benzene	--		1.41E-04	Control Efficiency
Toluene	--		1.40E-04	
Ethylbenzene	--		5.85E-05	
Xylenes	--		6.58E-05	
2,2,4 TMP	--		0.01	
n-Hexane	--		0.02	
Total HAPs[6]	--		0.0324	

Notes
1. See attached Promax® Tank Loss Stencil data for additional detail.
2. Wyoming Department of Environmental Quality Oil and Gas Guidance for flaring emission factors (Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance, Rev. September 2013)

EOG Resources
I-80 Compressor Station, Laramie County
Truck Loadout PTE Calculation

QA/QC for ProMax® VOC Calculation ***Potential Emissions - AP-42 Calculation***		
EPA AP-42, Volume I, Fifth Edition - 06/08, Equation (1) 5.2-4 and Table 5.2-1, Saturation (S) Factors for Calculating Petroleum Liquid Loading Losses		
S = saturation factor	*1*	*Submerged, Dedicated vapor balance (conservative assumption)*
P = true vapor pressure of liquid loaded (psia)	*7.94*	*psia, calc'd by ProMax®*
M = molecular weight of tank vapors	*55.87*	*calculated by ProMax®*
T = temperature of bulk liquid loaded (F)	*55.43*	*Average daily temp, Cheyenne WY, determined by ProMax® database*
(R)	*515.43*	
$L_l = 12.46*S*P*M/T$	*10.72*	*(lb/1,000 gal)*
*Emissions = LI * amount loaded*	*8.22*	*tpy*

EOG Resources
I-80 Compressor Station, Laramie County
Dehydration Unit #1 - Still Vent PTE Calculation, VOC and HAPs

Equipment Usage	TEG Dehydrator #1 (Still Vent) *(TEG Flash Tank Vent emissions presented separately)*	
Operating Hours	8,760	hr/yr
Dry Gas Rate	20	MMscfd
Wet Gas Benzene Content	0.140	mole %
Glycol Circulation Rate (max)	7.5	gal/min
	(2 pumps operating in parallel @3.75 gpm max, ea.)	
Treating Temperature	100	°F
Treating Pressure	1000	psi
Stripping Gas Rate	42	scfm
Emission Controls	Still vent condenser, condenser vent stream to flare, OR to compressor inlet, or to reboiler burner fuel line Glycol flash tank, vent stream to flare	
Flare Control Efficiency	98%	
BTEX Condenser OH to flare	3120 sch/hr =	0.07488 Mscf/Day

Component	BTEXCond OH Gas[1] lbs/hr	Heating Value Btu/lbm	Heat Release Btu/hr
Water	10.20	0	0
Nitrogen, N2	0.86	0	0
Carbon Dioxide, CO2	9.10	0	0
Methane, CH4	58.30	23,811	1,388,181
Ethane, C2H6	27.40	20,277	555,590
Propane	52.00	19,757	1,027,364
Iso-Butane	7.83	19,437	152,192
Normal Butane	32.20	19,494	627,707
Iso Pentane	9.97	19,303	192,451
Normal Pentane	13.90	19,335	268,757
Cyclopentane	2.10	20,350	42,735
Hexane	2.60	19,232	50,003
Cyclohexane	13.10	20,195	264,555
Other Hexanes	6.68	20,195	134,903
Heptane	9.21	19,155	176,418
Methylcyclohexane	1.88	20,146	37,874
Benzene	17.80	18,172	323,462
Toluene	3.36	18,422	61,898
Ethylbenzene	0.25	18,658	4,739
Xylenes	1.19	18,610	22,146
C8+	0.78	20,747	16,100
TOTALS	245.25		4,880,854

Potential Criteria, HAP Emissions (controlled)

Pollutant	Emission Factor [lb/MMBtu]	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor/Calculation
NOx	0.14	0.68	2.99	WY O&G Guidance for flares
CO	0.035	0.17	0.75	WY O&G Guidance for flares
VOC	N/A; See GlyCalc Report	3.50	15.32	GRI GlyCalc
Benzene	N/A; See GlyCalc Report	0.3560	1.56	GRI GlyCalc
Toluene	N/A; See GlyCalc Report	0.0672	0.29	GRI GlyCalc
Ethyl Benzene	N/A; See GlyCalc Report	0.0051	0.02	GRI GlyCalc
Xylenes	N/A; See GlyCalc Report	0.0237	0.10	GRI GlyCalc
n-Hexane	N/A; See GlyCalc Report	0.0519	0.23	GRI GlyCalc
Total HAPs	N/A; See GlyCalc Report	0.50	2.21	GRI GlyCalc

Potential GHG Emissions

	# C atoms (molar ratio for comb rx)	GWP	GHG/yr [tons]	GHG_{CO2e}/yr [tons]
CH4, uncombusted		21	5.11	107.25
CO2, uncombusted		1	39.86	39.86
CO2, from combustion of:		1	2531.95	2531.95
Methane (C1):	*1*		*686.49*	
Ethane (C2)	*2*		*344.27*	
Propane (C3)	*3*		*668.29*	
Butanes (C4)	*4*		*520.41*	
Pentanes (C5)	*5*		*312.49*	
total GHGs			**2,577**	**2,679**

Notes
1. BTEX Condenser composition from GRI-GlyCalc Aggregate Report

EOG Resources
I-80 Compressor Station, Laramie County
Dehydration Unit #1 - Glycol Flash Separator Vent PTE Calculation, VOC and HAPs

Equipment Usage	TEG Dehydrator #1 (Flash Separator Vent) *(TEG Still Vent emissions presented separately)*	
Operating Hours	8,760	hr/yr
Dry Gas Rate	20	MMscfd
Wet Gas Benzene Content	0.140	mole %
Glycol Circulation Rate (max)	7.5	gal/min
	(2 pumps operating in parallel @3.75 gpm max, ea.)	
Treating Temperature	100	°F
Treating Pressure	1000	psi
Stripping Gas Rate	42	scfm
Emission Controls	Still vent condenser, condenser vent stream to flare, OR to compressor inlet, or to reboiler burner fuel line Glycol flash tank, vent stream to flare	
Flare Control Efficiency	98%	
Flash Separator OH to flare	5660 sch/hr =	0.13584 Mscf/Day

Component	FlashSep OH Gas[1] lbs/hr	Heating Value Btu/lbm	Heat Release Btu/hr
Water	0.10	0	0
Nitrogen, N2	1.94	0	0
Carbon Dioxide, CO2	24.90	0	0
Methane, CH4	127.00	23,811	3,023,997
Ethane, C2H6	60.80	20,277	1,232,842
Propane	106.00	19,757	2,094,242
Iso-Butane	14.50	19,437	281,837
Normal Butane	55.80	19,494	1,087,765
Iso Pentane	15.40	19,303	297,266
Normal Pentane	19.80	19,335	382,833
Cyclopentane	1.56	20,350	31,746
Hexane	2.55	19,232	49,042
Cyclohexane	5.22	20,195	105,418
Other Hexanes	7.73	20,195	156,107
Heptane	5.02	19,155	96,158
Methylcyclohexane	0.53	20,146	10,637
Benzene	1.06	18,172	19,262
Toluene	0.11	18,422	2,045
Ethylbenzene	0.00	18,658	79
Xylenes	0.01	18,610	246
C8+	0.06	20,747	1,174
TOTALS	448.22		8,839,252

Potential Criteria, HAP Emissions (controlled)

Pollutant	Emission Factor [lb/MMBtu]	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor/Calculation
NOx	0.14	1.24	5.42	WY O&G Guidance for flares
CO	0.035	0.31	1.36	WY O&G Guidance for flares
VOC	N/A; See GlyCalc Report	4.71	20.63	GRI GlyCalc
Benzene	N/A; See GlyCalc Report	0.0212	0.09	GRI GlyCalc
Toluene	N/A; See GlyCalc Report	0.0022	0.01	GRI GlyCalc
Ethyl Benzene	N/A; See GlyCalc Report	0.0001	0.00	GRI GlyCalc
Xylenes	N/A; See GlyCalc Report	0.0003	0.00	GRI GlyCalc
n-Hexane	N/A; See GlyCalc Report	0.0510	0.22	GRI GlyCalc
Total HAPs	N/A; See GlyCalc Report	0.07	0.33	GRI GlyCalc

Potential GHG Emissions

	# C atoms (molar ratio for comb rx)	GWP	GHG/yr [tons]	GHG_{CO2e}/yr [tons]
CH4, uncombusted		21	11.13	233.63
CO2, uncombusted		1	109.06	109.06
CO2, from combustion of:		1	4996.40	4996.40
Methane (C1):	*1*		*1495.44*	
Ethane (C2)	*2*		*763.93*	
Propane (C3)	*3*		*1362.29*	
Butanes (C4)	*4*		*913.93*	
Pentanes (C5)	*5*		*460.81*	
total GHGs			**5,117**	**5,339**

Notes
1. BTEX Condenser composition from GRI-GlyCalc Aggregate Report

EOG Resources
I-80 Compressor Station, Laramie County
Dehydration Unit #2 - Still Vent PTE Calculation, VOC and HAPs

Equipment Usage	TEG Dehydrator #2 (Still Vent) *(TEG Flash Tank Vent emissions presented separately)*	
Operating Hours	8,760	hr/yr
Dry Gas Rate	20	MMscfd
Wet Gas Benzene Content	0.140	mole %
Glycol Circulation Rate (max)	7.5	gal/min
	(2 pumps operating in parallel @3.75 gpm max, ea.)	
Treating Temperature	100	°F
Treating Pressure	1000	psi
Stripping Gas Rate	42	scfm
Emission Controls	Still vent condenser, condenser vent stream to flare, OR to compressor inlet, or to reboiler burner fuel line Glycol flash tank, vent stream to flare	
Flare Control Efficiency	98%	
BTEX Condenser OH to flare	3120 sch/hr =	0.07488 Mscf/Day

Component	BTEXCond OH Gas[1] lbs/hr	Heating Value Btu/lbm	Heat Release Btu/hr
Water	10.20	0	0
Nitrogen, N2	0.86	0	0
Carbon Dioxide, CO2	9.10	0	0
Methane, CH4	58.30	23,811	1,388,181
Ethane, C2H6	27.40	20,277	555,590
Propane	52.00	19,757	1,027,364
Iso-Butane	7.83	19,437	152,192
Normal Butane	32.20	19,494	627,707
Iso Pentane	9.97	19,303	192,451
Normal Pentane	13.90	19,335	268,757
Cyclopentane	2.10	20,350	42,735
Hexane	2.60	19,232	50,003
Cyclohexane	13.10	20,195	264,555
Other Hexanes	6.68	20,195	134,903
Heptane	9.21	19,155	176,418
Methylcyclohexane	1.88	20,146	37,874
Benzene	17.80	18,172	323,462
Toluene	3.36	18,422	61,898
Ethylbenzene	0.25	18,658	4,739
Xylenes	1.19	18,610	22,146
C8+	0.78	20,747	16,100
TOTALS	245.25		4,880,854

Potential Criteria, HAP Emissions (controlled)

Pollutant	Emission Factor [lb/MMBtu]	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor/Calculation
NOx	0.14	0.68	2.99	WY O&G Guidance for flares
CO	0.035	0.17	0.75	WY O&G Guidance for flares
VOC	N/A; See GlyCalc Report	3.50	15.32	GRI GlyCalc
Benzene	N/A; See GlyCalc Report	0.3560	1.56	GRI GlyCalc
Toluene	N/A; See GlyCalc Report	0.0672	0.29	GRI GlyCalc
Ethyl Benzene	N/A; See GlyCalc Report	0.0051	0.02	GRI GlyCalc
Xylenes	N/A; See GlyCalc Report	0.0237	0.10	GRI GlyCalc
n-Hexane	N/A; See GlyCalc Report	0.0519	0.23	GRI GlyCalc
Total HAPs	N/A; See GlyCalc Report	0.50	2.21	GRI GlyCalc

Potential GHG Emissions

	# C atoms (molar ratio for comb rx)	GWP	GHG/yr [tons]	GHG_{CO2e}/yr [tons]
CH4, uncombusted		21	5.11	107.25
CO2, uncombusted		1	39.86	39.86
CO2, from combustion of:		1	2531.95	2531.95
Methane (C1):	*1*		*686.49*	
Ethane (C2)	*2*		*344.27*	
Propane (C3)	*3*		*668.29*	
Butanes (C4)	*4*		*520.41*	
Pentanes (C5)	*5*		*312.49*	
total GHGs			**2,577**	**2,679**

Notes
1. BTEX Condenser composition from GRI-GlyCalc Aggregate Report

EOG Resources
I-80 Compressor Station, Laramie County
Dehydration Unit #2 - Glycol Flash Separator Vent PTE Calculation, VOC and HAPs

Equipment Usage	TEG Dehydrator #2 (Flash Separator Vent) *(TEG Still Vent emissions presented separately)*		
Operating Hours	8,760	hr/yr	
Dry Gas Rate	20	MMscfd	
Wet Gas Benzene Content	0.140	mole %	
Glycol Circulation Rate (max)	7.5	gal/min	
	(2 pumps operating in parallel @3.75 gpm max, ea.)		
Treating Temperature	100	°F	
Treating Pressure	1000	psi	
Stripping Gas Rate	42	scfm	
Emission Controls	Still vent condenser, condenser vent stream to flare, OR to compressor inlet, or to reboiler burner fuel line Glycol flash tank, vent stream to flare		
Flare Control Efficiency	98%		
Flash Separator OH to flare	5660	sch/hr =	0.13584 Mscf/Day

Component	FlashSep OH Gas[1] lbs/hr	Heating Value Btu/lbm	Heat Release Btu/hr
Water	0.10	0	0
Nitrogen, N2	1.94	0	0
Carbon Dioxide, CO2	24.90	0	0
Methane, CH4	127.00	23,811	3,023,997
Ethane, C2H6	60.80	20,277	1,232,842
Propane	106.00	19,757	2,094,242
Iso-Butane	14.50	19,437	281,837
Normal Butane	55.80	19,494	1,087,765
Iso Pentane	15.40	19,303	297,266
Normal Pentane	19.80	19,335	382,833
Cyclopentane	1.56	20,350	31,746
Hexane	2.55	19,232	49,042
Cyclohexane	5.22	20,195	105,418
Other Hexanes	7.73	20,195	156,107
Heptane	5.02	19,155	96,158
Methylcyclohexane	0.53	20,146	10,637
Benzene	1.06	18,172	19,262
Toluene	0.11	18,422	2,045
Ethylbenzene	0.00	18,658	79
Xylenes	0.01	18,610	246
C8+	0.06	20,747	1,174
TOTALS	448.22		8,839,252

Potential Criteria, HAP Emissions (controlled)

Pollutant	Emission Factor [lb/MMBtu]	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor/Calculation
NOx	0.14	1.24	5.42	WY O&G Guidance for flares
CO	0.035	0.31	1.36	WY O&G Guidance for flares
VOC	N/A; See GlyCalc Report	4.71	20.63	GRI GlyCalc
Benzene	N/A; See GlyCalc Report	0.0212	0.09	GRI GlyCalc
Toluene	N/A; See GlyCalc Report	0.0022	0.01	GRI GlyCalc
Ethyl Benzene	N/A; See GlyCalc Report	0.0001	0.00	GRI GlyCalc
Xylenes	N/A; See GlyCalc Report	0.0003	0.00	GRI GlyCalc
n-Hexane	N/A; See GlyCalc Report	0.0510	0.22	GRI GlyCalc
Total HAPs	N/A; See GlyCalc Report	0.07	0.33	GRI GlyCalc

Potential GHG Emissions

	# C atoms (molar ratio for comb rx)	GWP	GHG/yr [tons]	GHG_{CO2e}/yr [tons]
CH4, uncombusted		21	11.13	233.63
CO2, uncombusted		1	109.06	109.06
CO2, from combustion of:		1	4996.40	4996.40
Methane (C1):	*1*		*1495.44*	
Ethane (C2)	*2*		*763.93*	
Propane (C3)	*3*		*1362.29*	
Butanes (C4)	*4*		*913.93*	
Pentanes (C5)	*5*		*460.81*	
total GHGs			**5,117**	**5,339**

Notes
1. BTEX Condenser composition from GRI-GlyCalc Aggregate Report

EOG Resources
I-80 Compressor Station, Laramie County
Dehydration System #1 Reboiler PTE Calculation

Equipment Usage	TEG Dehydrator #1 Reboiler	
Equipment Make	TBD	
Equipment Model	TBD	
Serial Number	TBD	
Reboiler Burner Duty Rating	0.60	MMBtu/hr
Burner Efficiency	90	%
Operating Hours	8,760	hr/yr
Natural Gas Usage		
Fuel Heating Value (HV)	1,716	Btu/scf
NG Potential Fuel Usage	0.0004	MMscf/hr
(reboiler burner only)	9,326	scfd
	3.40	mmscf/yr

Reboiler Potential Emissions (Natural Gas Combustion, at Maximum Reboiler Duty)

Pollutant	Emission Factor (lb/MMscf) at 1,020 Btu/scf	Emission Factor (lb/MMscf) at actual NG HV	Emission Factor (lb/MMbtu)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor[4]
NOx	100.00	168.20	0.10	0.07	0.29	AP-42[1]
CO	84.00	141.29	0.08	0.05	0.24	AP-42[1]
VOC	5.50	9.25	5.4E-03	0.00	0.02	AP-42[2]
SO2	0.60	1.01	5.9E-04	0.00	0.00	AP-42[2]
PM10	7.60	12.78	7.5E-03	0.00	0.02	AP-42[2]
Benzene	2.1E-03	3.5E-03	2.1E-06	1.37E-06	6.01E-06	AP-42[3]
Formaldehyde	7.5E-02	1.3E-01	7.4E-05	4.90E-05	2.15E-04	AP-42[3]
Hexane	1.80	3.0E+00	1.8E-03	1.18E-03	5.15E-03	AP-42[3]
Total HAPs[6]	1.88	3.2E+00	1.8E-03	1.23E-03	5.39E-03	AP-42[3]

Reboiler Potential GHG Emissions (Natural Gas Combustion, at Maximum Reboiler Duty)

Pollutant	Emission Factor (kg/MMBtu)	Emission Factor GWP $_{100\text{-yr}}$ (per EPA reg)	Estimated Emissions (kg/hr)	Estimated Emissions (tpy)	Estimated Emissions (tonnes/yr)	Source of Emission Factor
CO2	53	1.00	31.81	307.18	278.67	Subpart W
Methane (CH4)	1.0.E-03	21.00	0.00	0.01	0.01	Subpart W
(N2O)	1.0.E-04	310.00	0.00	0.00	0.00	Subpart W
Total GHGs (mass)	na	NA	31.81	307.19	278.68	NA
Total GHGs (CO2e)	na	NA	31.84	307.49	278.95	NA

Notes
1. EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion.
2. EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.
3. EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.
4. Per EPA AP-42: Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from lb/10^5 scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value.
6. Sum of all HAPs listed in EPA AP-42, Volume I, Fifth Edition - August 2000, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.

EOG Resources
I-80 Compressor Station, Laramie County
Dehydration System #2 Reboiler PTE Calculation

Equipment Usage	TEG Dehydrator #2 Reboiler	
Equipment Make	TBD	
Equipment Model	TBD	
Serial Number	TBD	
Reboiler Burner Duty Rating	0.60	MMBtu/hr
Burner Efficiency	90	%
Operating Hours	8,760	hr/yr
Natural Gas Usage		
Fuel Heating Value (HV)	1,716	Btu/scf
NG Potential Fuel Usage	0.0004	MMscf/hr
(reboiler burner only)	9,326	scfd
	3.40	mmscf/yr

Reboiler Potential Emissions (Natural Gas Combustion, at Maximum Reboiler Duty)

Pollutant	Emission Factor (lb/MMscf) at 1,020 Btu/scf	Emission Factor (lb/MMscf) at actual NG HV	(lb/MMbtu)	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor[4]
NOx	100.00	168.20	0.10	0.07	0.29	AP-42[1]
CO	84.00	141.29	0.08	0.05	0.24	AP-42[1]
VOC	5.50	9.25	5.4E-03	0.00	0.02	AP-42[2]
SO2	0.60	1.01	5.9E-04	0.00	0.00	AP-42[2]
PM10	7.60	12.78	7.5E-03	0.00	0.02	AP-42[2]
Benzene	2.1E-03	3.5E-03	2.1E-06	1.37E-06	6.01E-06	AP-42[3]
Formaldehyde	7.5E-02	1.3E-01	7.4E-05	4.90E-05	2.15E-04	AP-42[3]
Hexane	1.80	3.0E+00	1.8E-03	1.18E-03	5.15E-03	AP-42[3]
Total HAPs[6]	1.88	3.2E+00	1.8E-03	1.23E-03	5.39E-03	AP-42[3]

Reboiler Potential GHG Emissions (Natural Gas Combustion, at Maximum Reboiler Duty)

Pollutant	Emission Factor (kg/MMBtu)	Emission Factor GWP 100-yr (per EPA reg)	Estimated Emissions (kg/hr)	Estimated Emissions (tpy)	Estimated Emissions (tonnes/yr)	Source of Emission Factor
CO2	53	1.00	31.81	307.18	278.67	Subpart W
Methane (CH4)	1.0.E-03	21.00	0.00	0.01	0.01	Subpart W
(N2O)	1.0.E-04	310.00	0.00	0.00	0.00	Subpart W
Total GHGs (mass)	na	NA	31.81	307.19	278.68	NA
Total GHGs (CO2e)	na	NA	31.84	307.49	278.95	NA

Notes
1. EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion.
2. EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.
3. EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.
4. Per EPA AP-42: Emission factors are based on an average natural gas higher heating value of 1,020 Btu/scf. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. The emission factors in this table may be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this average heating value.
6. Sum of all HAPs listed in EPA AP-42, Volume I, Fifth Edition - August 2000, Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion.

EOG Resources
I-80 Compressor Station, Laramie County
Produced Water Storage Tank
PTE Calculation

NOTE:

EOG considers normal emissions from the produced water storage tank to be negligible, due to the expected water content of the produced water stream.

EOG will sample and analyze the produced water after facility startup, to confirm this assumption, if requested by the WDEQ.

EOG Resources
I-80 Compressor Station, Laramie County
Flare - Routine & Predictable Flows to Flare
(Other than Dehydration Unit Vents & Storage Tank Vents, which are addressed on separate calculation pages)
PTE Calculation

Flare Control Efficiency 98%

	Flare Pilot	Compressor Blowdowns	Pigging Operations
Composition Basis	Dry Gas, as estimated via GlyCalc	Dry Gas, as estimated via GlyCalc	Dry Gas, as estimated via GlyCalc
Volumetric Flow	400 scfh	2,600 scfh, 1 blowdown, each comp	50,000 scfh
	3,504,000 scf/yr	20,800 scf/yr	5,000,000 scf/yr
Molar Flow (assume ideal)	1.055 lbmol/hr	6.860 lbmol/hr	131.926 lbmol/hr
	9245 lbmol/yr	54.9 lbmol/yr	13193 lbmol/yr
Annual Hours	8,760 hrs/year	12 hrs/year (1 hr per blowdown)	
Molecular Weight (MW)	30.3 lb/lbmol	30.3 lb/lbmol	30.3 lb/lbmol
Heating Value	1,716 Btu/scf	1,716 Btu/scf	1,716 Btu/scf
Heat Rate to Flare	0.69 MMBtu/hr	4.46 MMBtu/hr	85.80 MMBtu/hr
	6012.86 MMBtu/yr	35.69 MMBtu/yr	8,580 MMBtu/yr

Components	Flare Pilot			Compressor Blowdowns			Pigging Operations		
	Mole Fraction (dry gas)	Mass Flow [lb/hr]	Mass Flow [lb/yr]	Mole Fraction (dry gas)	Mass Flow [lb/hr]	Mass Flow [lb/yr]	Mole Fraction (dry gas)	Mass Flow [lb/hr]	Mass Flow [lb/yr]
Water	0.00	0.00	8.19	0.00	0.01	0.05	0.00	0.12	11.69
Nitrogen, N2	0.46	0.14	1186.18	0.46	0.88	7.04	0.46	16.93	1692.61
Carbon Dioxide, CO2	2.35	1.09	9561.90	2.35	7.10	56.76	2.35	136.44	13644.26
Methane, CH4	54.10	9.16	80228.10	54.10	59.53	476.24	54.10	1144.81	114480.74
Ethane, C2H6	13.00	4.13	36141.13	13.00	26.82	214.54	13.00	515.71	51571.24
Propane	15.80	7.35	64419.98	15.80	47.80	382.40	15.80	919.23	91923.48
Iso-Butane	1.68	1.03	9027.34	1.68	6.70	53.59	1.68	128.81	12881.48
Normal Butane	6.47	3.97	34766.00	6.47	25.80	206.37	6.47	496.09	49609.02
Iso Pentane	1.55	1.18	10339.34	1.55	7.67	61.38	1.55	147.54	14753.63
Normal Pentane	2.01	1.53	13407.79	2.01	9.95	79.59	2.01	191.32	19132.12
Cyclopentane	0.15	0.11	998.08	0.15	0.74	5.92	0.15	14.24	1424.20
n-Hexane	0.25	0.23	2023.79	0.25	1.50	12.01	0.25	28.88	2887.83
Cyclohexane	0.60	0.53	4629.64	0.60	3.44	27.48	0.60	66.06	6606.23
Other Hexanes	0.73	0.66	5816.40	0.73	4.32	34.53	0.73	83.00	8299.66
Heptane	0.58	0.61	5345.79	0.58	3.97	31.73	0.58	76.28	7628.12
Methylcyclohexane	0.07	0.08	661.76	0.07	0.49	3.93	0.07	9.44	944.30
Benzene	0.13	0.11	938.80	0.13	0.70	5.57	0.13	13.40	1339.62
Toluene	0.02	0.02	174.63	0.02	0.13	1.04	0.02	2.49	249.19
Ethylbenzene	0.00	0.00	13.74	0.00	0.01	0.08	0.00	0.20	19.61
Xylenes	0.00	0.01	48.49	0.00	0.04	0.29	0.00	0.69	69.19
C8+	0.02	0.03	224.95	0.02	0.17	1.34	0.02	3.21	320.99
TOTALS	99.98	31.96	279,962.03	99.98	207.73	1,661.88	99.98	3,994.89	399,489.19

Potential Controlled Criteria & HAP Emissions - Total, All Vent Streams Listed Above

Pollutant	Emission Factor [lb/MMBtu]	Estimated Emissions (lb/hr)	Estimated Emissions (tpy)	Source of Emission Factor
NO_x[2]	0.140	12.73	1.02	WY O&G Guidance for flares
CO[2]	0.035	3.18	0.26	WY O&G Guidance for flares
VOC	NA; use flare control efficiency	46.23	3.72	Flare Manufacturer/Guarantee
Benzene		0.28	0.02	
Toluene		0.05	0.00	
Ethyl Benzene		0.00	0.00	
Xylenes		0.01	0.00	
n-Hexane		0.61	0.05	
Total HAPs		0.97	0.08	

Potential GHG Emissions [2]

	# C atoms (molar ratio for comb. rx)	GWP	GHG/yr [tons]	GHG_{CO2e}/yr [tons]
CH4, uncombusted		21	1.95	40.99
CO2, uncombusted		1	11.63	11.63
CO2, from combustion of:		1	796.78	796.78
Methane (C1):	*1*		*262.37*	
Ethane (C2)	*2*		*126.11*	
Propane (C3)	*3*		*229.93*	
Butanes (C4)	*4*		*158.12*	
Pentanes (C5)	*5*		*20.25*	
total GHGs			**810**	**849**

Notes

1. Composition from GRI-GlyCalc Aggregate Report

EOG Resources
I-80 Compressor Station, Laramie County
Fuel Gas Analysis

Gas Analysis: *Dry Gas stream, as calculated by Gly-Calc*

	Mole Fraction %	MW [lb/lb-mol]	*Calculate gas MW*	HHV (Gross HV) [Btu/scf]	*Calculate gas HHV*
Water	0.00	18.01528	*0.000886352*	0	*0*
Nitrogen, N2	0.46	28.013	*0.12829954*	0	*0*
Carbon Dioxide, CO2	2.35	44.01	*1.034235*	0	*0*
Methane, CH4	54.10	16.04	*8.67764*	1011	*546.951*
Ethane, C2H6	13.00	30.07	*3.9091*	1783	*231.79*
Propane	15.80	44.1	*6.9678*	2572	*406.376*
Iso-Butane	1.68	58.12	*0.976416*	3252	*54.63192*
Normal Butane	6.47	58.12	*3.760364*	3225	*208.6575*
Iso Pentane	1.55	72.15	*1.118325*	4001	*62.01395*
Normal Pentane	2.01	72.15	*1.450215*	3981	*80.0181*
Cyclopentane	0.15	70.1	*0.107954*	3973	*6.11842*
n-Hexane	0.25	86.18	*0.2188972*	4667	*11.85418*
Cyclohexane	0.60	84.16	*0.500752*	4734	*28.1673*
Other Hexanes	0.73	86.18	*0.629114*	4667	*34.0691*
Heptane	0.58	100.21	*0.5782117*	5812	*33.53524*
Methylcyclohexane	0.07	98.186	*0.071577594*	5509	*4.016061*
Benzene	0.13	78.11	*0.101543*	3741	*4.8633*
Toluene	0.02	92.14	*0.0188887*	4408	*0.90364*
Ethylbenzene	0.00	106.17	*0.00148638*	5517	*0.077238*
Xylenes	0.00	106.16	*0.005244304*	5155	*0.254657*
C8+	0.02	114.23	*0.02433099*	6239	*1.328907*
TOTAL, gas mixture	99.98	30.28	--	1716	--

EOG Resources
I-80 Compressor Station, Laramie County
Equipment Leaks (Fugitive Emissions) PTE & Detail Sheet

Component Type	Estimated Number of Components	Oil & Gas Production TOC Emission Factors[1]		Emissions											
		[kg/hr/component]	[lb/hr/component]	TOC [lb/hr]	VOC [lb/hr]	n-Hexane [lb/hr]	Benzene [lb/hr]	Toluene [lb/hr]	Ethyl benzene [lb/hr]	Xylenes [lb/hr]	Total HAP [lb/hr]	CO2 [lb/hr]	CH4 [lb/hr]	Total GHG [lb/hr]	Total CO2e [lb/hr]
Valves:															
Gas/Vapor:	40	4.5E-03	9.9E-03	0.40	0.36	1.3E-03	0.0E+00	0.000	0.000	0.0006	0.002	0.003	0.065	0.067	1.617
Light Liquid:	20	2.5E-03	5.5E-03	0.11	0.06	2.4E-02	3.5E-04	0.001	0.000	0.000	0.025	0.000	0.000	0.000	0.003
Heavy Liquid (Oil):	0	8.4E-06	1.9E-05	0.00	0.00	0.0E+00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water/Oil	20	9.8E-05	2.2E-04	0.00	0.00	0.0E+00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pump Seals:															
Gas/Vapor:	0	2.4E-03	5.3E-03	0.00	0.00	0.0E+00	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000
Light Liquid:	0	1.3E-02	2.9E-02	0.00	0.00	0.0E+00	0.000	0.000	0.0000	0.000	0.000	0.000	0.000		0.000
Heavy Liquid (Oil):	0			0.00	0.00										
Water/Oil	0	2.4E-05	5.3E-05	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Others:															
Gas/Vapor:	20	8.8E-03	1.9E-02	0.39	0.35	1.3E-03	0.000	0.000	0.0000	0.001	0.002	0.002	0.063	0.066	0.000
Light Liquid:	20	7.5E-03	1.7E-02	0.33	0.18	7.2E-02	0.000	0.002	0.000	0.000	0.074	0.000	0.000	0.000	0.010
Heavy Liquid (Oil):	0	3.2E-05	7.1E-05	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water/Oil	20	1.4E-02	3.1E-02	0.62	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Connectors:															
Gas/Vapor:	100	2.0E-04	4.4E-04	0.04	0.04	1.5E-04	0.000	0.000	0.0000	0.000	0.000	0.000	0.007	0.007	0.180
Light Liquid:	100	2.1E-04	4.6E-04	0.05	0.03	1.0E-02	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.001
Heavy Liquid (Oil)	0	7.5E-06	1.7E-05	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water/Oil	0	1.1E-04	2.4E-04	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flanges:															
Gas/Vapor:	500	3.9E-04	8.6E-04	0.43	0.39	0.0E+00	0.000	0.000	0.0000	0.001	0.001	0.003	0.070	0.073	1.752
Light Liquid:	500	1.1E-04	2.4E-04	0.12	0.07	2.6E-02	0.000	0.001	0.000	0.000	0.027	0.000	0.000	0.000	0.004
Heavy Liquid (Oil)	0	3.9E-07	8.6E-07	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water/Oil	500	2.9E-06	6.4E-06	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Open-Ended Lines															
Gas/Vapor:	5	2.0E-03	4.4E-03	0.02	0.02	0.0E+00	0.000	0.000	0.0000	0.000	0.000	0.000	0.004	0.004	0.090
Light Liquid:	5	1.4E-03	3.1E-03	0.02	0.01	3.3E-03	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000
Heavy Liquid (Oil)	0	1.4E-04	3.1E-04	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Water/Oil	0	2.5E-04	5.5E-04	0.00	0.00	0.0E+00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	TOC	VOC	n-Hexane	Benzene	Toluene	EthylBenzen	Xylenes	HAPs	CO2	CH4	GHGs	CO2e
Totals, [lb/hr]	2.53	1.49	0.14	0.00	0.00	0.00	0.00	0.15	0.01	0.21	0.22	3.66
Totals, [lb/yr]	*22158.98*	*13078.75*	*1206.76*	*4.44*	*41.99*	*4.03*	*16.83*	*1274.05*	*72.37*	*1832.61*	*1904.98*	*32038.26*
Totals [tpy]	11.08	6.54	0.60	0.00	0.02	0.00	0.01	0.64	0.04	0.92	0.95	16.02
	TOC	VOC	n-Hexane	Benzene	Toluene	EthylBenzen	Xylenes	HAPs	CO2	CH4	GHGs	CO2e
							xylenes, all [lb/yr]					

Notes
1. EPA's 1995 Protocol for Equipment Leak Emission Estimates, Table 2-4 (Oil and Gas Production Operations Average Emission Factors)

Backup data, for fugitive equipment leak emission calculations presented on previous page

Average Assumed Compositions for Facility, %*				
	Gas/Vapor	Light Liquid	Heavy Oil	Water/Oil
			N/A	*N/A*
VOC	90.00	54.53	0.00	0.00
n-Hexane	0.34	21.63	0.00	0.00
2,2,4 TMP	0.00	0.00	0.00	0.00
Benzene	1.00	0.32	0.00	0.00
Toluene	0.10	0.57	0.00	0.00
Ethylbenzene	0.01	0.05	0.00	0.00
m-Xylene	0.05	0.20	0.00	0.00
o-Xylene	0.05	0.16	0.00	0.00
p-Xylene	0.05	0.00	0.00	0.00
Xylenes	0.15			
CO2	0.64	0.01	0.00	0.00
CH4	16.27	0.12	0.00	0.00

* No water/oil or heavy oil streams in this project, only gas/vapor and light liquid.

Attachment 4-a

Backup Documentation: GRI-GLYCalc 4.0 Input and Aggregate Reports for Dehydration Units #1 and #2

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: EOG Resources, I-80 Compressor Station, Dehy #1
File Name: S:\KVEnv\EOG I-80_Stn WY\Air Permit NSR App\Documents_Spreadsheets\I-80 CS Windy flash gas Dehy1.ddf
Date: December 02, 2014

DESCRIPTION:

Description: PTE Calculation for 1 of 2 dehy units, 20 MMscfd
Windy 1-18H gas sample results; 4/8/2013 sample date
Three glycol pumps; 2 in use, 1 spare

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 100.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	2.3600
Nitrogen	0.4575
Methane	54.0930
Ethane	13.0025
Propane	15.7900
Isobutane	1.6827
n-Butane	6.4682
Isopentane	1.5533
n-Pentane	2.0134
Cyclopentane	0.1545
n-Hexane	0.2542
Cyclohexane	0.5992
Other Hexanes	0.7302
Heptanes	0.5780
Methylcyclohexane	0.0733
Benzene	0.1397
Toluene	0.0220
Ethylbenzene	0.0015
Xylenes	0.0054
C8+ Heavies	0.0213

DRY GAS:

Flow Rate: 20.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 7.5 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Temperature: 80.0 deg. F
Pressure: 60.0 psig

STRIPPING GAS:

Source of Gas: Dry Gas
Gas Flow Rate: 42.000 scfm

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Condenser
Temperature: 100.0 deg. F
Pressure: 14.0 psia

Control Device: Combustion Device
Destruction Efficiency: 98.0 %
Excess Oxygen: 5.0 %
Ambient Air Temperature: 60.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: EOG Resources, I-80 Compressor Station, Dehy #1
File Name: S:\KVEnv\EOG I-80_Stn WY\Air Permit NSR App\Documents_Spreadsheets\I-80 CS Windy flash gas Dehy1.ddf
Date: December 02, 2014

DESCRIPTION:

Description: PTE Calculation for 1 of 2 dehy units, 20 MMscfd
Windy 1-18H gas sample results; 4/8/2013 sample date
Three glycol pumps; 2 in use, 1 spare

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	1.1668	28.002	5.1104
Ethane	0.5474	13.138	2.3977
Propane	1.0394	24.947	4.5528
Isobutane	0.1567	3.760	0.6863
n-Butane	0.6439	15.454	2.8203
Isopentane	0.1993	4.784	0.8731
n-Pentane	0.2785	6.683	1.2196
Cyclopentane	0.0420	1.007	0.1838
n-Hexane	0.0519	1.246	0.2273
Cyclohexane	0.2624	6.297	1.1492
Other Hexanes	0.1337	3.208	0.5854
Heptanes	0.1841	4.418	0.8064
Methylcyclohexane	0.0376	0.903	0.1648
Benzene	0.3560	8.544	1.5592
Toluene	0.0672	1.612	0.2942
Ethylbenzene	0.0051	0.122	0.0222
Xylenes	0.0237	0.570	0.1040
C8+ Heavies	0.0155	0.372	0.0680
Total Emissions	5.2111	125.067	22.8247
Total Hydrocarbon Emissions	5.2111	125.067	22.8247
Total VOC Emissions	3.4969	83.927	15.3166
Total HAP Emissions	0.5039	12.093	2.2070
Total BTEX Emissions	0.4520	10.847	1.9797

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	58.3381	1400.114	255.5209
Ethane	27.3709	656.902	119.8845
Propane	51.9723	1247.335	227.6386
Isobutane	7.8343	188.023	34.3142
n-Butane	32.1952	772.685	141.0151

Isopentane	9.9664	239.193	43.6528
n-Pentane	13.9227	334.144	60.9814
Cyclopentane	2.0983	50.360	9.1907
n-Hexane	2.5950	62.280	11.3662
Cyclohexane	13.1186	314.846	57.4593
Other Hexanes	6.6832	160.396	29.2723
Heptanes	9.2051	220.922	40.3182
Methylcyclohexane	1.8818	45.162	8.2421
Benzene	17.8080	427.392	77.9991
Toluene	3.3599	80.639	14.7165
Ethylbenzene	0.2540	6.096	1.1125
Xylenes	1.1873	28.495	5.2004
C8+ Heavies	0.7759	18.623	3.3986
Total Emissions	260.5670	6253.607	1141.2833
Total Hydrocarbon Emissions	260.5670	6253.607	1141.2833
Total VOC Emissions	174.8580	4196.591	765.8779
Total HAP Emissions	25.2043	604.902	110.3947
Total BTEX Emissions	22.6093	542.622	99.0285

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.5302	60.726	11.0825
Ethane	1.2151	29.162	5.3221
Propane	2.1231	50.955	9.2993
Isobutane	0.2891	6.938	1.2661
n-Butane	1.1165	26.795	4.8901
Isopentane	0.3084	7.401	1.3507
n-Pentane	0.3958	9.500	1.7338
Cyclopentane	0.0313	0.750	0.1370
n-Hexane	0.0510	1.223	0.2233
Cyclohexane	0.1045	2.507	0.4576
Other Hexanes	0.1547	3.713	0.6776
Heptanes	0.1004	2.409	0.4396
Methylcyclohexane	0.0106	0.253	0.0462
Benzene	0.0212	0.508	0.0927
Toluene	0.0022	0.053	0.0098
Ethylbenzene	0.0001	0.002	0.0004
Xylenes	0.0003	0.006	0.0012
C8+ Heavies	0.0011	0.027	0.0050
Total Emissions	8.4554	202.930	37.0347
Total Hydrocarbon Emissions	8.4554	202.930	37.0347
Total VOC Emissions	4.7101	113.041	20.6301
Total HAP Emissions	0.0747	1.793	0.3273
Total BTEX Emissions	0.0237	0.570	0.1040

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	126.5125	3036.299	554.1246
Ethane	60.7546	1458.111	266.1052
Propane	106.1560	2547.744	464.9633
Isobutane	14.4531	346.875	63.3047
n-Butane	55.8225	1339.741	244.5027

Isopentane	15.4185	370.043	67.5328
n-Pentane	19.7922	475.013	86.6899
Cyclopentane	1.5634	37.521	6.8476
n-Hexane	2.5490	61.175	11.1644
Cyclohexane	5.2236	125.367	22.8796
Other Hexanes	7.7349	185.638	33.8790
Heptanes	5.0182	120.438	21.9799
Methylcyclohexane	0.5276	12.663	2.3110
Benzene	1.0586	25.406	4.6366
Toluene	0.1113	2.672	0.4877
Ethylbenzene	0.0042	0.101	0.0184
Xylenes	0.0132	0.317	0.0579
C8+ Heavies	0.0566	1.359	0.2480
Total Emissions	422.7702	10146.484	1851.7334
Total Hydrocarbon Emissions	422.7702	10146.484	1851.7334
Total VOC Emissions	235.5031	5652.074	1031.5035
Total HAP Emissions	3.7363	89.672	16.3651
Total BTEX Emissions	1.1874	28.497	5.2007

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	3.6970	88.728	16.1929
Ethane	1.7625	42.300	7.7198
Propane	3.1626	75.901	13.8520
Isobutane	0.4457	10.698	1.9524
n-Butane	1.7604	42.248	7.7103
Isopentane	0.5077	12.185	2.2237
n-Pentane	0.6743	16.183	2.9534
Cyclopentane	0.0732	1.758	0.3208
n-Hexane	0.1029	2.469	0.4506
Cyclohexane	0.3668	8.804	1.6068
Other Hexanes	0.2884	6.921	1.2630
Heptanes	0.2845	6.827	1.2460
Methylcyclohexane	0.0482	1.157	0.2111
Benzene	0.3772	9.052	1.6520
Toluene	0.0694	1.666	0.3040
Ethylbenzene	0.0052	0.124	0.0226
Xylenes	0.0240	0.576	0.1051
C8+ Heavies	0.0167	0.400	0.0729
Total Emissions	13.6665	327.996	59.8593
Total Hydrocarbon Emissions	13.6665	327.996	59.8593
Total VOC Emissions	8.2070	196.968	35.9467
Total HAP Emissions	0.5786	13.887	2.5343
Total BTEX Emissions	0.4757	11.417	2.0837

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	809.6454	16.1929	98.00
Ethane	385.9898	7.7198	98.00
Propane	692.6019	13.8520	98.00

Isobutane	97.6189	1.9524	98.00
n-Butane	385.5178	7.7103	98.00
Isopentane	111.1856	2.2237	98.00
n-Pentane	147.6712	2.9534	98.00
Cyclopentane	16.0382	0.3208	98.00
n-Hexane	22.5306	0.4506	98.00
Cyclohexane	80.3389	1.6068	98.00
Other Hexanes	63.1513	1.2630	98.00
Heptanes	62.2981	1.2460	98.00
Methylcyclohexane	10.5532	0.2111	98.00
Benzene	82.6357	1.6520	98.00
Toluene	15.2042	0.3040	98.00
Ethylbenzene	1.1309	0.0226	98.00
Xylenes	5.2583	0.1051	98.00
C8+ Heavies	3.6466	0.0729	98.00
Total Emissions	2993.0167	59.8593	98.00
Total Hydrocarbon Emissions	2993.0167	59.8593	98.00
Total VOC Emissions	1797.3814	35.9467	98.00
Total HAP Emissions	126.7598	2.5343	98.00
Total BTEX Emissions	104.2292	2.0837	98.00

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature:	100.00 deg. F
Condenser Pressure:	14.00 psia
Condenser Duty:	1.15e+000 MM BTU/hr
Produced Water:	2.37 bbls/day
Ambient Temperature:	60.00 deg. F
Excess Oxygen:	5.00 %
Combustion Efficiency:	98.00 %
Supplemental Fuel Requirement:	1.15e+000 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
Cyclopentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25	
Calculated Dry Gas Dew Point:	2.33	lbs. H2O/MMSCF
Temperature:	100.0	deg. F
Pressure:	1000.0	psig
Dry Gas Flow Rate:	20.0000	MMSCF/day
Glycol Losses with Dry Gas:	8.3330	lb/hr
Wet Gas Water Content:	Saturated	
Calculated Wet Gas Water Content:	55.71	lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	10.11	gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.18%	95.82%
Carbon Dioxide	99.42%	0.58%
Nitrogen	99.92%	0.08%
Methane	99.94%	0.06%
Ethane	99.89%	0.11%
Propane	99.88%	0.12%
Isobutane	99.88%	0.12%
n-Butane	99.85%	0.15%
Isopentane	99.88%	0.12%
n-Pentane	99.86%	0.14%
Cyclopentane	99.37%	0.63%
n-Hexane	99.84%	0.16%
Cyclohexane	99.26%	0.74%
Other Hexanes	99.87%	0.13%
Heptanes	99.79%	0.21%
Methylcyclohexane	99.39%	0.61%
Benzene	93.03%	6.97%
Toluene	93.10%	6.90%
Ethylbenzene	93.52%	6.48%
Xylenes	91.36%	8.64%
C8+ Heavies	99.87%	0.13%

FLASH TANK

Flash Control:	Combustion device	
Flash Control Efficiency:	98.00	%
Flash Temperature:	80.0	deg. F
Flash Pressure:	60.0	psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.91%	0.09%
Carbon Dioxide	8.25%	91.75%
Nitrogen	0.52%	99.48%
Methane	0.54%	99.46%
Ethane	2.26%	97.74%
Propane	5.12%	94.88%

Isobutane	8.48%	91.52%
n-Butane	11.48%	88.52%
Isopentane	14.14%	85.86%
n-Pentane	17.85%	82.15%
Cyclopentane	47.06%	52.94%
n-Hexane	30.99%	69.01%
Cyclohexane	65.83%	34.17%
Other Hexanes	24.59%	75.41%
Heptanes	51.72%	48.28%
Methylcyclohexane	73.27%	26.73%
Benzene	94.45%	5.55%
Toluene	96.92%	3.08%
Ethylbenzene	98.47%	1.53%
Xylenes	99.00%	1.00%
C8+ Heavies	90.66%	9.34%

REGENERATOR

Regenerator Stripping Gas:
Dry Product Gas
Stripping Gas Flow Rate: 42.0000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	58.58%	41.42%
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%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.58%	99.42%
n-Pentane	0.54%	99.46%
Cyclopentane	0.54%	99.46%
n-Hexane	0.33%	99.67%
Cyclohexane	2.71%	97.29%
Other Hexanes	0.72%	99.28%
Heptanes	0.24%	99.76%
Methylcyclohexane	2.79%	97.21%
Benzene	4.89%	95.11%
Toluene	7.54%	92.46%
Ethylbenzene	9.75%	90.25%
Xylenes	12.31%	87.69%
C8+ Heavies	2.60%	97.40%

STREAM REPORTS:

WET GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.35e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.17e-001	4.65e+001
Carbon Dioxide	2.36e+000	2.28e+003
Nitrogen	4.57e-001	2.82e+002
Methane	5.40e+001	1.91e+004
Ethane	1.30e+001	8.60e+003
Propane	1.58e+001	1.53e+004
Isobutane	1.68e+000	2.15e+003
n-Butane	6.46e+000	8.27e+003
Isopentane	1.55e+000	2.46e+003
n-Pentane	2.01e+000	3.19e+003
Cyclopentane	1.54e-001	2.38e+002
n-Hexane	2.54e-001	4.82e+002
Cyclohexane	5.98e-001	1.11e+003
Other Hexanes	7.29e-001	1.38e+003
Heptanes	5.77e-001	1.27e+003
Methylcyclohexane	7.32e-002	1.58e+002
Benzene	1.40e-001	2.40e+002
Toluene	2.20e-002	4.46e+001
Ethylbenzene	1.50e-003	3.50e+000
Xylenes	5.39e-003	1.26e+001
C8+ Heavies	2.13e-002	7.98e+001
Total Components	100.00	6.67e+004

DRY GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.33e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.92e-003	1.95e+000
Carbon Dioxide	2.35e+000	2.27e+003
Nitrogen	4.58e-001	2.82e+002
Methane	5.41e+001	1.91e+004
Ethane	1.30e+001	8.59e+003
Propane	1.58e+001	1.53e+004
Isobutane	1.68e+000	2.15e+003
n-Butane	6.47e+000	8.25e+003
Isopentane	1.55e+000	2.46e+003
n-Pentane	2.01e+000	3.19e+003
Cyclopentane	1.54e-001	2.37e+002
n-Hexane	2.54e-001	4.81e+002
Cyclohexane	5.95e-001	1.10e+003
Other Hexanes	7.30e-001	1.38e+003
Heptanes	5.77e-001	1.27e+003
Methylcyclohexane	7.29e-002	1.57e+002
Benzene	1.30e-001	2.23e+002
Toluene	2.05e-002	4.15e+001
Ethylbenzene	1.40e-003	3.27e+000
Xylenes	4.94e-003	1.15e+001
C8+ Heavies	2.13e-002	7.97e+001
Total Components	100.00	6.65e+004

LEAN GLYCOL STREAM

Temperature: 100.00 deg. F
Flow Rate: 7.49e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	4.15e+003
Water	1.50e+000	6.33e+001
Carbon Dioxide	3.12e-011	1.32e-009
Nitrogen	5.36e-013	2.26e-011
Methane	8.64e-018	3.64e-016
Ethane	1.09e-007	4.59e-006
Propane	1.78e-008	7.53e-007
Isobutane	1.90e-009	8.03e-008
n-Butane	7.43e-009	3.14e-007
Isopentane	3.47e-004	1.46e-002
n-Pentane	5.46e-004	2.31e-002
Cyclopentane	1.78e-004	7.50e-003
n-Hexane	8.95e-005	3.78e-003
Cyclohexane	6.46e-003	2.73e-001
Other Hexanes	4.31e-004	1.82e-002
Heptanes	3.11e-004	1.31e-002
Methylcyclohexane	9.56e-004	4.03e-002
Benzene	2.09e-002	8.80e-001
Toluene	6.25e-003	2.64e-001
Ethylbenzene	6.25e-004	2.64e-002
Xylenes	3.83e-003	1.62e-001
C8+ Heavies	3.39e-004	1.43e-002
Total Components	100.00	4.22e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.74e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	8.69e+001	4.15e+003
Water	2.26e+000	1.08e+002
Carbon Dioxide	5.67e-001	2.71e+001
Nitrogen	4.07e-002	1.95e+000
Methane	2.66e+000	1.27e+002
Ethane	1.30e+000	6.22e+001
Propane	2.34e+000	1.12e+002
Isobutane	3.30e-001	1.58e+001
n-Butane	1.32e+000	6.31e+001
Isopentane	3.75e-001	1.80e+001
n-Pentane	5.04e-001	2.41e+001
Cyclopentane	6.18e-002	2.95e+000
n-Hexane	7.72e-002	3.69e+000
Cyclohexane	3.20e-001	1.53e+001
Other Hexanes	2.14e-001	1.03e+001

Heptanes	2.17e-001	1.04e+001
Methylcyclohexane	4.13e-002	1.97e+000
Benzene	3.99e-001	1.91e+001
Toluene	7.55e-002	3.61e+000
Ethylbenzene	5.74e-003	2.75e-001
Xylenes	2.78e-002	1.33e+000
C8+ Heavies	1.27e-002	6.06e-001
Total Components	100.00	4.78e+003

FLASH TANK OFF GAS STREAM

Temperature: 80.00 deg. F
Pressure: 74.70 psia
Flow Rate: 5.66e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.77e-002	1.01e-001
Carbon Dioxide	3.79e+000	2.49e+001
Nitrogen	4.63e-001	1.94e+000
Methane	5.28e+001	1.27e+002
Ethane	1.35e+001	6.08e+001
Propane	1.61e+001	1.06e+002
Isobutane	1.67e+000	1.45e+001
n-Butane	6.43e+000	5.58e+001
Isopentane	1.43e+000	1.54e+001
n-Pentane	1.84e+000	1.98e+001
Cyclopentane	1.49e-001	1.56e+000
n-Hexane	1.98e-001	2.55e+000
Cyclohexane	4.16e-001	5.22e+000
Other Hexanes	6.01e-001	7.73e+000
Heptanes	3.35e-001	5.02e+000
Methylcyclohexane	3.60e-002	5.28e-001
Benzene	9.08e-002	1.06e+000
Toluene	8.10e-003	1.11e-001
Ethylbenzene	2.66e-004	4.21e-003
Xylenes	8.35e-004	1.32e-002
C8+ Heavies	2.23e-003	5.66e-002
Total Components	100.00	4.50e+002

FLASH TANK GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 7.74e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.59e+001	4.15e+003
Water	2.49e+000	1.08e+002
Carbon Dioxide	5.16e-002	2.24e+000
Nitrogen	2.34e-004	1.01e-002
Methane	1.58e-002	6.83e-001
Ethane	3.24e-002	1.40e+000
Propane	1.32e-001	5.73e+000
Isobutane	3.09e-002	1.34e+000
n-Butane	1.67e-001	7.24e+000

Isopentane	5.86e-002	2.54e+000
n-Pentane	9.93e-002	4.30e+000
Cyclopentane	3.21e-002	1.39e+000
n-Hexane	2.64e-002	1.14e+000
Cyclohexane	2.32e-001	1.01e+001
Other Hexanes	5.82e-002	2.52e+000
Heptanes	1.24e-001	5.38e+000
Methylcyclohexane	3.34e-002	1.45e+000
Benzene	4.16e-001	1.80e+001
Toluene	8.07e-002	3.50e+000
Ethylbenzene	6.24e-003	2.70e-001
Xylenes	3.03e-002	1.31e+000
C8+ Heavies	1.27e-002	5.49e-001
Total Components	100.00	4.33e+003

FLASH GAS EMISSIONS

Flow Rate: 2.65e+004 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	5.93e+001	7.46e+002
Carbon Dioxide	4.02e+001	1.24e+003
Nitrogen	9.89e-002	1.94e+000
Methane	2.26e-001	2.53e+000
Ethane	5.78e-002	1.22e+000
Propane	6.89e-002	2.12e+000
Isobutane	7.12e-003	2.89e-001
n-Butane	2.75e-002	1.12e+000
Isopentane	6.12e-003	3.08e-001
n-Pentane	7.85e-003	3.96e-001
Cyclopentane	6.38e-004	3.13e-002
n-Hexane	8.47e-004	5.10e-002
Cyclohexane	1.78e-003	1.04e-001
Other Hexanes	2.57e-003	1.55e-001
Heptanes	1.43e-003	1.00e-001
Methylcyclohexane	1.54e-004	1.06e-002
Benzene	3.88e-004	2.12e-002
Toluene	3.46e-005	2.23e-003
Ethylbenzene	1.14e-006	8.42e-005
Xylenes	3.57e-006	2.65e-004
C8+ Heavies	9.51e-006	1.13e-003
Total Components	100.00	1.99e+003

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.85e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.45e+001	4.48e+001

Carbon Dioxide	2.04e+000	9.10e+000
Nitrogen	3.03e-001	8.61e-001
Methane	3.58e+001	5.83e+001
Ethane	8.96e+000	2.74e+001
Propane	1.16e+001	5.20e+001
Isobutane	1.33e+000	7.83e+000
n-Butane	5.45e+000	3.22e+001
Isopentane	1.36e+000	9.97e+000
n-Pentane	1.90e+000	1.39e+001
Cyclopentane	2.95e-001	2.10e+000
n-Hexane	2.96e-001	2.60e+000
Cyclohexane	1.53e+000	1.31e+001
Other Hexanes	7.64e-001	6.68e+000
Heptanes	9.04e-001	9.21e+000
Methylcyclohexane	1.89e-001	1.88e+000
Benzene	2.24e+000	1.78e+001
Toluene	3.59e-001	3.36e+000
Ethylbenzene	2.36e-002	2.54e-001
Xylenes	1.10e-001	1.19e+000
C8+ Heavies	4.49e-002	7.76e-001
Total Components	100.00	3.15e+002

CONDENSER PRODUCED WATER STREAM

Temperature: 100.00 deg. F
Flow Rate: 6.92e-002 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	3.46e+001	999642.
Carbon Dioxide	2.61e-003	9.04e-004	26.
Nitrogen	5.62e-006	1.95e-006	0.
Methane	7.70e-004	2.67e-004	8.
Ethane	4.35e-004	1.51e-004	4.
Propane	7.18e-004	2.49e-004	7.
Isobutane	6.05e-005	2.09e-005	1.
n-Butane	3.38e-004	1.17e-004	3.
Isopentane	7.58e-005	2.63e-005	1.
n-Pentane	1.16e-004	4.00e-005	1.
Cyclopentane	1.32e-004	4.55e-005	1.
n-Hexane	1.86e-005	6.44e-006	0.
Cyclohexane	5.69e-004	1.97e-004	6.
Other Hexanes	3.80e-005	1.32e-005	0.
Heptanes	3.76e-005	1.30e-005	0.
Methylcyclohexane	3.96e-005	1.37e-005	0.
Benzene	2.42e-002	8.39e-003	242.
Toluene	3.90e-003	1.35e-003	39.
Ethylbenzene	2.30e-004	7.95e-005	2.
Xylenes	1.53e-003	5.28e-004	15.
C8+ Heavies	1.78e-006	6.15e-007	0.
Total Components	100.00	3.46e+001	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 100.00 deg. F

The calculated flow rate is less than 0.000001 #mol/hr.
The stream flow rate and composition are not reported.

CONDENSER VENT STREAM

Temperature: 100.00 deg. F
Pressure: 14.00 psia
Flow Rate: 3.12e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.86e+000	1.02e+001
Carbon Dioxide	2.51e+000	9.10e+000
Nitrogen	3.73e-001	8.61e-001
Methane	4.42e+001	5.83e+001
Ethane	1.11e+001	2.74e+001
Propane	1.43e+001	5.20e+001
Isobutane	1.64e+000	7.83e+000
n-Butane	6.73e+000	3.22e+001
Isopentane	1.68e+000	9.97e+000
n-Pentane	2.34e+000	1.39e+001
Cyclopentane	3.63e-001	2.10e+000
n-Hexane	3.66e-001	2.60e+000
Cyclohexane	1.89e+000	1.31e+001
Other Hexanes	9.42e-001	6.68e+000
Heptanes	1.12e+000	9.21e+000
Methylcyclohexane	2.33e-001	1.88e+000
Benzene	2.77e+000	1.78e+001
Toluene	4.43e-001	3.36e+000
Ethylbenzene	2.90e-002	2.54e-001
Xylenes	1.36e-001	1.19e+000
C8+ Heavies	5.53e-002	7.76e-001
Total Components	100.00	2.81e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 5.64e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	4.89e+001	1.17e+000
Ethane	1.22e+001	5.47e-001
Propane	1.59e+001	1.04e+000
Isobutane	1.81e+000	1.57e-001
n-Butane	7.45e+000	6.44e-001
Isopentane	1.86e+000	1.99e-001
n-Pentane	2.60e+000	2.78e-001
Cyclopentane	4.03e-001	4.20e-002
n-Hexane	4.05e-001	5.19e-002
Cyclohexane	2.10e+000	2.62e-001
Other Hexanes	1.04e+000	1.34e-001
Heptanes	1.24e+000	1.84e-001
Methylcyclohexane	2.58e-001	3.76e-002
Benzene	3.07e+000	3.56e-001

Toluene	4.90e-001	6.72e-002
Ethylbenzene	3.22e-002	5.08e-003
Xylenes	1.50e-001	2.37e-002
C8+ Heavies	6.13e-002	1.55e-002
Total Components	100.00	5.21e+000

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: EOG Resources, I-80 Compressor Station, Dehy #2
File Name: S:\KVEnv\EOG I-80_Stn WY\Air Permit NSR App\Documents_Spreadsheets\I-80 CS Windy flash gas Dehy2.ddf
Date: December 02, 2014

DESCRIPTION:

Description: PTE Calculation for 1 of 2 dehy units, 20 MMscfd
Windy 1-18H gas sample results; 4/8/2013 sample date
Three glycol pumps; 2 in use, 1 spare

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 100.00 deg. F
Pressure: 1000.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	2.3600
Nitrogen	0.4575
Methane	54.0930
Ethane	13.0025
Propane	15.7900
Isobutane	1.6827
n-Butane	6.4682
Isopentane	1.5533
n-Pentane	2.0134
Cyclopentane	0.1545
n-Hexane	0.2542
Cyclohexane	0.5992
Other Hexanes	0.7302
Heptanes	0.5780
Methylcyclohexane	0.0733
Benzene	0.1397
Toluene	0.0220
Ethylbenzene	0.0015
Xylenes	0.0054
C8+ Heavies	0.0213

DRY GAS:

Flow Rate: 20.0 MMSCF/day
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 7.5 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Combustion device
Flash Control Efficiency: 98.00 %
Temperature: 80.0 deg. F
Pressure: 60.0 psig

STRIPPING GAS:

Source of Gas: Dry Gas
Gas Flow Rate: 42.000 scfm

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Condenser
Temperature: 100.0 deg. F
Pressure: 14.0 psia

Control Device: Combustion Device
Destruction Efficiency: 98.0 %
Excess Oxygen: 5.0 %
Ambient Air Temperature: 60.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: EOG Resources, I-80 Compressor Station, Dehy #2
File Name: S:\KVEnv\EOG I-80_Stn WY\Air Permit NSR App\Documents_Spreadsheets\I-80 CS Windy flash gas Dehy2.ddf
Date: December 02, 2014

DESCRIPTION:

Description: PTE Calculation for 1 of 2 dehy units, 20 MMscfd
Windy 1-18H gas sample results; 4/8/2013 sample date
Three glycol pumps; 2 in use, 1 spare

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	1.1668	28.002	5.1104
Ethane	0.5474	13.138	2.3977
Propane	1.0394	24.947	4.5528
Isobutane	0.1567	3.760	0.6863
n-Butane	0.6439	15.454	2.8203
Isopentane	0.1993	4.784	0.8731
n-Pentane	0.2785	6.683	1.2196
Cyclopentane	0.0420	1.007	0.1838
n-Hexane	0.0519	1.246	0.2273
Cyclohexane	0.2624	6.297	1.1492
Other Hexanes	0.1337	3.208	0.5854
Heptanes	0.1841	4.418	0.8064
Methylcyclohexane	0.0376	0.903	0.1648
Benzene	0.3560	8.544	1.5592
Toluene	0.0672	1.612	0.2942
Ethylbenzene	0.0051	0.122	0.0222
Xylenes	0.0237	0.570	0.1040
C8+ Heavies	0.0155	0.372	0.0680
Total Emissions	5.2111	125.067	22.8247
Total Hydrocarbon Emissions	5.2111	125.067	22.8247
Total VOC Emissions	3.4969	83.927	15.3166
Total HAP Emissions	0.5039	12.093	2.2070
Total BTEX Emissions	0.4520	10.847	1.9797

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	58.3381	1400.114	255.5209
Ethane	27.3709	656.902	119.8845
Propane	51.9723	1247.335	227.6386
Isobutane	7.8343	188.023	34.3142
n-Butane	32.1952	772.685	141.0151

Isopentane	9.9664	239.193	43.6528
n-Pentane	13.9227	334.144	60.9814
Cyclopentane	2.0983	50.360	9.1907
n-Hexane	2.5950	62.280	11.3662
Cyclohexane	13.1186	314.846	57.4593
Other Hexanes	6.6832	160.396	29.2723
Heptanes	9.2051	220.922	40.3182
Methylcyclohexane	1.8818	45.162	8.2421
Benzene	17.8080	427.392	77.9991
Toluene	3.3599	80.639	14.7165
Ethylbenzene	0.2540	6.096	1.1125
Xylenes	1.1873	28.495	5.2004
C8+ Heavies	0.7759	18.623	3.3986
Total Emissions	260.5670	6253.607	1141.2833
Total Hydrocarbon Emissions	260.5670	6253.607	1141.2833
Total VOC Emissions	174.8580	4196.591	765.8779
Total HAP Emissions	25.2043	604.902	110.3947
Total BTEX Emissions	22.6093	542.622	99.0285

FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	2.5302	60.726	11.0825
Ethane	1.2151	29.162	5.3221
Propane	2.1231	50.955	9.2993
Isobutane	0.2891	6.938	1.2661
n-Butane	1.1165	26.795	4.8901
Isopentane	0.3084	7.401	1.3507
n-Pentane	0.3958	9.500	1.7338
Cyclopentane	0.0313	0.750	0.1370
n-Hexane	0.0510	1.223	0.2233
Cyclohexane	0.1045	2.507	0.4576
Other Hexanes	0.1547	3.713	0.6776
Heptanes	0.1004	2.409	0.4396
Methylcyclohexane	0.0106	0.253	0.0462
Benzene	0.0212	0.508	0.0927
Toluene	0.0022	0.053	0.0098
Ethylbenzene	0.0001	0.002	0.0004
Xylenes	0.0003	0.006	0.0012
C8+ Heavies	0.0011	0.027	0.0050
Total Emissions	8.4554	202.930	37.0347
Total Hydrocarbon Emissions	8.4554	202.930	37.0347
Total VOC Emissions	4.7101	113.041	20.6301
Total HAP Emissions	0.0747	1.793	0.3273
Total BTEX Emissions	0.0237	0.570	0.1040

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	126.5125	3036.299	554.1246
Ethane	60.7546	1458.111	266.1052
Propane	106.1560	2547.744	464.9633
Isobutane	14.4531	346.875	63.3047
n-Butane	55.8225	1339.741	244.5027

Isopentane	15.4185	370.043	67.5328
n-Pentane	19.7922	475.013	86.6899
Cyclopentane	1.5634	37.521	6.8476
n-Hexane	2.5490	61.175	11.1644
Cyclohexane	5.2236	125.367	22.8796
Other Hexanes	7.7349	185.638	33.8790
Heptanes	5.0182	120.438	21.9799
Methylcyclohexane	0.5276	12.663	2.3110
Benzene	1.0586	25.406	4.6366
Toluene	0.1113	2.672	0.4877
Ethylbenzene	0.0042	0.101	0.0184
Xylenes	0.0132	0.317	0.0579
C8+ Heavies	0.0566	1.359	0.2480
Total Emissions	422.7702	10146.484	1851.7334
Total Hydrocarbon Emissions	422.7702	10146.484	1851.7334
Total VOC Emissions	235.5031	5652.074	1031.5035
Total HAP Emissions	3.7363	89.672	16.3651
Total BTEX Emissions	1.1874	28.497	5.2007

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	3.6970	88.728	16.1929
Ethane	1.7625	42.300	7.7198
Propane	3.1626	75.901	13.8520
Isobutane	0.4457	10.698	1.9524
n-Butane	1.7604	42.248	7.7103
Isopentane	0.5077	12.185	2.2237
n-Pentane	0.6743	16.183	2.9534
Cyclopentane	0.0732	1.758	0.3208
n-Hexane	0.1029	2.469	0.4506
Cyclohexane	0.3668	8.804	1.6068
Other Hexanes	0.2884	6.921	1.2630
Heptanes	0.2845	6.827	1.2460
Methylcyclohexane	0.0482	1.157	0.2111
Benzene	0.3772	9.052	1.6520
Toluene	0.0694	1.666	0.3040
Ethylbenzene	0.0052	0.124	0.0226
Xylenes	0.0240	0.576	0.1051
C8+ Heavies	0.0167	0.400	0.0729
Total Emissions	13.6665	327.996	59.8593
Total Hydrocarbon Emissions	13.6665	327.996	59.8593
Total VOC Emissions	8.2070	196.968	35.9467
Total HAP Emissions	0.5786	13.887	2.5343
Total BTEX Emissions	0.4757	11.417	2.0837

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	809.6454	16.1929	98.00
Ethane	385.9898	7.7198	98.00
Propane	692.6019	13.8520	98.00

Isobutane	97.6189	1.9524	98.00
n-Butane	385.5178	7.7103	98.00
Isopentane	111.1856	2.2237	98.00
n-Pentane	147.6712	2.9534	98.00
Cyclopentane	16.0382	0.3208	98.00
n-Hexane	22.5306	0.4506	98.00
Cyclohexane	80.3389	1.6068	98.00
Other Hexanes	63.1513	1.2630	98.00
Heptanes	62.2981	1.2460	98.00
Methylcyclohexane	10.5532	0.2111	98.00
Benzene	82.6357	1.6520	98.00
Toluene	15.2042	0.3040	98.00
Ethylbenzene	1.1309	0.0226	98.00
Xylenes	5.2583	0.1051	98.00
C8+ Heavies	3.6466	0.0729	98.00
Total Emissions	2993.0167	59.8593	98.00
Total Hydrocarbon Emissions	2993.0167	59.8593	98.00
Total VOC Emissions	1797.3814	35.9467	98.00
Total HAP Emissions	126.7598	2.5343	98.00
Total BTEX Emissions	104.2292	2.0837	98.00

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature:	100.00 deg. F
Condenser Pressure:	14.00 psia
Condenser Duty:	1.15e+000 MM BTU/hr
Produced Water:	2.37 bbls/day
Ambient Temperature:	60.00 deg. F
Excess Oxygen:	5.00 %
Combustion Efficiency:	98.00 %
Supplemental Fuel Requirement:	1.15e+000 MM BTU/hr

Component	Emitted	Destroyed
Methane	2.00%	98.00%
Ethane	2.00%	98.00%
Propane	2.00%	98.00%
Isobutane	2.00%	98.00%
n-Butane	2.00%	98.00%
Isopentane	2.00%	98.00%
n-Pentane	2.00%	98.00%
Cyclopentane	2.00%	98.00%
n-Hexane	2.00%	98.00%
Cyclohexane	2.00%	98.00%
Other Hexanes	2.00%	98.00%
Heptanes	2.00%	98.00%
Methylcyclohexane	2.00%	98.00%
Benzene	2.00%	98.00%
Toluene	2.00%	98.00%
Ethylbenzene	2.00%	98.00%
Xylenes	2.00%	98.00%
C8+ Heavies	2.00%	98.00%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25	
Calculated Dry Gas Dew Point:	2.33	lbs. H2O/MMSCF
Temperature:	100.0	deg. F
Pressure:	1000.0	psig
Dry Gas Flow Rate:	20.0000	MMSCF/day
Glycol Losses with Dry Gas:	8.3330	lb/hr
Wet Gas Water Content:	Saturated	
Calculated Wet Gas Water Content:	55.71	lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	10.11	gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.18%	95.82%
Carbon Dioxide	99.42%	0.58%
Nitrogen	99.92%	0.08%
Methane	99.94%	0.06%
Ethane	99.89%	0.11%
Propane	99.88%	0.12%
Isobutane	99.88%	0.12%
n-Butane	99.85%	0.15%
Isopentane	99.88%	0.12%
n-Pentane	99.86%	0.14%
Cyclopentane	99.37%	0.63%
n-Hexane	99.84%	0.16%
Cyclohexane	99.26%	0.74%
Other Hexanes	99.87%	0.13%
Heptanes	99.79%	0.21%
Methylcyclohexane	99.39%	0.61%
Benzene	93.03%	6.97%
Toluene	93.10%	6.90%
Ethylbenzene	93.52%	6.48%
Xylenes	91.36%	8.64%
C8+ Heavies	99.87%	0.13%

FLASH TANK

Flash Control:	Combustion device	
Flash Control Efficiency:	98.00	%
Flash Temperature:	80.0	deg. F
Flash Pressure:	60.0	psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.91%	0.09%
Carbon Dioxide	8.25%	91.75%
Nitrogen	0.52%	99.48%
Methane	0.54%	99.46%
Ethane	2.26%	97.74%
Propane	5.12%	94.88%

Isobutane	8.48%	91.52%
n-Butane	11.48%	88.52%
Isopentane	14.14%	85.86%
n-Pentane	17.85%	82.15%
Cyclopentane	47.06%	52.94%
n-Hexane	30.99%	69.01%
Cyclohexane	65.83%	34.17%
Other Hexanes	24.59%	75.41%
Heptanes	51.72%	48.28%
Methylcyclohexane	73.27%	26.73%
Benzene	94.45%	5.55%
Toluene	96.92%	3.08%
Ethylbenzene	98.47%	1.53%
Xylenes	99.00%	1.00%
C8+ Heavies	90.66%	9.34%

REGENERATOR

Regenerator Stripping Gas:
Dry Product Gas
Stripping Gas Flow Rate: 42.0000 scfm

Component	Remaining in Glycol	Distilled Overhead
Water	58.58%	41.42%
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%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	0.58%	99.42%
n-Pentane	0.54%	99.46%
Cyclopentane	0.54%	99.46%
n-Hexane	0.33%	99.67%
Cyclohexane	2.71%	97.29%
Other Hexanes	0.72%	99.28%
Heptanes	0.24%	99.76%
Methylcyclohexane	2.79%	97.21%
Benzene	4.89%	95.11%
Toluene	7.54%	92.46%
Ethylbenzene	9.75%	90.25%
Xylenes	12.31%	87.69%
C8+ Heavies	2.60%	97.40%

STREAM REPORTS:

WET GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.35e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.17e-001	4.65e+001
Carbon Dioxide	2.36e+000	2.28e+003
Nitrogen	4.57e-001	2.82e+002
Methane	5.40e+001	1.91e+004
Ethane	1.30e+001	8.60e+003
Propane	1.58e+001	1.53e+004
Isobutane	1.68e+000	2.15e+003
n-Butane	6.46e+000	8.27e+003
Isopentane	1.55e+000	2.46e+003
n-Pentane	2.01e+000	3.19e+003
Cyclopentane	1.54e-001	2.38e+002
n-Hexane	2.54e-001	4.82e+002
Cyclohexane	5.98e-001	1.11e+003
Other Hexanes	7.29e-001	1.38e+003
Heptanes	5.77e-001	1.27e+003
Methylcyclohexane	7.32e-002	1.58e+002
Benzene	1.40e-001	2.40e+002
Toluene	2.20e-002	4.46e+001
Ethylbenzene	1.50e-003	3.50e+000
Xylenes	5.39e-003	1.26e+001
C8+ Heavies	2.13e-002	7.98e+001
Total Components	100.00	6.67e+004

DRY GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.33e+005 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.92e-003	1.95e+000
Carbon Dioxide	2.35e+000	2.27e+003
Nitrogen	4.58e-001	2.82e+002
Methane	5.41e+001	1.91e+004
Ethane	1.30e+001	8.59e+003
Propane	1.58e+001	1.53e+004
Isobutane	1.68e+000	2.15e+003
n-Butane	6.47e+000	8.25e+003
Isopentane	1.55e+000	2.46e+003
n-Pentane	2.01e+000	3.19e+003
Cyclopentane	1.54e-001	2.37e+002
n-Hexane	2.54e-001	4.81e+002
Cyclohexane	5.95e-001	1.10e+003
Other Hexanes	7.30e-001	1.38e+003
Heptanes	5.77e-001	1.27e+003
Methylcyclohexane	7.29e-002	1.57e+002
Benzene	1.30e-001	2.23e+002
Toluene	2.05e-002	4.15e+001
Ethylbenzene	1.40e-003	3.27e+000
Xylenes	4.94e-003	1.15e+001
C8+ Heavies	2.13e-002	7.97e+001
Total Components	100.00	6.65e+004

LEAN GLYCOL STREAM

Temperature: 100.00 deg. F
Flow Rate: 7.49e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	4.15e+003
Water	1.50e+000	6.33e+001
Carbon Dioxide	3.12e-011	1.32e-009
Nitrogen	5.36e-013	2.26e-011
Methane	8.64e-018	3.64e-016
Ethane	1.09e-007	4.59e-006
Propane	1.78e-008	7.53e-007
Isobutane	1.90e-009	8.03e-008
n-Butane	7.43e-009	3.14e-007
Isopentane	3.47e-004	1.46e-002
n-Pentane	5.46e-004	2.31e-002
Cyclopentane	1.78e-004	7.50e-003
n-Hexane	8.95e-005	3.78e-003
Cyclohexane	6.46e-003	2.73e-001
Other Hexanes	4.31e-004	1.82e-002
Heptanes	3.11e-004	1.31e-002
Methylcyclohexane	9.56e-004	4.03e-002
Benzene	2.09e-002	8.80e-001
Toluene	6.25e-003	2.64e-001
Ethylbenzene	6.25e-004	2.64e-002
Xylenes	3.83e-003	1.62e-001
C8+ Heavies	3.39e-004	1.43e-002
Total Components	100.00	4.22e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1014.70 psia
Flow Rate: 8.74e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	8.69e+001	4.15e+003
Water	2.26e+000	1.08e+002
Carbon Dioxide	5.67e-001	2.71e+001
Nitrogen	4.07e-002	1.95e+000
Methane	2.66e+000	1.27e+002
Ethane	1.30e+000	6.22e+001
Propane	2.34e+000	1.12e+002
Isobutane	3.30e-001	1.58e+001
n-Butane	1.32e+000	6.31e+001
Isopentane	3.75e-001	1.80e+001
n-Pentane	5.04e-001	2.41e+001
Cyclopentane	6.18e-002	2.95e+000
n-Hexane	7.72e-002	3.69e+000
Cyclohexane	3.20e-001	1.53e+001
Other Hexanes	2.14e-001	1.03e+001

Heptanes	2.17e-001	1.04e+001
Methylcyclohexane	4.13e-002	1.97e+000
Benzene	3.99e-001	1.91e+001
Toluene	7.55e-002	3.61e+000
Ethylbenzene	5.74e-003	2.75e-001
Xylenes	2.78e-002	1.33e+000
C8+ Heavies	1.27e-002	6.06e-001
Total Components	100.00	4.78e+003

FLASH TANK OFF GAS STREAM

Temperature: 80.00 deg. F
Pressure: 74.70 psia
Flow Rate: 5.66e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	3.77e-002	1.01e-001
Carbon Dioxide	3.79e+000	2.49e+001
Nitrogen	4.63e-001	1.94e+000
Methane	5.28e+001	1.27e+002
Ethane	1.35e+001	6.08e+001
Propane	1.61e+001	1.06e+002
Isobutane	1.67e+000	1.45e+001
n-Butane	6.43e+000	5.58e+001
Isopentane	1.43e+000	1.54e+001
n-Pentane	1.84e+000	1.98e+001
Cyclopentane	1.49e-001	1.56e+000
n-Hexane	1.98e-001	2.55e+000
Cyclohexane	4.16e-001	5.22e+000
Other Hexanes	6.01e-001	7.73e+000
Heptanes	3.35e-001	5.02e+000
Methylcyclohexane	3.60e-002	5.28e-001
Benzene	9.08e-002	1.06e+000
Toluene	8.10e-003	1.11e-001
Ethylbenzene	2.66e-004	4.21e-003
Xylenes	8.35e-004	1.32e-002
C8+ Heavies	2.23e-003	5.66e-002
Total Components	100.00	4.50e+002

FLASH TANK GLYCOL STREAM

Temperature: 80.00 deg. F
Flow Rate: 7.74e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.59e+001	4.15e+003
Water	2.49e+000	1.08e+002
Carbon Dioxide	5.16e-002	2.24e+000
Nitrogen	2.34e-004	1.01e-002
Methane	1.58e-002	6.83e-001
Ethane	3.24e-002	1.40e+000
Propane	1.32e-001	5.73e+000
Isobutane	3.09e-002	1.34e+000
n-Butane	1.67e-001	7.24e+000

Isopentane	5.86e-002	2.54e+000
n-Pentane	9.93e-002	4.30e+000
Cyclopentane	3.21e-002	1.39e+000
n-Hexane	2.64e-002	1.14e+000
Cyclohexane	2.32e-001	1.01e+001
Other Hexanes	5.82e-002	2.52e+000
Heptanes	1.24e-001	5.38e+000
Methylcyclohexane	3.34e-002	1.45e+000
Benzene	4.16e-001	1.80e+001
Toluene	8.07e-002	3.50e+000
Ethylbenzene	6.24e-003	2.70e-001
Xylenes	3.03e-002	1.31e+000
C8+ Heavies	1.27e-002	5.49e-001
Total Components	100.00	4.33e+003

FLASH GAS EMISSIONS

Flow Rate: 2.65e+004 scfh
Control Method: Combustion Device
Control Efficiency: 98.00

Component	Conc. (vol%)	Loading (lb/hr)
Water	5.93e+001	7.46e+002
Carbon Dioxide	4.02e+001	1.24e+003
Nitrogen	9.89e-002	1.94e+000
Methane	2.26e-001	2.53e+000
Ethane	5.78e-002	1.22e+000
Propane	6.89e-002	2.12e+000
Isobutane	7.12e-003	2.89e-001
n-Butane	2.75e-002	1.12e+000
Isopentane	6.12e-003	3.08e-001
n-Pentane	7.85e-003	3.96e-001
Cyclopentane	6.38e-004	3.13e-002
n-Hexane	8.47e-004	5.10e-002
Cyclohexane	1.78e-003	1.04e-001
Other Hexanes	2.57e-003	1.55e-001
Heptanes	1.43e-003	1.00e-001
Methylcyclohexane	1.54e-004	1.06e-002
Benzene	3.88e-004	2.12e-002
Toluene	3.46e-005	2.23e-003
Ethylbenzene	1.14e-006	8.42e-005
Xylenes	3.57e-006	2.65e-004
C8+ Heavies	9.51e-006	1.13e-003
Total Components	100.00	1.99e+003

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.85e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	2.45e+001	4.48e+001

Carbon Dioxide	2.04e+000	9.10e+000
Nitrogen	3.03e-001	8.61e-001
Methane	3.58e+001	5.83e+001
Ethane	8.96e+000	2.74e+001
Propane	1.16e+001	5.20e+001
Isobutane	1.33e+000	7.83e+000
n-Butane	5.45e+000	3.22e+001
Isopentane	1.36e+000	9.97e+000
n-Pentane	1.90e+000	1.39e+001
Cyclopentane	2.95e-001	2.10e+000
n-Hexane	2.96e-001	2.60e+000
Cyclohexane	1.53e+000	1.31e+001
Other Hexanes	7.64e-001	6.68e+000
Heptanes	9.04e-001	9.21e+000
Methylcyclohexane	1.89e-001	1.88e+000
Benzene	2.24e+000	1.78e+001
Toluene	3.59e-001	3.36e+000
Ethylbenzene	2.36e-002	2.54e-001
Xylenes	1.10e-001	1.19e+000
C8+ Heavies	4.49e-002	7.76e-001
Total Components	100.00	3.15e+002

CONDENSER PRODUCED WATER STREAM

Temperature: 100.00 deg. F
Flow Rate: 6.92e-002 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	1.00e+002	3.46e+001	999642.
Carbon Dioxide	2.61e-003	9.04e-004	26.
Nitrogen	5.62e-006	1.95e-006	0.
Methane	7.70e-004	2.67e-004	8.
Ethane	4.35e-004	1.51e-004	4.
Propane	7.18e-004	2.49e-004	7.
Isobutane	6.05e-005	2.09e-005	1.
n-Butane	3.38e-004	1.17e-004	3.
Isopentane	7.58e-005	2.63e-005	1.
n-Pentane	1.16e-004	4.00e-005	1.
Cyclopentane	1.32e-004	4.55e-005	1.
n-Hexane	1.86e-005	6.44e-006	0.
Cyclohexane	5.69e-004	1.97e-004	6.
Other Hexanes	3.80e-005	1.32e-005	0.
Heptanes	3.76e-005	1.30e-005	0.
Methylcyclohexane	3.96e-005	1.37e-005	0.
Benzene	2.42e-002	8.39e-003	242.
Toluene	3.90e-003	1.35e-003	39.
Ethylbenzene	2.30e-004	7.95e-005	2.
Xylenes	1.53e-003	5.28e-004	15.
C8+ Heavies	1.78e-006	6.15e-007	0.
Total Components	100.00	3.46e+001	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 100.00 deg. F

The calculated flow rate is less than 0.000001 #mol/hr.
The stream flow rate and composition are not reported.

CONDENSER VENT STREAM

Temperature: 100.00 deg. F
Pressure: 14.00 psia
Flow Rate: 3.12e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.86e+000	1.02e+001
Carbon Dioxide	2.51e+000	9.10e+000
Nitrogen	3.73e-001	8.61e-001
Methane	4.42e+001	5.83e+001
Ethane	1.11e+001	2.74e+001
Propane	1.43e+001	5.20e+001
Isobutane	1.64e+000	7.83e+000
n-Butane	6.73e+000	3.22e+001
Isopentane	1.68e+000	9.97e+000
n-Pentane	2.34e+000	1.39e+001
Cyclopentane	3.63e-001	2.10e+000
n-Hexane	3.66e-001	2.60e+000
Cyclohexane	1.89e+000	1.31e+001
Other Hexanes	9.42e-001	6.68e+000
Heptanes	1.12e+000	9.21e+000
Methylcyclohexane	2.33e-001	1.88e+000
Benzene	2.77e+000	1.78e+001
Toluene	4.43e-001	3.36e+000
Ethylbenzene	2.90e-002	2.54e-001
Xylenes	1.36e-001	1.19e+000
C8+ Heavies	5.53e-002	7.76e-001
Total Components	100.00	2.81e+002

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 5.64e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	4.89e+001	1.17e+000
Ethane	1.22e+001	5.47e-001
Propane	1.59e+001	1.04e+000
Isobutane	1.81e+000	1.57e-001
n-Butane	7.45e+000	6.44e-001
Isopentane	1.86e+000	1.99e-001
n-Pentane	2.60e+000	2.78e-001
Cyclopentane	4.03e-001	4.20e-002
n-Hexane	4.05e-001	5.19e-002
Cyclohexane	2.10e+000	2.62e-001
Other Hexanes	1.04e+000	1.34e-001
Heptanes	1.24e+000	1.84e-001
Methylcyclohexane	2.58e-001	3.76e-002
Benzene	3.07e+000	3.56e-001

Toluene	4.90e-001	6.72e-002
Ethylbenzene	3.22e-002	5.08e-003
Xylenes	1.50e-001	2.37e-002
C8+ Heavies	6.13e-002	1.55e-002
Total Components	100.00	5.21e+000

Attachment 4-b

Backup Documentation: ProMax® model output for Condensate Tank and Truck Loading Emissions

(provided by Kahuna Ventures)

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

Simulation Report

Project: CondTkFlash.pmx

Licensed to Kahuna Ventures, LLC and Affiliates

Client Name: EOG Resources
Location: I-80 Compressor Station
Job: Estimated Condensate Tank Emissions (assumed condensate composition)

ProMax Filename: S:\KVEnv\EOG_I-80_Stn WY\Air Permit NSR App\CondTkFlash.pmx
ProMax Version: 3.2.13330.0
Simulation Initiated: 11/24/2014 3:21:59 PM

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Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

Tank loss calculations for "Condensate To Tank".
Total working and breathing losses from the Vertical Cylinder are 7.477 ton/yr.
Flashing losses are 346.9 ton/yr.
Loading losses are 12.28 ton/yr of loaded liquid.

Tank-1

Properties	Tank Flash	
Std Vapor Volumetric Flow(Total)	0.014378	MMSCFD
Molecular Weight(Total)	54.046	lb/lbmol
Gross Ideal Gas Heating Value(Total)	3043.5	Btu/ft^3
Temperature(Total)	67.1	F
Pressure(Total)	-2.9359	psig
Composition	Tank Flash	
Methane(Mass Flow, Total)	0.61475	lb/h
Ethane(Mass Flow, Total)	5.4966	lb/h
Propane(Mass Flow, Total)	21.895	lb/h
Isobutane(Mass Flow, Total)	5.9275	lb/h
Butane(Mass Flow, Total)	22.575	lb/h
Isopentane(Mass Flow, Total)	7.8218	lb/h
Pentane(Mass Flow, Total)	10.994	lb/h
Hexane(Mass Flow, Total)	6.6758	lb/h
Heptane(Mass Flow, Total)	2.381	lb/h
Octane(Mass Flow, Total)	0.2618	lb/h
Nonane(Mass Flow, Total)	0.015987	lb/h
Benzene(Mass Flow, Total)	0.072016	lb/h
Toluene(Mass Flow, Total)	0.032965	lb/h
Ethylbenzene(Mass Flow, Total)	0.0070817	lb/h
m-Xylene(Mass Flow, Total)	0.0061415	lb/h
2,2,4-Trimethylpentane(Mass Flow, Total)	0.54038	lb/h
C10 Plus(Mass Flow, Total)	0.0014926	lb/h

Tank Flash

Properties	Condensate To Tank	
Temperature(Total)	100*	°F
Pressure(Total)	50*	psig
Liquid Volumetric Flow(Total)	113.01	bbl/d

Condensate To Tank

Q-1

AtmTank

Properties	Condensate to P/L	
Std Liquid Volumetric Flow(Total)	100*	bbl/d
Temperature(Total)	67.07*	°F
Pressure(Total)	-2.9359*	psig

Condensate to P/L

Promax AP-42 Emissions Report
Tank Losses Property Stencil
Calculated Results

Summary Data & Results

Atmospheric Pressure	11.76	psia
True Vapor Pressure at Average Temperature	7.94	psia
Average Liquid Surface Temperature	55.43	°F
Maximum Liquid Surface Temperature	67.07	°F
Flashing Losses	346.93	ton/yr
Loading Losses	8.23	ton/yr
Total W/B Losses	6.81	ton/yr
Working Losses per Tank	3.76	ton/yr
Standing Losses per Tank	3.05	ton/yr
Rim Seal Losses per Tank	0	ton/yr
Withdrawal Loss per Tank	0	ton/yr
Deck Fitting Losses per Tank	0	ton/yr
Deck Seam Losses per Tank	0	ton/yr

Promax AP-42 Emissions Report
Annual Emissions
Vertical Cylinder

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)
Mixture	3.763	3.049	6.812
Propane	1.225	0.9927	2.218
Isobutane	0.3105	0.2516	0.5621
Butane	1.18	0.9564	2.137
Isopentane	0.3736	0.3027	0.6764
Pentane	0.5186	0.4202	0.9388
Hexane	0.02475	0.02005	0.0448
Heptane	0.09702	0.07861	0.1756
Octane	0.009769	0.007915	0.01768
Nonane	0.0005399	0.0004374	0.0009774
Benzene	0.0002057	0.0001666	0.0003723
Toluene	0.0002039	0.0001652	0.0003692
Ethylbenzene	8.52E-05	6.90E-05	0.0001543
m-Xylene	9.59E-05	7.77E-05	0.0001736
2,2,4-Trimethylpentane	0.02185	0.0177	0.03955
C10 Plus	4.38E-05	3.55E-05	7.93E-05

Promax Loading Losses Report
Annual Emissions
Tank Truck or Rail Tank Car with Submerged Loading: Dedicated Vapor Balance Service

Components	Loading Losses (ton/yr)
Mixture	8.227
Propane	2.679
Isobutane	0.6788
Butane	2.581
Isopentane	0.8169
Pentane	1.134
Hexane	0.0541
Heptane	0.2121

Promax AP-42 Emissions Report
Tank Losses Property Stencil
Calculated Results

Octane	0.02136
Nonane	0.00118
Benzene	0.0004496
Toluene	0.0004458
Ethylbenzene	0.0001863
m-Xylene	0.0002097
2,2,4-Trimethylpentane	0.04776
C10 Plus	9.57E-05

Flashing Emissions Report
Annual Emissions
Tank flashed at the daily maximum surface temperature (67.07 °F) and the atmospheric pressure of Cheyenne, WY (11.76 psia)

Components	Flashing Losses (ton/yr)
Mixture	346.9
Propane	95.9
Isobutane	25.96
Butane	98.88
Isopentane	34.26
Pentane	48.15
Hexane	29.24
Heptane	10.43
Octane	1.147
Nonane	0.07002
Benzene	0.3154
Toluene	0.1444
Ethylbenzene	0.03102
m-Xylene	0.0269
2,2,4-Trimethylpentane	2.367
C10 Plus	0.006537

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	Status:	Solved	Solved	Solved
Phase: Total	From Block:	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Mole Fraction		%	%	%
Methane		0.0104836	0.308500*	2.42743
Ethane		0.335692	1.72210*	11.5796
Propane		3.24587	6.72401*	31.4540
Isobutane		1.77203	2.35010*	6.46026
Butane		9.97149	11.7757*	24.6039
Isopentane		7.12689	7.09491*	6.86753
Pentane		13.5744	13.0908*	9.65234
Hexane		24.9936	22.5169*	4.90731
Heptane		24.2246	21.4232*	1.50523
Octane		7.51982	6.61051*	0.145184
Nonane		1.30094	1.14150*	0.00789597
Benzene		0.284932	0.257000*	0.0584031
Toluene		0.417483	0.368800*	0.0226642
Ethylbenzene		0.247268	0.217300*	0.00422550
m-Xylene		0.257499	0.226200*	0.00366446
2,2,4-Trimethylpentane		4.30485	3.81100*	0.299671
C10 Plus		0.412140	0.361400*	0.000635568
Molar Flow		lbmol/h	lbmol/h	lbmol/h
Methane		0.00117671	0.0394968*	0.0383201
Ethane		0.0376788	0.220478*	0.182799
Propane		0.364323	0.860864*	0.496541
Isobutane		0.198896	0.300880*	0.101983
Butane		1.11922	1.50763*	0.388404
Isopentane		0.799937	0.908349*	0.108413
Pentane		1.52362	1.67600*	0.152374
Hexane		2.80534	2.88281*	0.0774680
Heptane		2.71902	2.74278*	0.0237620
Octane		0.844041	0.846332*	0.00229191
Nonane		0.146020	0.146145*	0.000124648
Benzene		0.0319814	0.0329033*	0.000921966
Toluene		0.0468591	0.0472169*	0.000357782
Ethylbenzene		0.0277539	0.0278206*	6.67048E-05
m-Xylene		0.0289022	0.0289600*	5.78482E-05
2,2,4-Trimethylpentane		0.483186	0.487917*	0.00473069
C10 Plus		0.0462595	0.0462695*	1.00332E-05
Mass Flow		lb/h	lb/h	lb/h
Methane		0.0188773	0.633626*	0.614748
Ethane		1.13296	6.62956*	5.49659
Propane		16.0650	37.9603*	21.8953
Isobutane		11.5603	17.4878*	5.92750
Butane		65.0516	87.6265*	22.5749
Isopentane		57.7145	65.5363*	7.82184

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Pentane		109.927	120.921*	10.9936
Hexane		241.751	248.427*	6.67583
Heptane		272.451	274.832*	2.38100
Octane		96.4135	96.6753*	0.261802
Nonane		18.7278	18.7438*	0.0159867
Benzene		2.49812	2.57014*	0.0720165
Toluene		4.31753	4.35049*	0.0329655
Ethylbenzene		2.94649	2.95357*	0.00708172
m-Xylene		3.06840	3.07454*	0.00614145
2,2,4-Trimethylpentane		55.1936	55.7340*	0.540379
C10 Plus		6.88169	6.88318*	0.00149257

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Properties	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Property	**Units**			
Temperature	°F	67.07*	100*	67.07
Pressure	psia	11.76*	64.6959*	11.76
Mole Fraction Vapor	%	0	0	100
Mole Fraction Light Liquid	%	100	100	0
Mole Fraction Heavy Liquid	%	0	0	0
Molecular Weight	lb/lbmol	86.0390	82.0942	54.0465
Mass Density	lb/ft^3	41.3446	39.7553	0.114763
Molar Flow	lbmol/h	11.2242	12.8028	1.57863
Mass Flow	lb/h	965.720	1051.04	85.3192
Vapor Volumetric Flow	ft^3/h	23.3578	26.4377	743.437
Liquid Volumetric Flow	gpm	2.91215	3.29613	92.6883
Std Vapor Volumetric Flow	MMSCFD	0.102226	0.116603	0.0143775
Std Liquid Volumetric Flow	sgpm	2.91667*	3.22569	0.309021
Compressibility		0.00432936	0.0222433	0.979743
Specific Gravity		0.662902	0.637420	1.86608
API Gravity		80.7828	83.2001	
Enthalpy	Btu/h	-951674	-1.02913E+06	-82379.7
Mass Enthalpy	Btu/lb	-985.456	-979.151	-965.548
Mass Cp	Btu/(lb*°F)	0.511060	0.538177	0.398301
Ideal Gas CpCv Ratio		1.06327	1.06305	1.10245
Dynamic Viscosity	cP	0.315293	0.247225	0.00763573
Kinematic Viscosity	cSt	0.476074	0.388219	4.15362
Thermal Conductivity	Btu/(h*ft*°F)	0.0688157	0.0643809	0.00933319
Surface Tension	lbf/ft	0.00125503?	0.00103945	
Net Ideal Gas Heating Value	Btu/ft^3	4390.03	4194.82	2806.82

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Net Liquid Heating Value	Btu/lb	19204.3	19232.3	19549.6
Gross Ideal Gas Heating Value	Btu/ft^3	4739.38	4530.27	3043.46
Gross Liquid Heating Value	Btu/lb	20745.2	20783.0	21211.2

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Vapor**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Mole Fraction				%
Methane				2.42743
Ethane				11.5796
Propane				31.4540
Isobutane				6.46026
Butane				24.6039
Isopentane				6.86753
Pentane				9.65234
Hexane				4.90731
Heptane				1.50523
Octane				0.145184
Nonane				0.00789597
Benzene				0.0584031
Toluene				0.0226642
Ethylbenzene				0.00422550
m-Xylene				0.00366446
2,2,4-Trimethylpentane				0.299671
C10 Plus				0.000635568
Molar Flow				lbmol/h
Methane				0.0383201
Ethane				0.182799
Propane				0.496541
Isobutane				0.101983
Butane				0.388404
Isopentane				0.108413
Pentane				0.152374
Hexane				0.0774680
Heptane				0.0237620
Octane				0.00229191
Nonane				0.000124648
Benzene				0.000921966
Toluene				0.000357782
Ethylbenzene				6.67048E-05

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
m-Xylene				5.78482E-05
2,2,4-Trimethylpentane				0.00473069
C10 Plus				1.00332E-05
Mass Flow				lb/h
Methane				0.614748
Ethane				5.49659
Propane				21.8953
Isobutane				5.92750
Butane				22.5749
Isopentane				7.82184
Pentane				10.9936
Hexane				6.67583
Heptane				2.38100
Octane				0.261802
Nonane				0.0159867
Benzene				0.0720165
Toluene				0.0329655
Ethylbenzene				0.00708172
m-Xylene				0.00614145
2,2,4-Trimethylpentane				0.540379
C10 Plus				0.00149257

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Properties	**Status:**	Solved	Solved	Solved
Phase: **Vapor**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Property	**Units**			
Temperature	°F			67.07
Pressure	psia			11.76
Mole Fraction Vapor	%			100
Mole Fraction Light Liquid	%			0
Mole Fraction Heavy Liquid	%			0
Molecular Weight	lb/lbmol			54.0465
Mass Density	lb/ft^3			0.114763
Molar Flow	lbmol/h			1.57863
Mass Flow	lb/h			85.3192
Vapor Volumetric Flow	ft^3/h			743.437
Liquid Volumetric Flow	gpm			92.6883
Std Vapor Volumetric Flow	MMSCFD			0.0143775
Std Liquid Volumetric Flow	sgpm			0.309021
Compressibility				0.979743

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Specific Gravity				1.86608
API Gravity				
Enthalpy	Btu/h			-82379.7
Mass Enthalpy	Btu/lb			-965.548
Mass Cp	Btu/(lb*°F)			0.398301
Ideal Gas CpCv Ratio				1.10245
Dynamic Viscosity	cP			0.00763573
Kinematic Viscosity	cSt			4.15362
Thermal Conductivity	Btu/(h*ft*°F)			0.00933319
Surface Tension	lbf/ft			
Net Ideal Gas Heating Value	Btu/ft^3			2806.82
Net Liquid Heating Value	Btu/lb			19549.6
Gross Ideal Gas Heating Value	Btu/ft^3			3043.46
Gross Liquid Heating Value	Btu/lb			21211.2

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Light Liquid**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Mole Fraction		%	%	
Methane		0.0104836	0.308500	
Ethane		0.335692	1.72210	
Propane		3.24587	6.72401	
Isobutane		1.77203	2.35010	
Butane		9.97149	11.7757	
Isopentane		7.12689	7.09491	
Pentane		13.5744	13.0908	
Hexane		24.9936	22.5169	
Heptane		24.2246	21.4232	
Octane		7.51982	6.61051	
Nonane		1.30094	1.14150	
Benzene		0.284932	0.257000	
Toluene		0.417483	0.368800	
Ethylbenzene		0.247268	0.217300	
m-Xylene		0.257499	0.226200	
2,2,4-Trimethylpentane		4.30485	3.81100	
C10 Plus		0.412140	0.361400	
Molar Flow		lbmol/h	lbmol/h	
Methane		0.00117671	0.0394968	
Ethane		0.0376788	0.220478	
Propane		0.364323	0.860864	

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Isobutane		0.198896	0.300880	
Butane		1.11922	1.50763	
Isopentane		0.799937	0.908349	
Pentane		1.52362	1.67600	
Hexane		2.80534	2.88281	
Heptane		2.71902	2.74278	
Octane		0.844041	0.846332	
Nonane		0.146020	0.146145	
Benzene		0.0319814	0.0329033	
Toluene		0.0468591	0.0472169	
Ethylbenzene		0.0277539	0.0278206	
m-Xylene		0.0289022	0.0289600	
2,2,4-Trimethylpentane		0.483186	0.487917	
C10 Plus		0.0462595	0.0462695	
Mass Flow		lb/h	lb/h	
Methane		0.0188773	0.633626	
Ethane		1.13296	6.62956	
Propane		16.0650	37.9603	
Isobutane		11.5603	17.4878	
Butane		65.0516	87.6265	
Isopentane		57.7145	65.5363	
Pentane		109.927	120.921	
Hexane		241.751	248.427	
Heptane		272.451	274.832	
Octane		96.4135	96.6753	
Nonane		18.7278	18.7438	
Benzene		2.49812	2.57014	
Toluene		4.31753	4.35049	
Ethylbenzene		2.94649	2.95357	
m-Xylene		3.06840	3.07454	
2,2,4-Trimethylpentane		55.1936	55.7340	
C10 Plus		6.88169	6.88318	

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Properties	**Status:**	Solved	Solved	Solved
Phase: **Light Liquid**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Property	**Units**			
Temperature	°F	67.07	100	
Pressure	psia	11.76	64.6959	
Mole Fraction Vapor	%	0	0	

ProMax Output
Condensate Tank Working/Breathing Flash Emissions, and Truck Loading Emissions

Process Streams		Condensate to P/L	Condensate To Tank	Tank Flash
Composition	**Status:**	Solved	Solved	Solved
Phase: **Total**	**From Block:**	AtmTank	--	AtmTank
	To Block:	--	AtmTank	--
Mole Fraction Light Liquid	%	100	100	
Mole Fraction Heavy Liquid	%	0	0	
Molecular Weight	lb/lbmol	86.0390	82.0942	
Mass Density	lb/ft^3	41.3446	39.7553	
Molar Flow	lbmol/h	11.2242	12.8028	
Mass Flow	lb/h	965.720	1051.04	
Vapor Volumetric Flow	ft^3/h	23.3578	26.4377	
Liquid Volumetric Flow	gpm	2.91215	3.29613	
Std Vapor Volumetric Flow	MMSCFD	0.102226	0.116603	
Std Liquid Volumetric Flow	sgpm	2.91667	3.22569	
Compressibility		0.00432936	0.0222433	
Specific Gravity		0.662902	0.637420	
API Gravity		80.7828	83.2001	
Enthalpy	Btu/h	-951674	-1.02913E+06	
Mass Enthalpy	Btu/lb	-985.456	-979.151	
Mass Cp	Btu/(lb*°F)	0.511060	0.538177	
Ideal Gas CpCv Ratio		1.06327	1.06305	
Dynamic Viscosity	cP	0.315293	0.247225	
Kinematic Viscosity	cSt	0.476074	0.388219	
Thermal Conductivity	Btu/(h*ft*°F)	0.0688157	0.0643809	
Surface Tension	lbf/ft	0.00125503?	0.00103945	
Net Ideal Gas Heating Value	Btu/ft^3	4390.03	4194.82	
Net Liquid Heating Value	Btu/lb	19204.3	19232.3	
Gross Ideal Gas Heating Value	Btu/ft^3	4739.38	4530.27	
Gross Liquid Heating Value	Btu/lb	20745.2	20783.0	

Attachment 5

Manufacturer Specifications

Kimray Pump

GLYCOL PUMPS

Models PV & SC

Instruction Manual: IMG

Glycol Pump

INTRODUCTION:

The PV Series (Pressure Volume) Pump transfers the energy available from the wet glycol, at absorber pressure, to an "equivalent" volume of dry glycol at reboiler pressure. In order to circulate the glycol, additional energy is needed to overcome friction losses within the pump and connecting piping. This additional energy is supplied by gas at absorber pressure.

The pump was designed as double acting with a maximum working pressure of 1500 psig (103 bar) with a factor of safety of ten. Corrosion and wear dictated use of the best materials available. These materials include stainless steel, hard chrome plating, nylon, Teflon, stellite, and "O"-rings specially compounded for glycol service. The pump contains two basic moving parts, a Piston-Rod Assembly, and a Pilot Piston. Each actuates a three-way D-slide.

PRINCIPLE OF OPERATION:

Actions of each of the two basic parts of the pump are completely dependent upon the other. The pilot D-slide actuated by the pilot piston alternately feeds and exhausts absorber pressure to the power cylinders at opposite ends of the piston-rod assembly. Likewise, the pump D-slide actuated by the piston-rod assembly alternately feeds and exhausts absorber pressure to opposite ends of the pilot piston.

The force to circulate glycol within the dehydration system is supplied by absorber pressure acting on the area of the piston rod at its O-ring seals. The area of the piston rod is approximately 20 percent of that of the piston. Neglecting pump friction and line losses, the resultant force is sufficient to produce a theoretical discharge pressure 25 percent greater than absorber pressure. The theoretical discharge pressure, for example, at 300 psig (20.7 bar) absorber pressure would be 375 lbs. (25.9 bar), and at 1500 psig (103.4 bar) absorber pressure would be 1875 psig (129.3 bar). This theoretical "over-pressure" would develop against a blocked discharge line but is not sufficient to cause damage or create a hazard.

Approximately 25 to 30 psig (1.7 to 2.0 bar) pressure is required to overcome pump friction leaving the additional "over pressure" for line losses and circulation. It is recommended that these losses be held to approximately 10 percent of the absorber pressure or as noted in System Operations Parameters, pages 7 - 10.

Two speed control valves are provided to regulate the flow of wet glycol and gas to and from the power cylinders. Reversing the direction of flow through the speed control valves provides a flushing action which cleans the valve orifices.

If the wet glycol, returning to the pump from the absorber were to completely fill the cylinder, no additional gas would be needed. However, the wet glycol will only occupy approximately 65 percent of the total volume of the cylinder and connecting tubing leaving 35 percent to be filled by gas from the absorber. This gas volume amounts to 1.7 S.C.F. per gallon (.013 cu. meters per liter) of dry glycol at 300 psig (20.7 bar) absorber pressure and 8.3S.C.F. (.062 cu. meters per liter) at 1500 psig (103.4 bar) and may be considered as continuing power cost for pump operation. This gas can be utilized in the regeneration process of the dehydrator for "rolling" and or "stripping" purposes. It may also be recovered in a low pressure glycol gas separator and used to fire the reboiler.

By supplying some absorber gas to the cylinders, the wet glycol level is maintained at the wet glycol outlet connection on the absorber and eliminates the need of a liquid level controller and its attendant problems. Excess liquids such as hydrocarbons are removed from the absorber at approximately 55 percent of the pump rate, reducing the hazard of dumping a large volume of hydrocarbons into the reboiler as would be the case with a liquid level controller.

APPLICATIONS:

Circulating pump for gas glycol dehydrators
Circulating pump for gas amine desulphurizers

FEATURES:

Eliminates absorber liquid level controls
No auxiliary power supply required
Low gas consumption
No springs or toggles, only two moving assemblies
Hydraulic "cushioned" check valves with removable seats

PUMPS AVAILABLE:

"PV" SERIES GLYCOL PUMPS						
Model Number	Capacity Gal. / Hr. (Liters / Hr.)		Rate Strokes / Minute		Working Pressure psig (bar)	
	Min.	Max.*	Min.	Max.	Min.	Max.
4015PV	12 (45.4)	40 (151)	12	40	300 (20.7)	1500 (103)
9015PV	27 (102)	90 (340)	12	40	300 (20.7)	1500 (103)
21015PV	66 (250)	210 (795)	10	32	400 (27.6)	1500 (103)
45015PV	166 (628)	450 (1700)	10	28	400 (27.6)	1500 (103)

"SC" SERIES GLYCOL PUMPS						
Model Number	Capacity Gal. / Hr.		Rate Strokes / Minute		Working Pressure	
	Min.	Max.*	Min.	Max.	Min.	Max.
2015SC	8 (30.3)	20 (75.7)	5	55	100 (6.9)	500 (34.5)
5015SC	12 (45.4)	50 (189)	10	50	100 (6.9)	500 (34.5)
10015SC	22 (83.3)	100 (379)	10	48	100 (6.9)	500 (34.5)
20015SC	60 (227)	200 (757)	10	40	100 (6.9)	500 (34.5)

*Maximum output is affected by system pressure drops. See system operation parameter to maximum output curves.

Construction Materials:

BODY	Ductile Iron, ASTM A536
SUCTION BLOCK	Ductile Iron, ASTM A536
DISCHARGE BLOCK	Ductile Iron, ASTM A536
MAIN VALVE HOUSING	Steel
PILOT VALVE HOUSING	Steel
PORT PLATES	Stellite 3
CYLINDER HEADS	Ductile Iron, ASTM A536
PILOT PISTON CAPS	Ductile Iron, ASTM A536
CYLINDERS	Stainless steel, chrome plated steel
PISTONS	Steel
PILOT PISTONS	17-4 PH stainless steel
PISTON ROD	17-4 PH stainless steel
PISTON ROD GLANDS	Ductile Iron, ASTM A536
FITTINGS	Steel
TUBING	304 stainless steel
O-RINGS	Nitrile
BACK UPS	Glass filled Teflon

BEFORE INSTALLATION:

Be sure you fully understand the application, operation and connection of the device before installing.

WARNING:

Only trained personnel should install or service a glycol pump. Glycol pumps should be installed, operated, and maintained in accordance with international codes and regulations, manufacturer's instructions, and proven best practices.

Personal injury, equipment damage, property damage, leakage or bursting of pressure-containing parts may result if the pump is overpressured or installed where service conditions could exceed the limits given in the SPECIFICATIONS section.

To avoid injury or damage, install pressure-relieving or pressure limiting devices to prevent service conditions from exceeding those limits. Consult the appropriate code, regulations, or standards.

If a glycol pump is used in a hazardous or flammable fluid service, personal injury and property damage could occur due to fire or explosion of vented fluid that may have accumulated. To prevent such injury or damage, install piping or tubing to vent the fluid to a safe, well-ventilated area or containment vessel. When venting a hazardous fluid, the piping or tubing should be located far enough away from any buildings or windows so as not to create further hazard.

Consideration should be given to the potential risk of injury or property damage due to escaping fluid. To avoid such risks, install the pump in a safe location.

INSTALLATION:

Inspect the openings in the pump for foreign material and clean the pipe lines to remove scale, chips and debris.

A number of considerations should be made with regard to pump installation since it is the "heart" of a dehydration system. It is a moving mechanical device subject to wear and will ultimately need repair. Location of the pump is very important. Easy access to the pump for repair or exchange can save time and trouble.

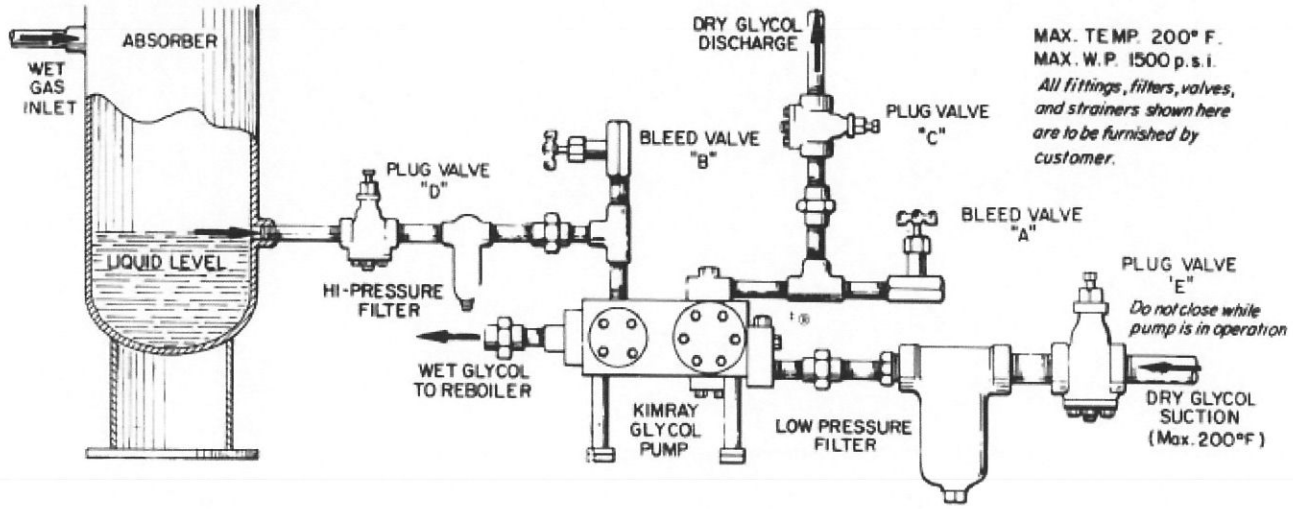
Test connections (1/4" NPT with valve) located on the piping to and from the pump permit a fast means of trouble shooting pipe restrictions or blockage.

Filters, which are discussed later, should always be installed in the wet glycol piping between the absorber and pump and in the suction line to the pump, with provisions made for maintenance of the filters.

Suction piping should preferably be large enough to permit a positive feed to the pump. Feed pressure must be more than 4 or 5 inches of Hg vacuum to prevent pump cavitation.

Where two or more pumps are manifolded together, the total capacity must be considered in the piping design. Also, a manifold should be designed to provide each pump with its appropriate share of the wet glycol from the absorber. It is not necessary that the proportion be exact.

Pumps with lower "pumping ratios" are available to provide additional energy for pressures below 300 psig (20.7 bar); but is it better not to use these pumps at pressures above 400 (27.6 bar) or 500 psig (34.5 bar) because of excess gas consumption. Conversion kits are available to change standard pumps to "SC" pumps with declining field pressures.



FILTER & STRAINER CONNECTIONS:
The following filter and strainer line sizes are recommended minimum.

4015PV & 2015SC.....1/2" NPT
9015PV & 5015SC.....3/4" NPT
21015PV & 10015SC.....1" NPT
45015PV & 20015SC.....1-1/2" NPT

HEAT EXCHANGERS:
Sufficient heat exchange is necessary to reduce dry glycol suction temperature to at least 200°F (93°C), preferably to 150°F (65°C).

VITON "O" RINGS:
Viton "O" rings for all moving seals in th Kimray Glycol Pumps are available. Viton repair kits can be ordered for pumps already in operation or new pumps can be ordered with viton "O" rings at additional cost.

Viton "O" rings are recommended for use when liquid hydrocarbons are found in the gas, for CO2 service or for elevated operating temperatures. Under normal conditions (without the above problems) viton "O" rings will not give as long of a service life in the pump as standard Buna-N "O" rings.

OPERATING PROCEDURE:
1. Close both speed control valves, bleed valves "A", "B" and plug valve "C".
2. Open plug valves "D" and "E".
3. Pressure absorber to about 300 psig (20.7 bar).
4. With plug valve "C" closed, open bleed valve "A".
5. Slowly open both speed control valves until pump is running about 1/3 rated max. strokes per minute. Count one stroke for each DISCHARGE of PUMP. When dry glycol discharges from valve "A" on each stroke, the pump is primed. Close valve "A" and open valve "C". Readjust speed control valves to 1/3 rated max. strokes per minute and continue operating pump until wet glycol returns from the absorber to the pump. This will be evidenced when the pump tries to meter liquid through the speed control valves instead of gas and causes the pump to slow down. Close both speed control valves.
6. Bring absorber to full operating pressure.
7. Adjust speed control valves for desired rate (see capacity chart).
8. Inspect and clean filters and strainers periodically.
9. For preventive maintenance, "O" Rings should be replaced annually. To check "O" Ring seal, close valve "C". If pump continues to run, seals should be replaced.

SYSTEM SHUTDOWN:
1. Close plug valve "D" Allow pump to stop running
2. Close plug valve "C" and "E"
3. Bleed pressure from bleed valve "A" and "C"

SYSTEM PRESSURE DROPS:
The Kimray Glycol Pumps are designed to operate by using the energy from the wet glycol and some additional energy in the form of gas at absorber pressure. Excessive pressure drops in the lines connecting the pump to the system can cause the pump to run erratically or stall. The following conditions should be designed into the system to assure proper pump performance:

DRY GLYCOL SUCTION LINE: Size the suction line, low pressure filter and heat exchanger such that the pump will have a positive pressure at the suction inlet when running at the maximum rated speed. This line may need to be larger than the pipe fitting on the suction check valve block.

WET GLYCOL POWER LINE: Recommended line size is the same as the size of the pipe connection for the given pump. The pressure drop across the high pressure filter is a factor in co sidering the total system pressure drop.

DRY GLYCOL DISCHARGE LINE: Recommended line size is the same as the size of the pipe connections for the given pump and the absorber should be full opening to the recommended line size.

WET GLYCOL DISCHARGE LINE: Recommended line size is the same as the size of the pipe connection for the given pump. If a glycol gas separator is used, the pressure maintained on the separator must be considered in the total system pressure drop. Also, heat exchanger coils in accumulator tanks also add to this pressure drop.

ISOLATING VALVES: All plug, gate, or blocking valves should be full opening to the recommended line size of the given pump. If a positive feed is supplied to the pump at the dry suction inlet, the total system pressure drop will be the sum of the following pressure drops:

1. The pressure drop between the absorber and the pump in the wet glycol line.

2. The pressure drop between the pump and the absorber in the dry glycol discharge line including any pressure required to open and establish full flow in any check valves.

3. The pressure drop between the pump and the reboiler (at atmospheric pressure) in the wet glycol discharge line. This includes the liquid head to the reboiler, heat exchanger coil, and/or the pressure maintained on a glycol separators.

The sum of these pressure drops gives the total "system pressure drop". The graphs on pages 7 - 10 give the maximum total system pressures and their effect on pump output. Exceeding the total allowable system pressure drop will cause the pump to run erratically or to stall.

To determine if a problem exists in an operating dehydration system, slowly open the speed control valves on the pump until it runs at the maximum recommended pump speed. (See graph page 6) If the pump cavitates before reaching the maximum pump speed, the suction line is restricted. If the pump will not run at the maximum rated speed, then there are probably restrictions in one or more of the other three connecting lines.

FILTERS:

Filters should be used on every dehydrator for protection of both the pump and reboiler. Many pumps are severely damaged in the first minutes or days of operation from flow line and vessel debris. Reboilers have been known to be filled with sand which had to first pass through the pump.

Filters should give protection from 25 to 150 micron particle sizes depending on the specific condition. The disc type, micron type, and sock type have all proven very satisfactory if they are properly maintained. Some metal filters are equipped with a cleaning device which should be operated daily or at least every few days as experience may dictate. Sock filters must be replaced at regular intervals. Preventative maintenance on these filters will save many dollars in major pump and reboiler repairs plus the reduction of costly down time.

A spring loaded by-pass on the filter is not recommended. It is better for the pump to stall due to lack of power than be exposed to dirt and grit from an open by-pass. Always install a high pressure filter between the absorber and the pump. A filter on the wet glycol discharge of the pump will protect the reboiler but does nothing for the pump. A low pressure filter on the pump suction protects against metallic particles from a new reboiler and its connecting piping. Filters will also keep the glycol free of heavy tars and residue from evaporated hydrocarbons and resinous compounds caused by polymerization of the glycol. Sock type filters are probably best for this type of filtration but should be changed rather frequently.

In addition to using filters it is often necessary to make a chemical analysis of the glycol, not only for pump protection but for better dehydration. Organic acids in glycol are produced from oxidation, thermal decomposition, and acid gases from the gas stream. These acids cause corrosion in the system, and dissolve the plating on pump parts in a short time. Glycol acidity should be maintained between a pH of 7 to 9. Alkaline amines are usually recommended to control the pH value because they will neutralize any acid gases present and are easily regenerated.

Another glycol contaminate which causes pump problems is salt. Salt water which continues to enter a dehydration system soon produces a super saturated condition in the reboiler. This results in salt deposits in the lines and in the pump as the hot glycol is cooled. A complete cleaning and washing of the entire system is required to remove the salt.

OPERATION:

A new pump or new dehydrator should be put into operation by first bringing the glycol circulation and operating temperature to an equilibrium condition by using 300 psig (20.7 bar) to 400 psig (27.6 bar) absorber pressure. This can be done with or without gas flow. If it is easier to start up under a no-flow condition, only enough gas need be supplied the absorber to maintain the pressure. In most instances the pump will pick up its prime without help and should do so in a few strokes. If the pump does not prime immediately, the dry glycol discharge should be opened to atmosphere until glycol discharges from both cylinders.

When equilibrium has been established, the pump should be stopped an the absorber pressure increased for operation. Pump speed can then be reestablished to the desired rate.

The maximum operating temperature of the pump is limited by the moving "O"-ring seals and nylon D-slides. A maximum of 200°F (93°C) is recommended. Packing life will be extended considerably at 150°F (65°C).

Always stop the pump when the pump when the main gas flow is turned off. A pump which continues to circulate with no gas flow elevates the complete dehydrator temperature, and in time to reboiler temperature.

If a pump has been deactivated for several months, the check valves should be removed and inspected before attempting to operate the pump. The pump startup should be similar to that of a new pump by first bringing the system to equilibrium.

TROUBLE SHOOTING:

If a glycol pump has been operating in a clean system it is very likely that no major service will be required for several years. Only a yearly replacement of packing will be required. Normally the pump will not stop pumping unless some internal part has been bent, worn, or broken, or some foreign object has fouled the pump, or the system has lost its glycol.

A pump which has been running without glycol for some time should be checked before returning to normal service. Probably the pump will need at least new "O"-rings. The cylinders and piston rods may also have been scored from the "dry run."

Following are some typical symptoms and causes. These are presented to assist in an accurate diagnosis of trouble.

SYMPTOM	POSSIBLE CAUSE
Pump will not operate.	One or more of the flow lines to the pump are blocked or the system pressure is too low for standard pumps (below 300 psig) use "SC" pumps below 300 psig.
Pump will start and run until the glycol returns from the absorber. The pump then stops or slows appreciably and will not run at its rated speed.	The wet glycol discharge line to the reboiler is restricted. A pressure gauge installed on the line will show the restriction immediately.
Pump operates until the system temperature is normal then the pump speeds up and cavitates.	The suction line is too small and increase in temperature and pumping rate cavitates the pump.
Pump lopes or pumps on one side only.	A leaky check valve, a foreign object lodged under check valve, or a leaky piston seal.
Pump stops and leaks excessive gas from wet glycol discharge.	Look for metal chips or shavings under the pump D-slides.
Erratic pump speed. Pump changes speed frequently.	Traps in the wet glycol power piping sends alternate slugs of glycol and gas to the pump.
Broken Pilot Piston.	Insufficient glycol to the main piston D-slide ports. Elevate the control valve end of the pump.

WARNING:

Before performing any service be sure that the pump is fully isolated and that all pressure upstream and downstream has been relieved. Use bypass valves or fully shut off the process.

Be sure that any operating or instrument gas lines have been disconnected.

Never assume that a check valve is fully blocking the downstream line.

Never tighten any fitting or the main connections to the valve while there is pressure on the line.

NOTE:

When a gasket or O-ring seal is disturbed during disassembly a new gasket should be installed during reassembly to ensure proper sealing.

MAINTENANCE:

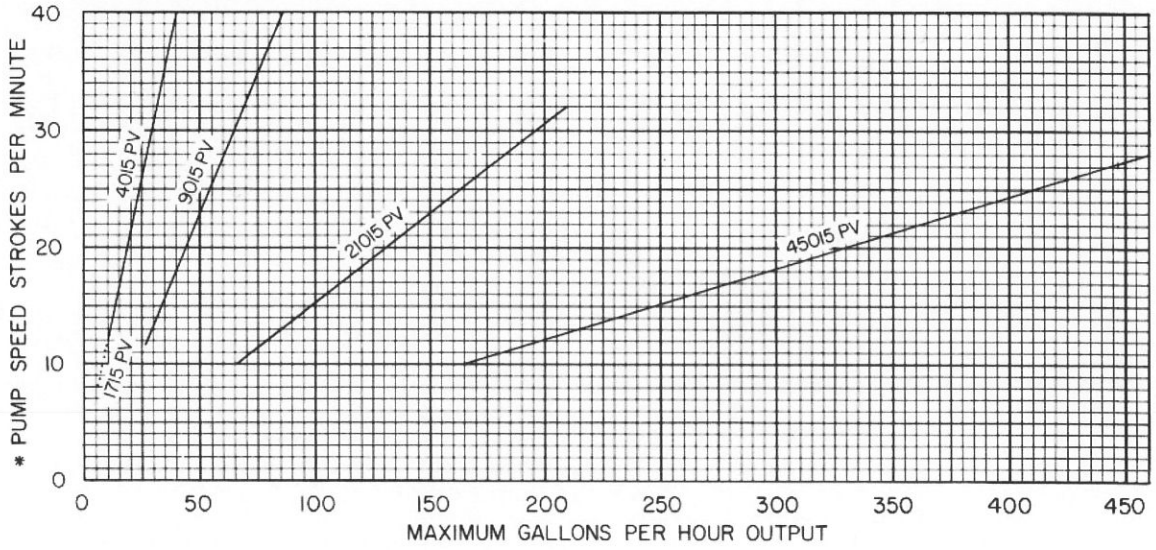
Maintenance should be performed on a regular basis. An initial inspection interval of 12 months is recommended. Depending on the service conditions and the condition of the pump, the inspection interval may be decreased or increased.

Warning: If the pump leaks fluid, it indicates that service is required. Failure to take the pump out of service immediately may create a hazardous condition.

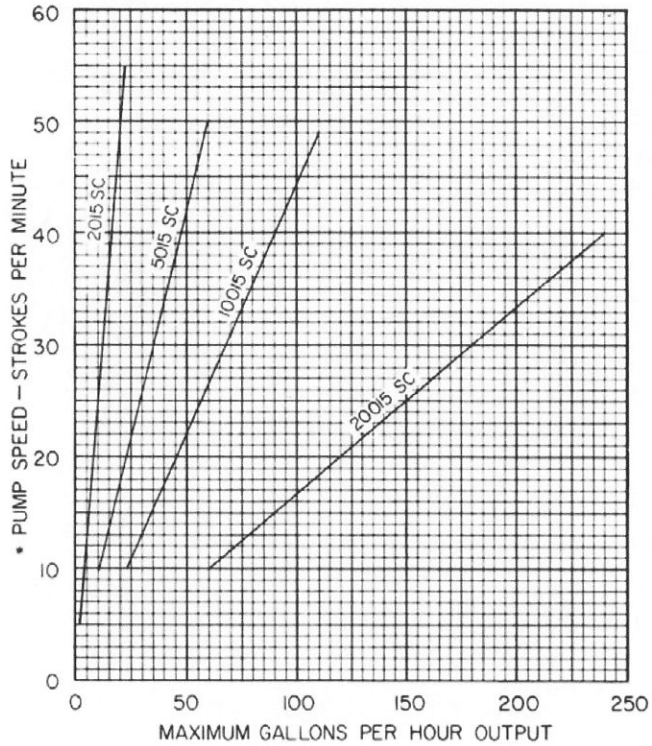
Detailed repair instructions are available for your pump.

Repair Kits are available. Consult the Kimray Catalog, Section G, or the packing slip which is enclosed with each valve for the correct Repair Kit number.

CIRCULATION RATE GRAPH "PV" SERIES PUMP

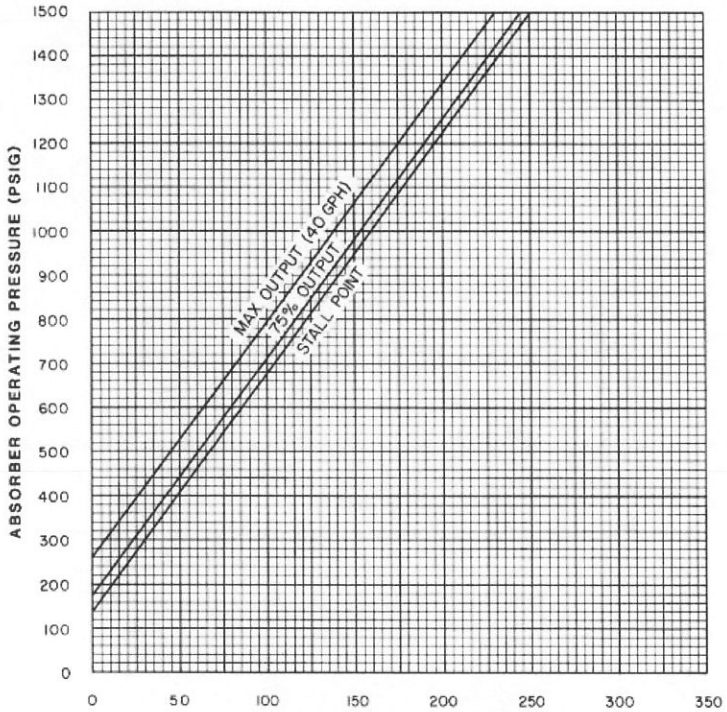


CIRCULATION RATE GRAPH "SC" SERIES PUMP

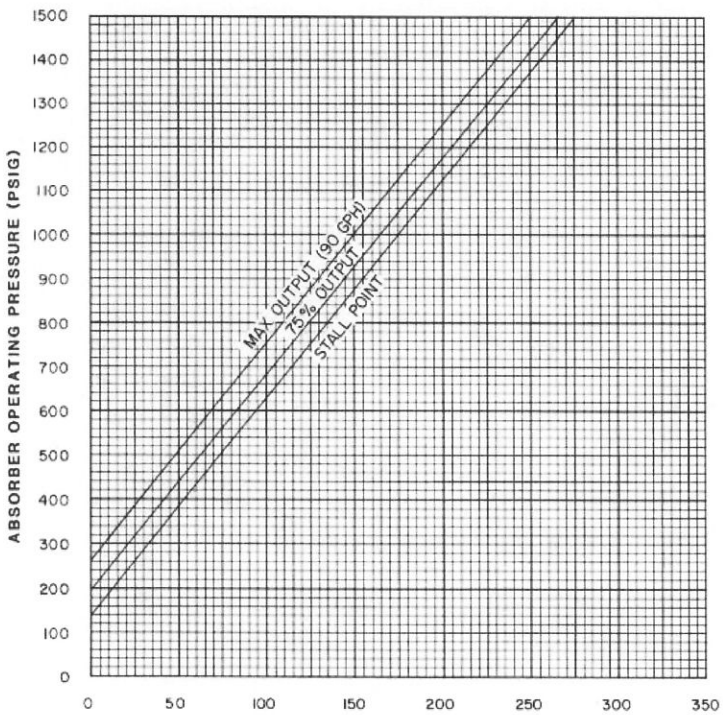


The "SC" (small cylinder) Series glycol pump was designed to extend the lower operating pressure of the "PV" Series pump downward from 300 psig (20.7 bar) to 100 psig (6.9 bar). Due to increased gas consumption it is recommended to use the "PV" Series pumps at pressures greater than 400 psig (27.6 bar).

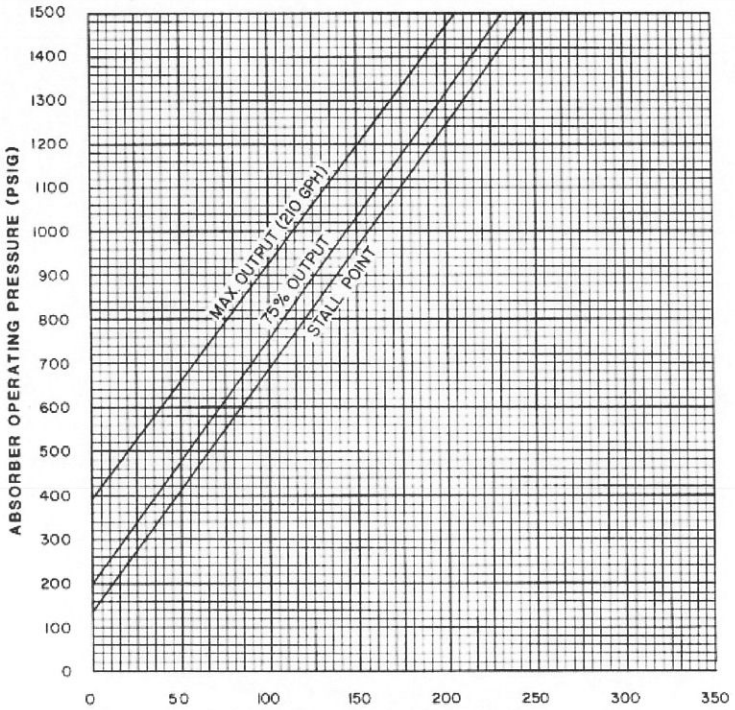
* It is not recommended to attempt to run pumps at speeds less or greater than those indicated in the above graphs.



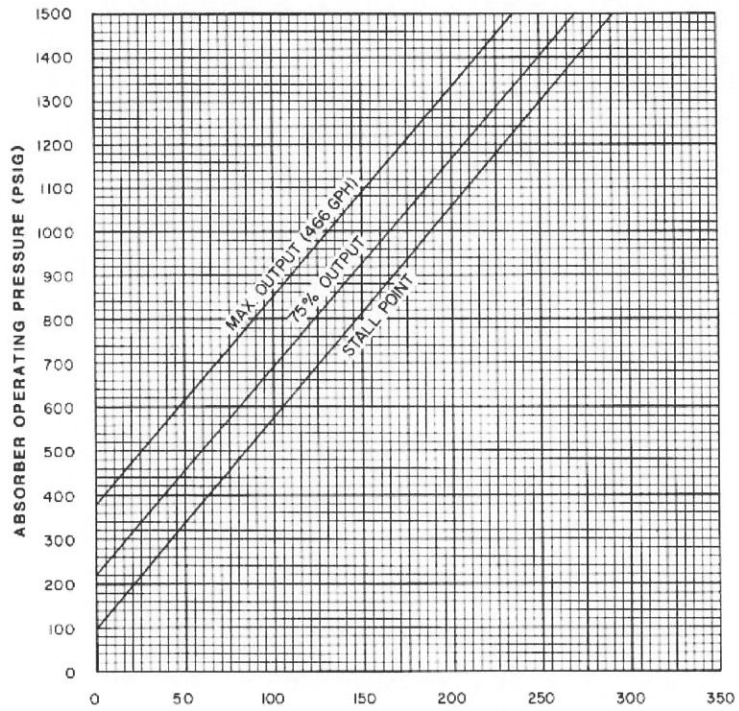
4015 PV Strokes/Minute 12 - 40



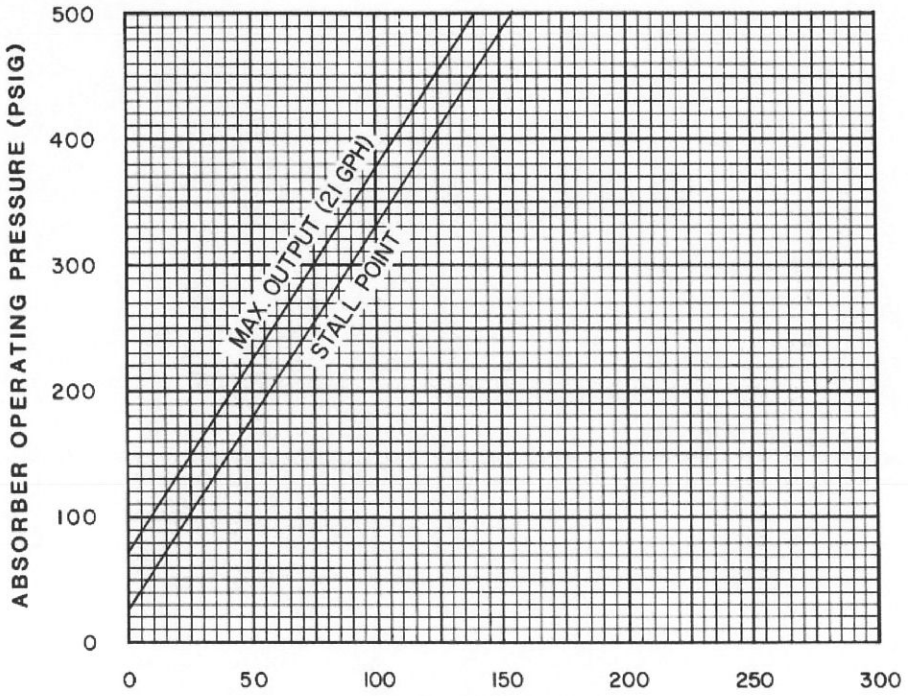
9015 PV Strokes/Minute 12 - 40



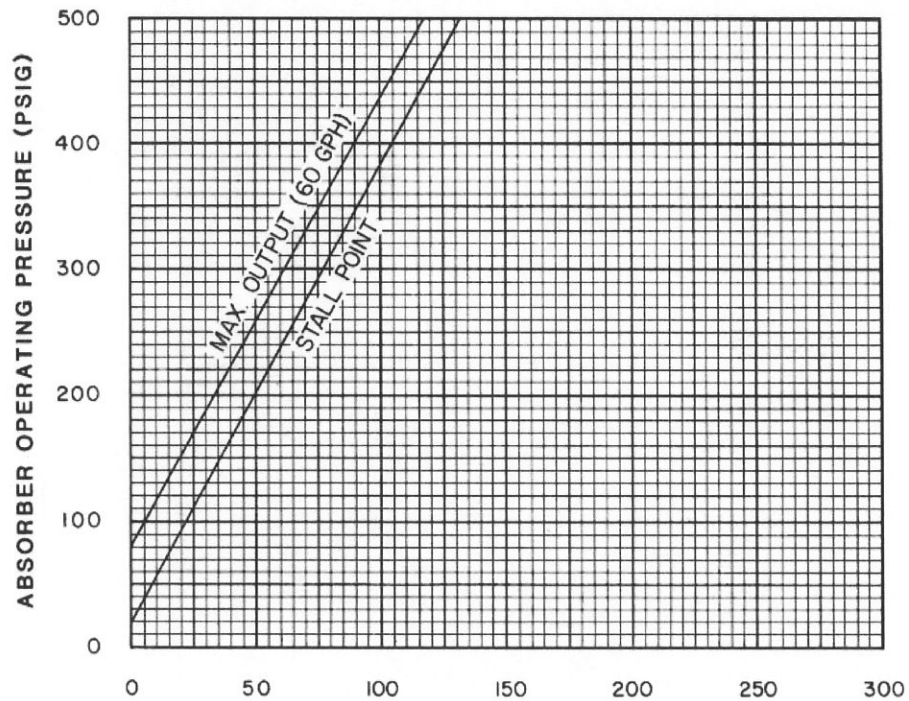
21015 PV Strokes/Minute 10 - 32



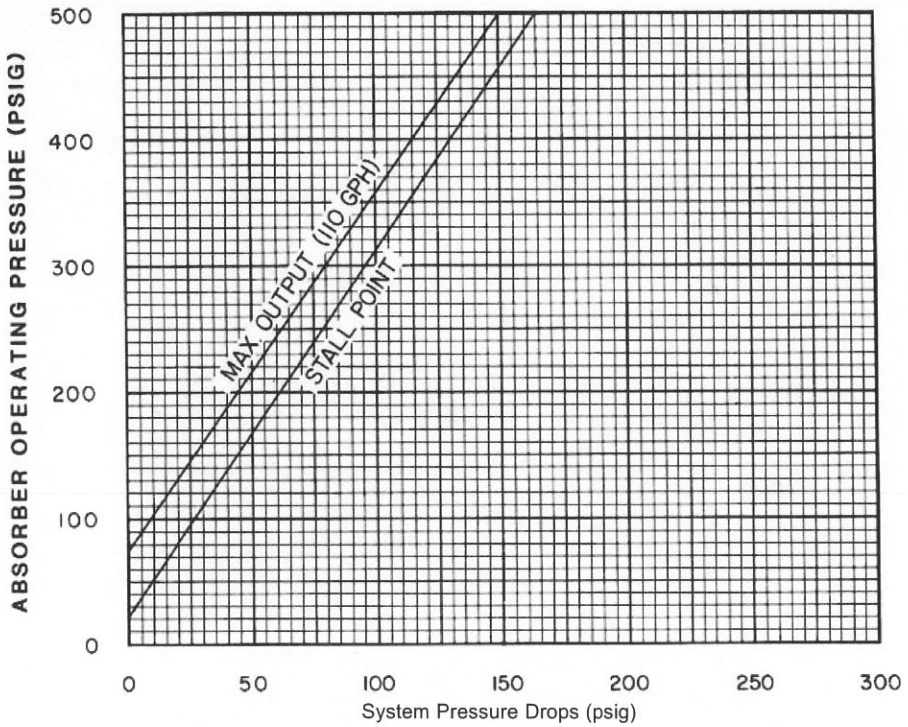
45015 PV Strokes/Minute 10 - 28



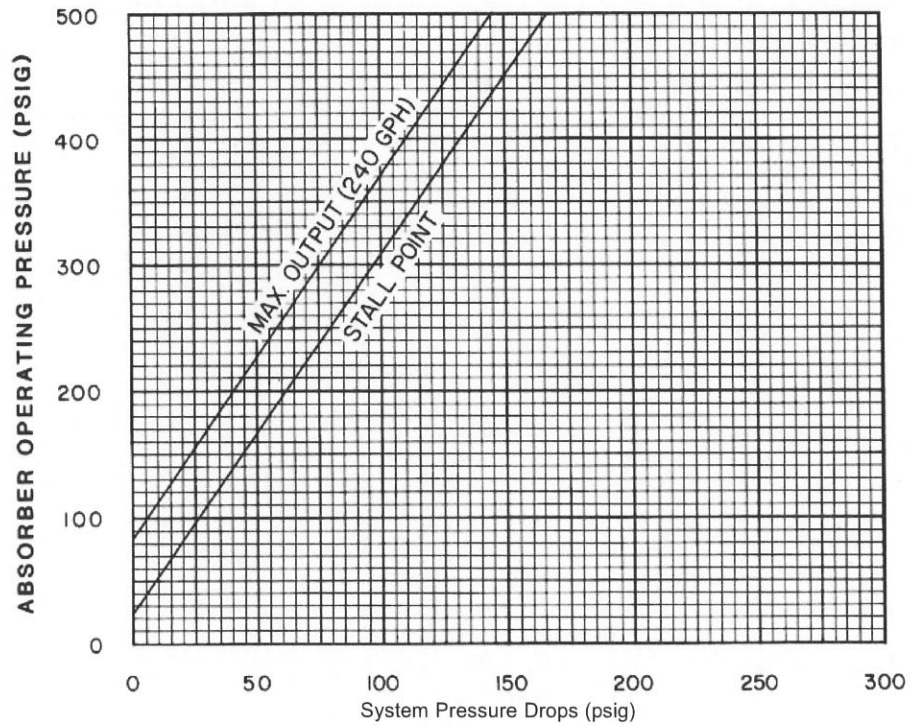
2015 SC Strokes/Minute 5 - 55



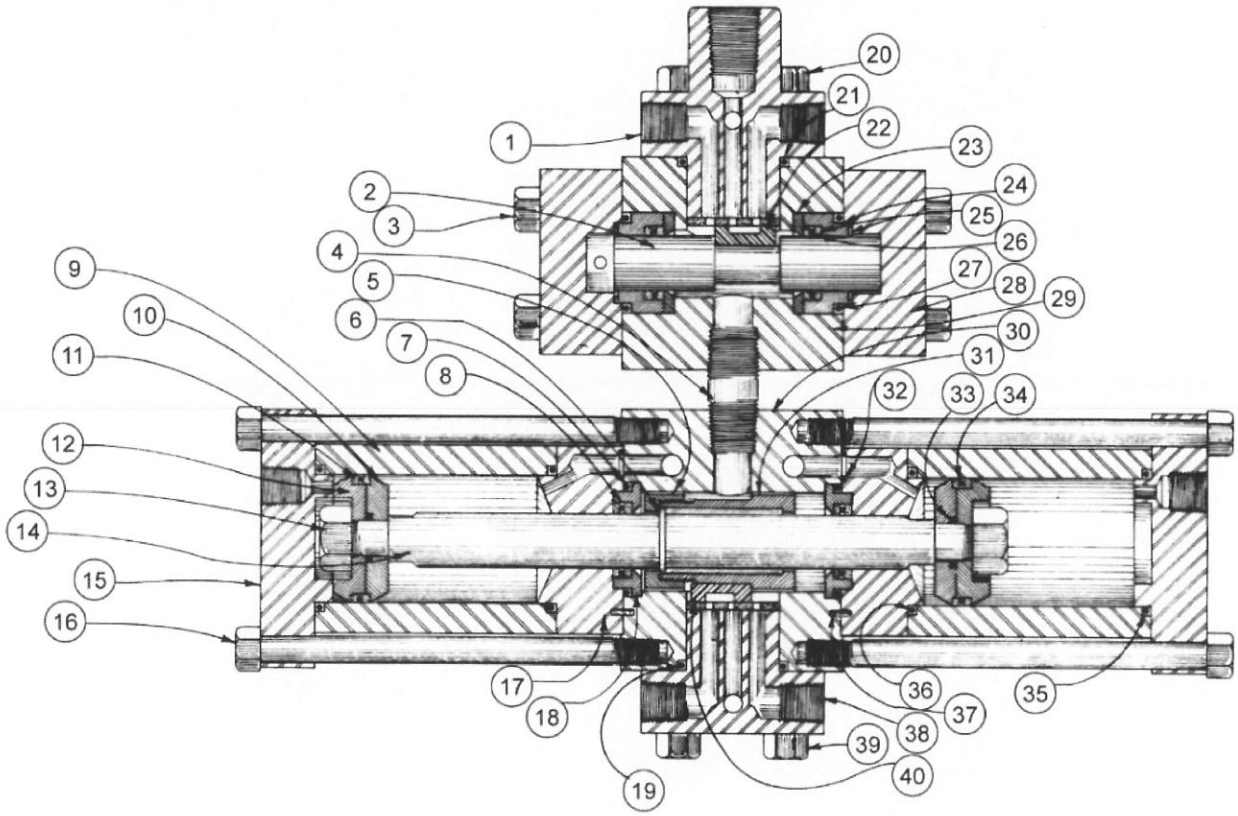
5015 SC Strokes/Minute 10 - 50



10015 SC Strokes/Minute 10 - 48



20015 SC Strokes/Minute 10 - 40



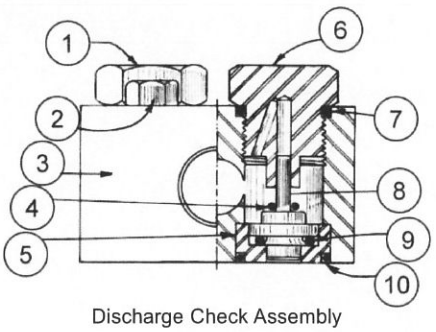
This is a general representation of a Glycol Pump model PV & SC.
For specific parts and their orientation refer to the Kimray Catalog or the packing slip which is enclosed with each pump.

Check Valve Assemblies and Tubing are located on the next page.

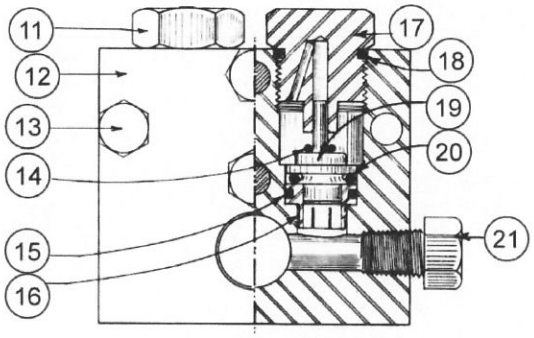
Key	Description
1	Pilot Piston Valve Housing, steel
2	Pilot Piston, stainless steel
3	Screw, plated steel
4	Nipple, plated steel
5	Actuator Cap, steel
6	Snap Ring, stainless steel
7	O-Ring, nitrile
8	O-Ring & Back Up, nitrile & teflon
9	Cylinder, PV - stainless steel SC - chrome plated steel
10	Piston Seal Retainer, steel
11	Back Up, teflon
12	Piston, steel
13	Nut, plated steel

Key	Description
14	Piston Rod, stainless steel
15	Cyinder Head, ductile iron
16	Screw, plated steel
17	Piston Rod Gland, ductile iron
18	Piston Rod Seal Retainer, steel
19	O-Ring, nitrile
20	Screw, plated steel
21	O-Ring, nitrile
22	"D" Slide, nylon
23	Pilot Piston Seal Retainer, steel
24	Pilot Piston Bearing, steel
25	Back Up, teflon
26	O-Ring, nitrile
27	O-Ring, nitrile

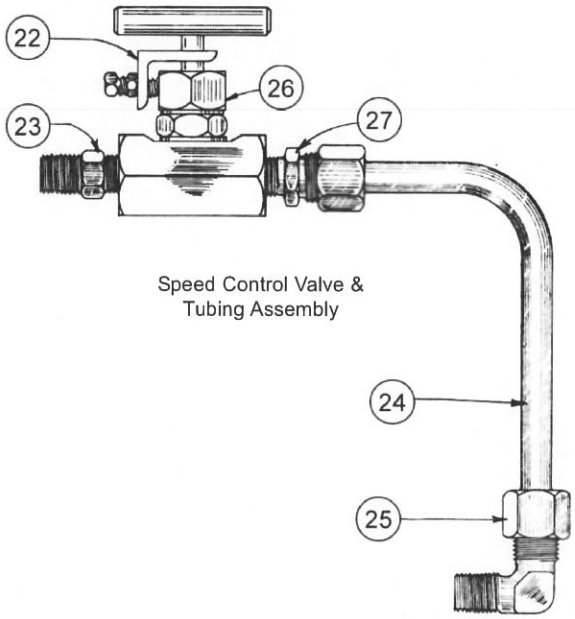
Key	Description
28	Pilot Piston Cap, ductile iron
29	Body (Pilot Piston), ductile iron
30	Body (Main Piston), ductile iron
31	"D" Slide Actuator, steel
32	O-Ring, nitrile
33	O-Ring, nitrile
34	O-Ring, nitrile
35	O-Ring, nitrile
36	O-Ring, nitrile
37	Index Pin, stainless steel
38	Main Piston Valve Housing, steel
39	Screw, plated steel
40	"D" Slide, nylon



Discharge Check Assembly



Suction Check Assembly



Speed Control Valve &
Tubing Assembly

This is a general representation of the check valve assemblies and tubing for Glycol Pump model PV & SC.
For specific parts and their orientation refer to the Kimray Catalog or the packing slip which is enclosed with each pump.

Key	Description
1	Check Valve Cap, steel
2	Screw, plated steel
3	Check Valve Block, ductile iron
4	O-Ring, nitrile
5	Removable Seat, tool steel
6	Check Valve Cap, steel
7	O-Ring, nitrile
8	Check Valve Dart, stainless steel
9	O-Ring, nitrile
10	O-Ring, nitrile
11	Check Valve Cap, steel
12	Check Valve Block, ductile iron
13	Screw, plated steel
14	O-Ring, nitrile

Key	Description
15	O-Ring, nitrile
16	Removable Seat, tool steel
17	Check Valve Cap, steel
18	O-Ring, nitrile
19	Check Valve Dart, stainless steel
20	O-Ring, nitrile
21	Plug, plated steel
22	Stem Lock Assembly, aluminum
23	Nipple, plated steel
24	Tubing, stainless steel
25	Ell, forged plated steel
26	Needle Valve, steel
27	Connector, plated steel

Attachment 6

Map of Greater Sage-Grouse Areas

Wyoming Game and Fish Department (WGFD):
Version 3 Sage Grouse Core Areas (green)
Connectivity Areas (tan)
2-Mile Buffers for Non-Core Occupied Leks (blue)

EOG I-80 Compressor Station, to be located in south central Laramie County, will not be located in a Core Population Area, Connectivity Area, or Non-Core Occupied Lek area for sage grouse.