

Jay-Bee Oil & Gas Inc  
Ketel Site  
095-00023  
R13-3257  
David Keatley

# **JAY-BEE OIL & GAS, INC.**

## **APPLICATION FOR MODIFICATION PERMIT**

**Ketel Compressor Station  
Tyler County, West Virginia**



98 Vanadium Road  
Bridgeville, PA 15017  
(412) 221-1100

# APPLICATION FOR MODIFICATION PERMIT

**Jay-Bee Oil & Gas, Inc.**

**Ketel Compressor Station**

**Tyler County, West Virginia**

## Table of Contents

### **I. Application Form**

### **II. Attachments**

- **Attachment A Business Registration**
- **Attachment B Site Location Map**
- **Attachment C Construction Schedule**
- **Attachment D Regulatory Analysis**
- **Attachment E Site Layout Diagram**
- **Attachment F Process Flow Diagram**
- **Attachment G Process Description**
- **Attachment H MSDS Sheets**
- **Attachment I Emissions Units Table**
- **Attachment J Emissions Points Data Summary Sheet**
- **Attachment K Fugitive Emissions Summary Sheet**
- **Attachment L Emissions Units Data Sheets**
- **Attachment M Air Pollution Control Device Sheets/Manufacturer Data**
- **Attachment N Supporting Calculations**
- **Attachment O Monitoring, Recordkeeping, Reporting and Testing Plan**
- **Attachment P Public Affidavit**



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**SECTION I**

**Application Form**



WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION  
**DIVISION OF AIR QUALITY**

601 57<sup>th</sup> Street, SE  
 Charleston, WV 25304  
 (304) 926-0475  
[www.wvdep.org/daq](http://www.wvdep.org/daq)

**APPLICATION FOR NSR PERMIT  
 AND  
 TITLE V PERMIT REVISION  
 (OPTIONAL)**

PLEASE CHECK ALL THAT APPLY TO NSR (45CSR13) (IF KNOWN):

- CONSTRUCTION     MODIFICATION     RELOCATION  
 CLASS I ADMINISTRATIVE UPDATE     TEMPORARY  
 CLASS II ADMINISTRATIVE UPDATE     AFTER-THE-FACT

PLEASE CHECK TYPE OF 45CSR30 (TITLE V) REVISION (IF ANY):

- ADMINISTRATIVE AMENDMENT     MINOR MODIFICATION  
 SIGNIFICANT MODIFICATION

IF ANY BOX ABOVE IS CHECKED, INCLUDE TITLE V REVISION INFORMATION AS ATTACHMENT S TO THIS APPLICATION

**FOR TITLE V FACILITIES ONLY:** Please refer to "Title V Revision Guidance" in order to determine your Title V Revision options (Appendix A, "Title V Permit Revision Flowchart") and ability to operate with the changes requested in this Permit Application.

**Section I. General**

1. Name of applicant (as registered with the WV Secretary of State's Office): <b>Jay-Bee Oil &amp; Gas, Inc.</b>		2. Federal Employer ID No. (FEIN): <b>55-0738862</b>	
3. Name of facility (if different from above): <b>Ketel Compressor Station</b>		4. The applicant is the: <input type="checkbox"/> OWNER <input type="checkbox"/> OPERATOR <input checked="" type="checkbox"/> BOTH	
5A. Applicant's mailing address: <b>3570 Shields Hill Road Cairo, WV 26337</b>		5B. Facility's present physical address: <b>No Address. See Directions in Section 12A.</b>	
6. West Virginia Business Registration. Is the applicant a resident of the State of West Virginia? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO - If YES, provide a copy of the Certificate of Incorporation/Organization/Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A. - If NO, provide a copy of the Certificate of Authority/Authority of L.L.C./Registration (one page) including any name change amendments or other Business Certificate as Attachment A.			
7. If applicant is a subsidiary corporation, please provide the name of parent corporation: <b>N/A</b>			
8. Does the applicant own, lease, have an option to buy or otherwise have control of the proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO - If YES, please explain: <b>Applicant has a lease agreement with the land owner for installation of all equipment necessary to manage gas and liquids</b> - If NO, you are not eligible for a permit for this source.			
9. Type of plant or facility (stationary source) to be constructed, modified, relocated, administratively updated or temporarily permitted (e.g., coal preparation plant, primary crusher, etc.): <b>Natural Gas Gathering Compression Facility</b>		10. North American Industry Classification System (NAICS) code for the facility: <b>211111</b>	
11A. DAQ Plant ID No. (for existing facilities only): <b>ID No. 095-00023</b>		11B. List all current 45CSR13 and 45CSR30 (Title V) permit numbers associated with this process (for existing facilities only): <b>G35-A089A</b>	

**All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.**

<p>12A.</p> <ul style="list-style-type: none"> <li>For <b>Modifications, Administrative Updates</b> or <b>Temporary permits</b> at an existing facility, please provide directions to the <i>present location</i> of the facility from the nearest state road;</li> <li>For <b>Construction</b> or <b>Relocation permits</b>, please provide directions to the <i>proposed new site location</i> from the nearest state road. Include a <b>MAP</b> as <b>Attachment B</b>.</li> </ul> <p><b>From Clarksburg, take US Route 50 west approximately 25 miles to Route 18 north (West Union Exist). Turn right on to Route 18 (north) and travel approximately 20 miles to the community of Alma. Pass through Alma. Continue on Route 18 approximately 1 mile to the intersection with County Route 1/3 (Indian Creek Road). Turn right onto Indian Creek Road and travel 6.8 miles to a private road on the left. (also the access road to Eureka Hunter Pipeline Tap). Proceed up this road 0.5 miles to facility on the left.</b></p>		
12.B. New site address (if applicable):	12C. Nearest city or town: <b>Alvy</b>	12D. County: <b>Tyler</b>
12.E. UTM Northing (KM): <b>4365.864</b>	12F. UTM Easting (KM): <b>523.570</b>	12G. UTM Zone: <b>17</b>
13. Briefly describe the proposed change(s) at the facility: Dehydrate and compress produced natural gas to allow discharge into a gathering line owned by others.		
14A. Provide the date of anticipated installation or change: If this is an <b>After-The-Fact</b> permit application, provide the date upon which the proposed change did happen: 02/15/2015		14B. Date of anticipated Start-Up if a permit is granted: <b>After-The-Fact</b>
14C. Provide a <b>Schedule</b> of the planned <b>Installation of/Change</b> to and <b>Start-Up</b> of each of the units proposed in this permit application as <b>Attachment C</b> (if more than one unit is involved).		
15. Provide maximum projected <b>Operating Schedule</b> of activity/activities outlined in this application: Hours Per Day <b>24</b> Days Per Week <b>7</b> Weeks Per Year <b>52</b>		
16. Is demolition or physical renovation at an existing facility involved? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
17. <b>Risk Management Plans.</b> If this facility is subject to 112(r) of the 1990 CAAA, or will become subject due to proposed changes (for applicability help see <a href="http://www.epa.gov/ceppo">www.epa.gov/ceppo</a> ), submit your <b>Risk Management Plan (RMP)</b> to U. S. EPA Region III.		
18. <b>Regulatory Discussion.</b> List all Federal and State air pollution control regulations that you believe are applicable to the proposed process ( <i>if known</i> ). A list of possible applicable requirements is also included in Attachment S of this application (Title V Permit Revision Information). Discuss applicability and proposed demonstration(s) of compliance ( <i>if known</i> ). Provide this information as <b>Attachment D</b> .		
<b>Section II. Additional attachments and supporting documents.</b>		
19. Include a check payable to WVDEP – Division of Air Quality with the appropriate <b>application fee</b> (per 45CSR22 and 45CSR13).		
20. Include a <b>Table of Contents</b> as the first page of your application package.		
21. Provide a <b>Plot Plan</b> , e.g. scaled map(s) and/or sketch(es) showing the location of the property on which the stationary source(s) is or is to be located as <b>Attachment E</b> (Refer to <b>Plot Plan Guidance</b> ). – Indicate the location of the nearest occupied structure (e.g. church, school, business, residence).		
22. Provide a <b>Detailed Process Flow Diagram(s)</b> showing each proposed or modified emissions unit, emission point and control device as <b>Attachment F</b> .		
23. Provide a <b>Process Description</b> as <b>Attachment G</b> . – Also describe and quantify to the extent possible all changes made to the facility since the last permit review (if applicable).		
<b>All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.</b>		
24. Provide <b>Material Safety Data Sheets (MSDS)</b> for all materials processed, used or produced as <b>Attachment H</b> . – For chemical processes, provide a MSDS for each compound emitted to the air.		
25. Fill out the <b>Emission Units Table</b> and provide it as <b>Attachment I</b> .		

26. Fill out the **Emission Points Data Summary Sheet (Table 1 and Table 2)** and provide it as **Attachment J**.

27. Fill out the **Fugitive Emissions Data Summary Sheet** and provide it as **Attachment K**.

28. Check all applicable **Emissions Unit Data Sheets** listed below:

<input type="checkbox"/> Bulk Liquid Transfer Operations	<input type="checkbox"/> Haul Road Emissions	<input type="checkbox"/> Quarry
<input type="checkbox"/> Chemical Processes*	<input type="checkbox"/> Hot Mix Asphalt Plant	<input type="checkbox"/> Solid Materials Sizing, Handling and Storage Facilities
<input type="checkbox"/> Concrete Batch Plant	<input type="checkbox"/> Incinerator	<input checked="" type="checkbox"/> Storage Tanks
<input type="checkbox"/> Grey Iron and Steel Foundry	<input checked="" type="checkbox"/> Natural Gas Compressors	

Dehydration

\*Leak Source Data Sheet Only

Fill out and provide the **Emissions Unit Data Sheet(s)** as **Attachment L**.

29. Check all applicable **Air Pollution Control Device Sheets** listed below:

<input type="checkbox"/> Absorption Systems	<input type="checkbox"/> Baghouse	<input checked="" type="checkbox"/> Flare
<input type="checkbox"/> Adsorption Systems	<input type="checkbox"/> Condenser	<input type="checkbox"/> Mechanical Collector
<input type="checkbox"/> Afterburner	<input type="checkbox"/> Electrostatic Precipitator	<input type="checkbox"/> Wet Collecting System

Other Collectors, specify: **Catalyst**

Fill out and provide the **Air Pollution Control Device Sheet(s)** as **Attachment M**.

30. Provide all **Supporting Emissions Calculations** as **Attachment N**, or attach the calculations directly to the forms listed in Items 28 through 31.

31. **Monitoring, Recordkeeping, Reporting and Testing Plans.** Attach proposed monitoring, recordkeeping, reporting and testing plans in order to demonstrate compliance with the proposed emissions limits and operating parameters in this permit application. Provide this information as **Attachment O**.

➤ Please be aware that all permits must be practically enforceable whether or not the applicant chooses to propose such measures. Additionally, the DAQ may not be able to accept all measures proposed by the applicant. If none of these plans are proposed by the applicant, DAQ will develop such plans and include them in the permit.

32. **Public Notice.** At the time that the application is submitted, place a **Class I Legal Advertisement** in a newspaper of general circulation in the area where the source is or will be located (See 45CSR§13-8.3 through 45CSR§13-8.5 and **Example Legal Advertisement** for details). Please submit the **Affidavit of Publication** as **Attachment P** immediately upon receipt.

33. **Business Confidentiality Claims.** Does this application include confidential information (per 45CSR31)?

YES     NO

➤ If YES, identify each segment of information on each page that is submitted as confidential and provide justification for each segment claimed confidential, including the criteria under 45CSR§31-4.1, and in accordance with the DAQ's "**Precautionary Notice – Claims of Confidentiality**" guidance found in the **General Instructions** as **Attachment Q**.

**Section III. Certification of Information**

34. **Authority/Delegation of Authority.** Only required when someone other than the responsible official signs the application. Check applicable **Authority Form** below:

<input type="checkbox"/> Authority of Corporation or Other Business Entity	<input type="checkbox"/> Authority of Partnership
<input type="checkbox"/> Authority of Governmental Agency	<input type="checkbox"/> Authority of Limited Partnership

Submit completed and signed **Authority Form** as **Attachment R**.

**All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.**

35A. **Certification of Information.** To certify this permit application, a Responsible Official (per 45CSR§13-2.22 and 45CSR§30-2.28) or Authorized Representative shall check the appropriate box and sign below.

**Certification of Truth, Accuracy, and Completeness**

I, the undersigned  **Responsible Official** /  **Authorized Representative**, hereby certify that all information contained in this application and any supporting documents appended hereto, is true, accurate, and complete based on information and belief after reasonable inquiry I further agree to assume responsibility for the construction, modification and/or relocation and operation of the stationary source described herein in accordance with this application and any amendments thereto, as well as the Department of Environmental Protection, Division of Air Quality permit issued in accordance with this application, along with all applicable rules and regulations of the West Virginia Division of Air Quality and W.Va. Code § 22-5-1 et seq. (State Air Pollution Control Act). If the business or agency changes its Responsible Official or Authorized Representative, the Director of the Division of Air Quality will be notified in writing within 30 days of the official change.

**Compliance Certification**

Except for requirements identified in the Title V Application for which compliance is not achieved, I, the undersigned hereby certify that, based on information and belief formed after reasonable inquiry, all air contaminant sources identified in this application are in compliance with all applicable requirements.

SIGNATURE   
(Please use blue ink)

DATE: 6-25-15  
(Please use blue ink)

35B. Printed name of signer: <b>Shane Dowell</b>		35C. Title: <b>Office Manger</b>
35D. E-mail: <b>sdowell@jaybeeoll.com</b>	36E. Phone: <b>304/628-3119</b>	36F. FAX: <b>304/628-3119</b>
36A. Printed name of contact person (if different from above):		36B. Title:
36C. E-mail:	36D. Phone:	36E. FAX:

**PLEASE CHECK ALL APPLICABLE ATTACHMENTS INCLUDED WITH THIS PERMIT APPLICATION:**

- |  |  |
|--|--|
| <input checked="" type="checkbox"/> Attachment A: Business Certificate               | <input checked="" type="checkbox"/> Attachment K: Fugitive Emissions Data Summary Sheet            |
| <input checked="" type="checkbox"/> Attachment B: Map(s)                             | <input checked="" type="checkbox"/> Attachment L: Emissions Unit Data Sheet(s)                     |
| <input checked="" type="checkbox"/> Attachment C: Installation and Start Up Schedule | <input checked="" type="checkbox"/> Attachment M: Air Pollution Control Device Sheet(s)            |
| <input checked="" type="checkbox"/> Attachment D: Regulatory Discussion              | <input checked="" type="checkbox"/> Attachment N: Supporting Emissions Calculations                |
| <input checked="" type="checkbox"/> Attachment E: Plot Plan                          | <input checked="" type="checkbox"/> Attachment O: Monitoring/Recordkeeping/Reporting/Testing Plans |
| <input checked="" type="checkbox"/> Attachment F: Detailed Process Flow Diagram(s)   | <input checked="" type="checkbox"/> Attachment P: Public Notice                                    |
| <input checked="" type="checkbox"/> Attachment G: Process Description                | <input type="checkbox"/> Attachment Q: Business Confidential Claims                                |
| <input checked="" type="checkbox"/> Attachment H: Material Safety Data Sheets (MSDS) | <input type="checkbox"/> Attachment R: Authority Forms   |
| <input checked="" type="checkbox"/> Attachment I: Emission Units Table               | <input type="checkbox"/> Attachment S: Title V Permit Revision Information                         |
| <input checked="" type="checkbox"/> Attachment J: Emission Points Data Summary Sheet | <input checked="" type="checkbox"/> Application Fee  |

*Please mail an original and three (3) copies of the complete permit application with the signature(s) to the DAQ, Permitting Section, at the address listed on the first page of this application. Please DO NOT fax permit applications.*

**FOR AGENCY USE ONLY - IF THIS IS A TITLE V SOURCE:**

- Forward 1 copy of the application to the Title V Permitting Group and:
- For Title V Administrative Amendments:
  - NSR permit writer should notify Title V permit writer of draft permit,
- For Title V Minor Modifications:
  - Title V permit writer should send appropriate notification to EPA and affected states within 5 days of receipt,
  - NSR permit writer should notify Title V permit writer of draft permit.
- For Title V Significant Modifications processed in parallel with NSR Permit revision:
  - NSR permit writer should notify a Title V permit writer of draft permit,
  - Public notice should reference both 45CSR13 and Title V permits,
  - EPA has 45 day review period of a draft permit.

*All of the required forms and additional information can be found under the Permitting Section of DAQ's website, or requested by phone.*

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**ATTACHMENT A**

**Business Registration**

Attachment A

Attached Current WV Business Certificate

**WEST VIRGINIA  
STATE TAX DEPARTMENT  
BUSINESS REGISTRATION  
CERTIFICATE**

ISSUED TO:  
**JAY-BEE OIL & GAS INC  
RR 1 BOX 5  
CAIRO, WV 26337-9701**

**BUSINESS REGISTRATION ACCOUNT NUMBER 1043442**

This certificate is issued on 08/11/2010

This certificate is issued by the  
West Virginia State Tax Commissioner  
in accordance with W.Va. Code § 50-2-12

The person whose name is shown on this certificate is authorized  
to conduct business in the State of West Virginia at the location(s) as follows:

This certificate is not transferable and must be displayed at the location(s) which fall(s) under

This certificate shall be void upon termination of the business for which the certificate of registration  
was granted or until it is suspended, revoked or cancelled by the Tax Commissioner.

Change in name or change of location shall require a suspension of the business and a new  
certificate shall be required.

**TRAVELING STREET VENDORS:** Must carry a copy of this certificate in every vehicle operated by them.  
**CONTRACTORS, DRILLING OPERATORS, TIMBER LOGGING OPERATIONS:** Must have a copy of  
this certificate displayed at every job site within West Virginia.

SLD08 v.1  
L1388180484

SCANNED

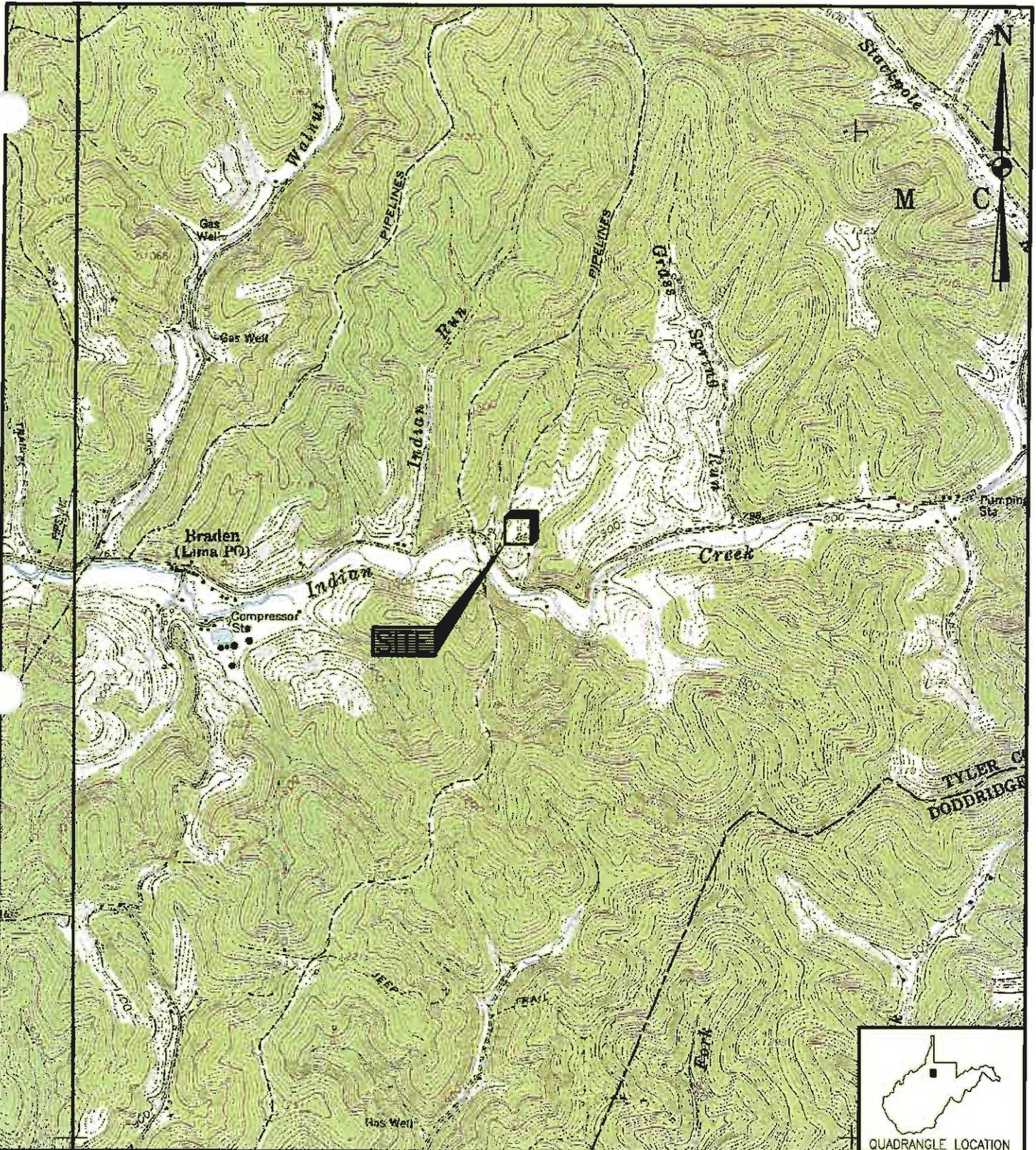
2010/11/10

DATE 11/10/10  
WEST VIRGINIA STATE TAX DEPARTMENT

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**ATTACHMENT B**

**Site Location Map**



REFERENCE: USGS 7.5' QUADRANGLE MAP OF: CENTER POINT, WEST VIRGINIA; DATED 1961, PHOTOREVISED 1976.

DRAWN BY	DJF
DATE	6/3/15
CHECKED BY	RAD
JOB NO.	214054-10
SET DWG FILE	KETELm01.dwg
DRAWING SCALE	1"=2000'



98 Vanadium Road Bridgeville, PA 15017 (412) 221-1100

JAY-BEE OIL & GAS, INC.	
KETEL COMPRESSOR STATION TYLER COUNTY, WEST VIRGINIA SITE LOCATION MAP	
DRAWING NO.	FIGURE 1
REV.	0

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**ATTACHMENT C**

**Construction Schedule**

**Jay-Bee Oil & Gas, Inc.**  
**Ketel Compressor Station**  
**Attachment C – Construction Schedule**

The requested permit modification seeks approval for a replacement engine and a single tank at an existing facility. As noted in the application form, the equipment and connect to existing gathering lines has already taken place.

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**ATTACHMENT D**

**Regulatory Analysis**

## **Ketel Compressor Station Attachment D Regulatory Analysis**

Both State and Federal environmental regulations governing air emissions apply to the planned Ketel Compressor Station. The West Virginia Department of Environmental Protection (WVDEP) has been delegated the authority to implement certain federal air quality requirements for the state. Air quality regulations that potentially affect the modification are discussed herein.

### **1.1 PSD and NSR**

The facility will be a minor source with respect to Prevention of Significant Deterioration (PSD) regulations as it will not have the potential to emit more than the annual emission thresholds of any PSD regulated pollutant with the voluntary restrictions (catalytic converters on engines).

The facility is not within any area designated as non-attainment for any criteria pollutants. Consequently, the facility is not subject to the New Source Review (NSR) regulations.

### **1.2 Title V Operating Permit Program**

West Virginia has incorporated provisions of the federal Title V operating permit program. Thresholds for inclusion under the Title V program are 10 tpy of any single Hazardous Air Pollutant (HAP) or 25 tons of any combination of HAP and/or 100 tpy of all other regulated pollutants. Additionally, facilities regulated under certain New Source Performance Standards (NSPS) require facilities to have Title V permits.

The expanded facility will remain a minor source. Additionally, the NSPS regulating this facility does not trigger a Title V permit. Hence, a Title V permit will not be required for the Ketel Compressor Station.

### **1.3 Aggregation**

Source aggregation determinations are typically made based on the following criteria:

- Whether the facilities are under common control,
- Whether the facilities belong to the same Major Group (i.e. the first two digit code) as described in the Standard Industrial Classification Manual, 1972, as amended by the 1977 Supplement;
- Whether the facilities are located on one or more contiguous or adjacent properties; and the distance between all pollutant emitting activities,
- Whether the facilities can operate independently

Only if all criteria are met does a permitting authority aggregate the facilities into a single source.

This Jay-Bee Oil & Gas facility currently receives and manages raw natural gas and associated produced fluids from area Jay-Bee well pads. All well pads are greater than 0.5 miles from this facility, with no clear line of sight. After separation of the liquids and dehydration, the gas will be injected into a gathering line for transportation to others for further processing or direct sales.

The Ketel Compressor Station and the well pads it serves is under the same general SIC Code, is under common ownership and may, from time to time have a sharing of staff. However, the compressor station is remote from the nearest well pad, with no clear line of sight. While there is a dependency between the well pads and this compressor station, the distance between the facilities does not rise to the definition of contiguous or adjacent. Thus, not all of the criteria for aggregation are met. Hence, emissions from the Ketel Compressor Station should not be aggregated with those from the well pads it serves.

#### **1.4 New Source Performance Standards**

New Source Performance Standards (NSPS) regulations promulgated under 40 CFR 60 require new and reconstructed facilities to control emissions to the level achievable by Best-Available Control Technology (BACT). Specific NSPS requirements potentially applicable to the Ketel Compressor Station are as follows:

- 40 CFR 60, Subpart Dc—Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units
- 40 CFR 60, Subpart KKK – Equipment Leaks of VOC from Onshore Natural Gas Processing Stations
- 40 CFR 60, Subpart LLL – Onshore Natural Gas Processing Stations: SO<sub>2</sub> Emissions
- 40 CFR 60, Subpart JJJJ – Stationary Spark Ignition Internal Combustion Engines
- 40 CFR 60, Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution

##### **1.4.1 Subpart Dc**

This subpart limits SO<sub>2</sub> and PM emissions from boilers and heaters fired by various fuels. While the primary thrust of this set of regulations is to control SO<sub>x</sub> and PM emissions from coal and oil-fired boilers and heaters, natural gas fired units are also covered under this rule. The planned re-boilers are well below the threshold of coverage for this rule (10 MMBTU/Hr). Thus, this rule does not apply.

#### 1.4.2 Subpart KKK

This subpart limits VOC emissions from equipment at a natural gas processing station. The planned Ketel Compressor Station does not meet the definition of a processing station under this rule. Hence, this rule does not apply.

#### 1.4.3 Subpart LLL

This set of regulations governs emissions from processes used to remove sulfur gases from the field gas stream (sweetening unit) and subsequent sulfur recovery operations. The field gas that will be received by the Ketel Compressor Station does not contain sufficient sulfur compounds to warrant a sweetening unit. Accordingly, not such equipment will be present. Hence, this rule does not apply.

#### 1.4.4 Subpart IIII

This subpart governs emissions from new compression ignition internal combustion engines (CI ICE) manufactured after July 11, 2005. There will be no compression ignition engines (e.g. diesel-fired emergency generator) at this station. Hence, this rule does not apply.

#### 1.4.5 Subpart JJJJ

This subpart governs emissions from new stationary spark ignition internal combustion engines (SI ICE) manufactured after July 1, 2007. The driver for the replacement compressor will be SI ICE units manufactured after this date. Accordingly, this rule applies to those engines.

#### 1.4.6 Subpart OOOO

This subpart governs emissions from a broad spectrum of operations in the oil and natural gas industries, including operations at processing and fractionation plants. The potentially applicable sections of this rule sets restrictions, recordkeeping and reporting requirements on reciprocating compressors and pneumatic controllers present at the Ketel Compressor Station, and sets requirements for storage vessels with potential VOC emissions greater than 6 tons per year. This rule applies to the Ketel Compressor Station.

Reciprocating compressors are present at the Ketel Compressor Station. The facility must meet the requirements of 40 CFR 60.5385, 60.5410 and 60.5420.

Another key components to this rule applicable to the Ketel Compressor Station is the requirement that all pneumatic controllers located between the well head and a processing plant must have a bleed rate of less than 6 scfh [40 CFR 60.5390(b)]. All pneumatic controllers to be installed at Ketel Compressor Station will meet these criteria.

This rule also stipulates that storage vessels with VOC emissions equal to or greater than 6 tpy must control those emissions by 95% by October 15, 2013. The Produced Fluids tank at Ketel has an estimated *uncontrolled* VOC emission rate well in excess of this threshold. Thus,

emissions from these tanks must be controlled by at least 95%. Jay-Bee Oil & Gas will meet this requirement through installation of a system that will capture vapors released from the tank and route them to an enclosed combustor. This unit will control VOC emissions to at least 98%, fulfilling this regulatory requirement. The control system proposed in this application will reduce VOC emissions from the tank to rates well below the 6 tpy limit and operation of the control will become part of the permit. As described in 40 CFR 60.5365(e), *...the determination may take into account requirements under a legally and practically enforceable limit in an operating permit or other requirement established under a Federal, State, local or tribal authority.* Thus, as proper use and operation of this control system is anticipated to become part of the permit, the Produced Fluids tank at this facility will not be regulated under 40 CFR 60, Subpart OOOO.

## **1.5 National Emission Standards for Hazardous Air Pollutants**

National Emission Standards for Hazardous Air Pollutants (NESHAPs) promulgated under 40 CFR 63 regulate the emission of Hazardous Air Pollutants (HAPs) from certain industrial processes. In general, these rules apply to major sources of HAPs with a major source being defined as having the potential to emit more than 10 tpy of any individual HAP or 25 tpy of total HAPs. Emissions standards under these rules have been established as the Maximum Achievable Control Technology (MACT) for each source category. The following NESHAP source category standards are potentially applicable to the planned Ketel Compressor Station:

- 40 CFR 63, Subpart HH – NESHAP from Oil and Natural Gas Production Facilities
- 40 CFR 63, Subpart HHH – NESHAP from Natural Gas Transmission and Storage Facilities
- 40 CFR 63, Subpart ZZZZ – NESHAP from Stationary Reciprocating Internal Combustion Engines
- 40 CFR 63, Subpart DDDDD – NESHAP for Industrial, Commercial and Institutional Boilers and Process Heaters

### **1.5.1 Subpart HH**

This Subpart contains MACT standards for major and area source dehydration units located at natural gas production facilities. The Ketel Compressor Station contains dehydration operations. Hence, this rule applies. However, as benzene emissions will be less than 1 ton per year, the facility is, for all practical purposes, exempt from the rule.

### **1.5.2 Subpart HHH**

This Subpart applies to dehydration units at facilities which are major sources of HAPs that transport or store natural gas in association with transmission pipelines as defined by 40 CFR 63.1271. The planned equipment at the Ketel Compressor Station does not cause the facility to be a major source of HAPs, a transportation source or a storage facility source associated with transmission pipelines. Hence, this rule does not apply.

### 1.5.3 Subpart ZZZZ

This Subpart governs emissions from a stationary reciprocating internal combustion engine (RICE) located both at major and area source of HAPs. The facility will not be a major source of HAPs, but will be considered an area source of HAPs. Hence, this rule is potentially applicable to the facility. In accordance with 40 CFR 63.6590(a)(2)(iii), none of the engines at the Ketel Compressor Station are considered Existing Stationary RICE. All are considered "new" engines. Thus, the engines will meet the requirements of this rule by meeting the requirements of NSPS, Subpart JJJJ as described above.

### 1.5.4 Subpart DDDDD

This Subpart applies to industrial boilers and process heaters of various sizes and fuel types located at facilities that are classified as a major source of HAPs. As the planned facility is not a major source of HAPs, this rule does not apply.

## 1.6 **Chemical Accident Prevention**

Subparts B-D of 40 CFR 68 present the requirements for the assessment and subsequent preparation of a Risk Management Plan (RMP) for a facility that stores more than a threshold quantity of a regulated substance listed in 40 CFR 68.130. If a facility stores, handles or processes one or more regulated substances in an amount greater than its corresponding threshold, the facility must prepare and implement an RMP. The Ketel Compressor Station will potentially store more than 10,000 lbs of a flammable mixture containing several of the substances listed in Table 3 in 40 CFR 68.130. However, an RMP is not required as this facility qualifies for the exclusion provided for remote oil and gas production facilities (40 CFR 68.115).

## 1.7 **West Virginia State Requirements**

### 1.7.1 45 CSR 2

The purpose of 45CSR2 is to control smoke and particulate matter emissions from fuel burning units. The facility is subject to the opacity requirement of 45 CSR 2. Emissions from the facility cannot exceed 10% over any six minute period.

#### 1.7.2 45 CSR 4

This regulation prohibits the emission of objectionable odors. Jay-Bee Oil & Gas is obligated to run the station in a manner that does not produce objectionable odors.

#### 1.7.3 45 CSR 6

This rule establishes emission standards for particulate matter and other requirements for incineration of refuse not subject to or specifically exempted from federal regulation. The vapor combustor units (VCUs) fall under Section 4.1 of this rule. PM emissions from the VCUs must remain below the allowable limit calculated under this rule.

The VCUs must also meet the visible emissions requirements of this rule limiting visible emissions to 20% opacity.

#### 1.7.4 45 CSR 10

This regulation limits emissions of sulfur oxides. As the sulfur content of the Inlet Gas contains no measurable sulfur, emissions of sulfur oxides is negligible. Thus, while parts of this rule are applicable to the planned facility, no actions are required on the part of Jay-Bee Oil & Gas to attain compliance. The various non-engine combustion units have a design heat input less than 10 MMBTU/Hr and are therefore exempt from the requirements of this rule. Additionally, other fuel-burning units at the proposed facility (e.g. engines) are not subject to 45 CSR 10, Section 3 as they do not produce power by indirect heat transfer and are therefore not considered "fuel burning units".

#### 1.7.5 45 CSR 13

The state regulations applicable to the permitting of the proposed construction are in Title 45 Series 13 of the Code of State Regulations. The proposed Ketel Compressor Station has the potential to emit several regulated pollutants in excess of the thresholds that define a Stationary Source.

When taking into consideration the voluntary limit to operate the engines equipped with catalysts only when the catalytic converters are properly functioning, the facility's potential to emit is less than the thresholds that would classify the facility as a Major Source under 45 CSR 14.

#### 1.7.6 45 CSR 16

This series of regulations is an incorporation, by reference, of the New Source Performance Standards codified under 40 CFR 60. As discussed under the federal regulations, the Ketel Compressor Station is subject to the emission limitations, monitoring, testing and recordkeeping of Subpart JJJJ. The facility is also subject to Subpart OOOO.

#### 1.7.7 45 CSR 30

The state regulations applicable to Title V operating permits are in Title 45 Series 30. The planned Ketel Compressor Station, as noted above, does not have the potential to emit any regulated pollutant about the threshold that would define it as a major facility. Additionally, although the facility is subject to certain New Source Performance Standards, the NSPS applicable to this facility do not trigger the need to submit a Title V application and obtain a Title V permit. Hence this rule is not applicable.

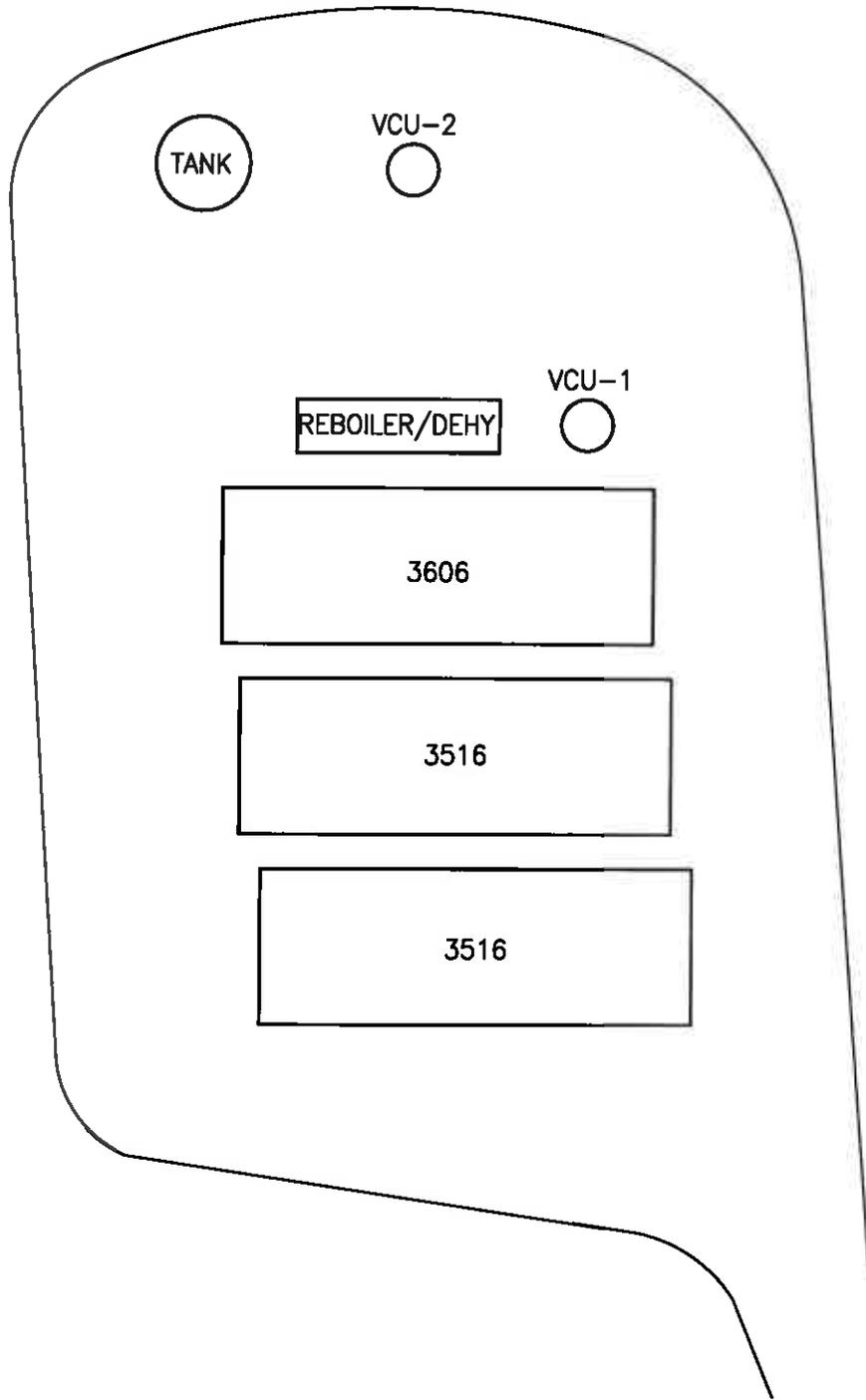
#### 1.7.8 Other Applicable Requirements

Through Series 34, WVDEP has adopted the National Emission Standards for Hazardous Air Pollutants for Source Categories. Both of these topics have been addressed above.

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**ATTACHMENT E**

**Site Layout Diagram**



DRAWN BY	DJF
DATE	6/23/15
CHECKED BY	RAD
JOB NO.	214054-10
SET DWG FILE	KETELa01.dwg
DRAWING SCALE	N.T.S.



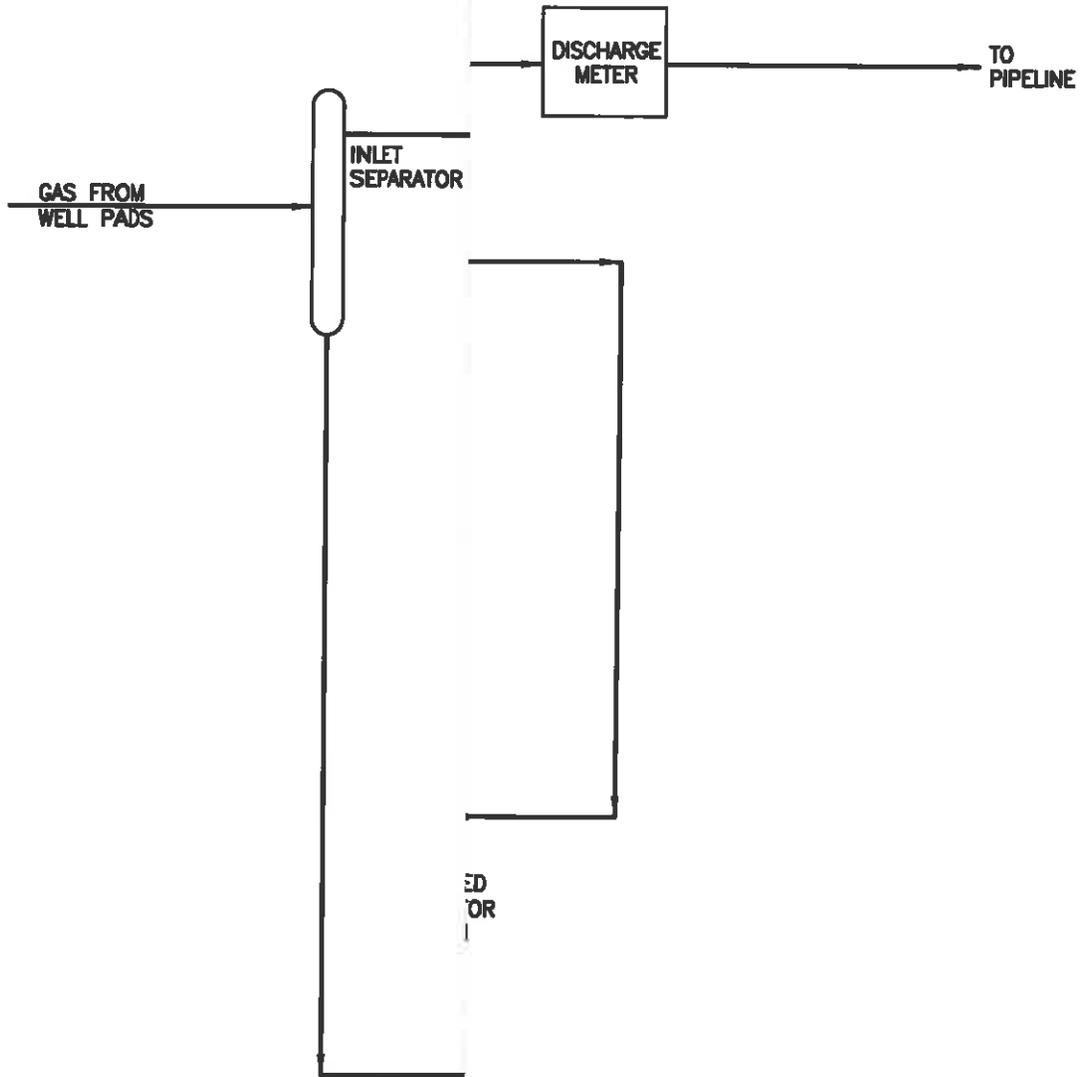
98 Vanadium Road Bridgeville, PA 15017 (412) 221-1100

JAY-BEE OIL & GAS, INC.	
KETEL COMPRESSOR STATION TYLER COUNTY, WEST VIRGINIA SITE LAYOUT	
DRAWING NAME	FIGURE 3
REV.	0

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**ATTACHMENT F**

**Process Flow Diagram**



**LEGEND:**

↑ EMISSION POINT

JAY-BEE OIL & GAS, INC.

KETEL COMPRESSOR STATION  
 TYLER COUNTY, WEST VIRGINIA  
 PROCESS FLOW DIAGRAM

DRAWING NAME

FIGURE 2

REV.

0

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**ATTACHMENT G**

**Process Description**

**Jay-Bee Oil & Gas, Inc.**  
**Ketel Compressor Station**  
**Attachment G**  
**Process Description**

Jay-Bee Oil & Gas, Inc. currently operates the Ketel Compressor Station under General Permit Registration No. G35-A089A. This station receives, compresses and dehydrates natural gas from area Jay-Bee well pads prior to injection into a transmission line owned and operated by others. At this time Jay-Bee is seeking approval for the installation of larger compressor and associated driver engine for one of the three compressor/driver engine combinations currently permitted. This replacement equipment was needed in order to accommodate increased gas flow that was required with the installation of additional wells in the area and the reduction in well head pressure at existing wells. More specifically, Jay-Bee:

- Removed one existing inlet gas compressor and Caterpillar 3516B driver
- Installed one inlet compressor and Caterpillar 3608 LE driver

Additionally, new well pads that utilize Ketel Compressor Station generate some condensate in addition to produced water that flows to Ketel via the gathering lines. Thus, Jay-Bee is also seeking approval for installation of a single 210 BBL tank replacing the permitted 100 BBL tank. This tank receives up to 136,000 gallons of condensate per year, along with 6300 gallons of produced water per year. Lastly, Jay – Bee will install an enclosed combustor to control tank emissions.

There will be no changes to the dehydration system currently permitted.

The following discussion describes planned equipment and material flow through this facility:

Gas produced by remote Jay-Bee wells is passed through an inlet separator, then compressed through two existing and one new compressors (driven by two of the existing CAT 3516B and the one new CAT 3608 LE engines), dehydrated in the one existing dehydration unit and injected into transmission pipelines for transportation to customers. A small portion of the dehydrated gas will be used as fuel for the compressor engines and dehydration unit re-boiler. The total amount of gas that will be processed through this facility will vary over time, but could reach a maximum of 40 MMSCFD. This application seeks to permit the emissions from the replacement equipment.

Under the new configuration, condensate and produced water removed from the incoming raw gas stream will be routed to the new 210 BBL accumulation tank. In addition, water condensed through the dehydration process is also routed to this tank. The accumulated condensate will be transported via truck to an area processing plant owned and operated by others. The produced water will be transported to an approved disposal facility. An estimated maximum of 40 truckloads of condensate and produced water will be transported from the expanded facility.

Vapors emitted by the storage tank will be routed to an enclosed combustor. However, there will be no controls on the associated truck loading operations.

In Summary, emission sources at this facility will include the following:

- Three Inlet Gas Compressor Gas-Fired Engine (two EXISTING and **one NEW SOURCE**)
- One 0.75 MMBTU/Hr TEG Re-boilers (EXISTING)
- Two Enclosed Combustors managing low pressure vapors from the produced fluids storage tank and dehydration still vents. (one EXISTING and **one NEW**)
- Engine Blowdowns (EXISTING and **NEW SOURCES**)
- One 210 BBL Produce Fluids Tank (**NEW SOURCE**)
- Fugitive Emissions – Facility Roadways (**NEW SOURCE**)
- Fugitive Emissions – Component Leaks (**NEW AND EXISTING SOURCES**)

**Due to the addition of condensate truck loading, the facility will no longer be considered eligible for continued operation under the existing G35-A permit. Hence, with this submittal, Jay-Bee is seeking to replace that permit with a R13 NSR permit.**

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# **ATTACHMENT H**

## **MSDS Sheets**

## Safety Data Sheet: Natural Gas Condensates

### 1. Identification

#### Product Name: Natural Gas Condensates

MSDS Number: A0021.sds

**Synonyms:** Liquids, Natural Gas; Sweet and Sour; (includes natural gasoline component)

**Product Use:** Natural gas production liquids

EP Energy

1001 Louisiana Street  
Houston, Texas 77002

Information: (713) 997-1000 or 855-269-0826  
CHEMTREC: (800) 424-9300

### 2. Hazard(s) Identification

**Note:** This product has not been tested by EP Energy to determine its specific health hazards. Therefore, the information provided in this section includes health hazard information on the product components.

#### Potential Health Effects from Overexposure:

##### Acute Effects:

**Eyes:** Slight to moderate eye irritation. Contact may cause eye burns or injury. H<sub>2</sub>S is irritating and may cause pain and an increased production of tears.

**Skin:** Harmful if absorbed through skin. Contact may cause irritation and possibly dermatitis.

**Inhalation:** Irritating to mucous membrane and respiratory tract. Can act as a simple asphyxiant. May cause dizziness or asphyxiation without warning. Overexposure may lead to headache, nausea, drowsiness, fatigue, pneumonitis, pulmonary edema, CNS depression, coma and respiratory arrest. H<sub>2</sub>S is a mucous membrane and respiratory tract irritant. High concentrations of H<sub>2</sub>S, even briefly, may cause dizziness, drowsiness, tremors, pulmonary edema, and death. H<sub>2</sub>S acts as a chemical asphyxiant by paralyzing the respiratory center. Lower concentrations of H<sub>2</sub>S will produce symptoms such as headache, dizziness, excitement, staggering gait, diarrhea and dysuria. H<sub>2</sub>S is fibrogenic to the lungs following acute exposures complicated by bronchitis obliterans.

**Ingestion:** Stomach irritation, gastritis, headache, nausea, drowsiness, loss of consciousness, convulsions, cyanosis, pneumonitis, pulmonary edema and CNS depression, capillary hemorrhaging of the lung and internal organs. Aspiration hazard if vomiting occurs.

##### Chronic Effects:

Cancer hazard. Contains chemicals which may have reproductive toxicity, teratogenic or mutagenic effects. Due to presence of benzene and n-hexane, long-term exposure may increase the risk of anemia, leukemia and nervous system damage. Liver or kidney injury may occur. May cause central nervous system disorders and/or damage. Frequent or prolonged contact may lead to dermatitis. In regards to H<sub>2</sub>S exposure, CNS injury can be immediate and significant. Chronic low exposures to H<sub>2</sub>S may cause conjunctivitis, photophobia, bronchitis and headaches.

#### Additional Medical and Toxicological Information:

Contact with full strength or dilute formulations of this product may aggravate pre-existing dermatitis or respiratory disorders in certain individuals. n-butane has been shown to cause mild cardiac sensitization in laboratory test animals. H<sub>2</sub>S exposure may aggravate pre-existing lung ailments, gastrointestinal, cardiovascular and nervous disorders.

### 3. Composition/Information

**Note:** Composition will vary with geographic location, geologic formation, temperature and pressure.

Components	CAS No.	Wt% <sup>(1)</sup>
Propane	74-98-6	20-60
Ethane	74-84-0	1-60
n-Pentane	109-66-0	5-25
n-Hexane	110-54-3	2-13
Heptane	142-82-5	1-10
Octane	111-65-9	1-10
n-Butane	106-97-8	2-5
Cyclohexane	110-82-7	1-5
Toluene	108-88-3	0.1-5
Ethyl benzene	100-41-4	0.1-5
Xylenes	1330-20-7	0.1-5
Benzene	71-43-2	0-2
Hydrogen Sulfide	7783-06-4	Varies

**Safety Data Sheet: Natural Gas Condensates**

<sup>(1)</sup>Normal composition ranges are shown. Exceptions may occur depending upon the source of the condensate.

**4. First-Aid Measures**

- Eye Contact:** Immediately flush gently with large amounts of luke warm water, holding eyelids open, for at least 15 minutes. Seek medical attention. If eye is exposed to hot liquid, cover eyes with cloth and seek immediate medical attention.
- Skin Contact:** Remove and isolate contaminated clothing and shoes. Flush skin with water. Seek medical attention if irritation persists or there is a large area of contact. Decontaminate clothing before reuse. In case of hot liquid exposure, do not remove clothing or treat, wash only unburned area and seek immediate medical attention.
- Inhalation:** If atmosphere is safe, move victim to fresh air. If breathing has stopped and airway is clear, provide artificial respiration. i. Do not use mouth-to-mouth method if victim ingested or inhaled the substance. Provide artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult, if qualified. Seek immediate medical attention.
- Ingestion:** DO NOT INDUCE VOMITING. If spontaneous vomiting occurs, place on the left side with head down to prevent aspiration of liquid into the lungs. Give 1-2 glasses of water if patient is alert and able to swallow. Have exposed individual rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person. Do not leave victim unattended. Monitor for breathing difficulties. Seek immediate medical attention.

**Medical Providers:** Medical providers are urged to contact a Regional Poison Center at 800-222-1222.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents.

At high concentrations, H<sub>2</sub>S may produce pulmonary edema, respiratory depression, and/or respiratory paralysis.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

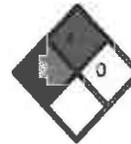
**5. Fire-Fighting Measures****Flammable Properties:**

Flash Point: -45 °F to -170 °F

Flammable Limits in Air % by Vol.:

Lower (LFL): 1.4-3.0 % Upper (UFL): 7.6-12.5 %

Auto-ignition Temperature: 495-850 °F



**NFPA Ratings:** Health: 2 Flammability: 4 Reactivity: 0

**General Fire Hazards:**

Extremely flammable. Easily ignited by heat, sparks or flames or other sources of ignition. Flowing condensates can be ignited by self-generated static electricity. Containers should be grounded and bonded. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may reach an ignition source, and flashback. Runoff to sewer may create fire or explosion hazard downstream from the source. Gases may form explosive mixtures with air. BLEVE'S (Boiling Liquid Expanding Vapor Explosions) can occur when a liquid in a pressurized container is heated to temperatures beyond its boiling point. This can lead to failure of the container and damage to the surrounding area.

Hazardous combustion/decomposition products may include carbon monoxide, carbon dioxide, hydrocarbons, nitrogen oxides, and sulfur oxides. Hydrogen sulfide may be present. Downwind personnel must be evacuated.

**Extinguishing Media:**

Suitable extinguishing media: Class B fire extinguisher, dry chemical, foam or carbon dioxide. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. For large fires, use unmanned hoses.

Unsuitable extinguishing media: Water should not be used as an extinguishing media, but should be used as a spray to keep surroundings area cool.

**Fire Fighting Instructions:** DO NOT extinguish a leaking gas flame unless the leak can be stopped. Allow gas to burn out. Move containers from fire area if you can do it without risk. Use a smothering technique for extinguishing fire of this flammable liquid. Do not use a forced- water stream directly on condensate fires as this will scatter the fire. Use a water spray to cool fire-exposed containers and surrounding areas until well after fire is out. Do not direct water at source of leak or safety devices as icing may occur. Dike fire-control water for later disposal; do not scatter the material. Firefighters should wear self-contained breathing apparatus and full protective clothing. Refer to Section 8 for proper PPE selection.

**Precautions for Fire Involving Tanks or Car/Trailer Loads:** If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions. Consider initial evacuation for 800 meters (1/2 mile) in all directions. ALWAYS stay away from tanks engulfed in flame. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. If unmanned hose

holders or monitor nozzles cannot be used, withdraw from area and let fire burn.

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## 6. Accidental Release Measures

As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before re-entering.

Remove any ignition sources and protect from ignition. Water spray may reduce vapor, but may not prevent ignition in closed spaces. A vapor suppressing foam may be used to reduce vapors. Provide sufficient ventilation in the affected area(s) and wear appropriate personal protective equipment as indicated in Section 8 when handling spill material.

If the facility has an oil or hazardous substance contingency plan, activate its procedures. For emergency information and procedures to follow in the case of an accidental release, call the Emergency Telephone Number(s) listed in Section 1.

In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations. Use clean, non-sparking tools to collect absorbed materials. Dike far ahead of liquid spill for later disposal. Never discharge releases directly into sewers or surface waters. Advise authorities and the National Response Center (800-424-8802) if the release is to navigable waters. Clean up in accordance with all applicable regulations.

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## 7. Handling and Storage

Handle in accordance with good industrial hygiene and safety practices. These practices include, but are not limited to, avoiding unnecessary exposure and prompt removal of material from eyes, skin, and clothing. If needed, take first aid actions as indicated in Section 4.

**Handling:** Handle as a flammable liquid. Keep away from heat, sparks and open flame. No smoking. May release or contain dangerous levels of H<sub>2</sub>S. Use only with adequate ventilation. Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8. Vent slowly to the atmosphere when opening. Avoid all contact with skin and eyes. Avoid breathing product dust or vapors. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Non-sparking tools should be used. Bond and ground containers before product transfer. Review all operations which have the potential of generating and accumulating electrostatic charge and/or flammable atmosphere including tank and container filling, cleaning, sampling gauging, switch loading, mixing, agitation and vacuum truck operations. Use appropriate mitigating procedures. Do not enter confined spaces without following proper entry procedures. Remove contaminated clothing immediately. Wash with soap and water after working with this product.

Scales, deposits and sludge from equipment associated with this product may have accumulation of Naturally Occurring Radioactive Materials (NORM). Equipment should be assessed for external gamma radiation.

**Storage:** Keep away from flame, sparks, excessive temperatures and open flame. No smoking. Maintain vessels closed and clearly labeled. Empty vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose these vessels to sources of ignition. This material may contain or release H<sub>2</sub>S. In a tank or other closed container, the vapor space above this material may accumulate hazardous concentrations of H<sub>2</sub>S. Do not enter confined spaces without following proper entry procedures. Ground all containers during transfer. Store away from incompatible materials. Use appropriate containment to avoid environmental contamination.

**Incompatibilities:** Keep away from strong oxidizers, ignition sources and heat.

## 8. Exposure Controls/Personal Protection

Components	CAS No.	Occupational Exposure Limits			Units
		OSHA <sup>(1)</sup>	ACGIH <sup>(1)</sup>	NIOSH <sup>(2)</sup>	
Ethane	74-84-0	N/A	1000 <sup>(3)</sup>	N/A	ppm
Propane	74-98-6	1000	1000 <sup>(3)</sup>	1000	ppm
n-Butane	106-97-8	N/A	1000 <sup>(3)</sup>	800	ppm
n-Pentane	109-66-0	1000	600	120 610 <sup>Ceiling</sup>	ppm
n-Hexane	110-54-3	500	50 <sup>(4)</sup>	50	ppm
Heptane	142-82-5	500	400 500 <sup>STEL</sup>	85 440 <sup>Ceiling</sup>	ppm
Octane	111-65-9	500	300	75 385 <sup>Ceiling</sup>	ppm
Cyclohexane	110-82-7	300	100	300	ppm
Toluene	108-88-3	200 300 <sup>Ceiling</sup>	20 <sup>(4)</sup>	100 150 <sup>STEL</sup>	ppm
Ethyl benzene	100-41-4	100	20 <sup>(4)</sup>	100 125 <sup>STEL</sup>	ppm
Xylenes	1330-20-7	100	100 <sup>(4)</sup> 150 <sup>STEL</sup>	100 150 <sup>STEL</sup>	ppm
Petroleum distillates, naptha	8002-05-9	<1	500 ppm	N/A	350 mg/m <sup>3</sup>
Hydrogen Sulfide	7783-06-4	20 <sup>Ceiling</sup>	15 <sup>STEL</sup>	10 <sup>Ceiling</sup>	ppm
Benzene	71-43-2	1 5 <sup>STEL</sup>	0.5 <sup>(5)</sup> 2.5 <sup>STEL</sup>	0.1 1 <sup>STEL</sup>	ppm

<sup>(1)</sup>8-hour TWA unless otherwise specified.

<sup>(2)</sup>10-hour TWA unless otherwise specified.

<sup>(3)</sup>Exposure limit given as Aliphatic hydrocarbon gases: Alkanes [C<sub>1</sub>-C<sub>4</sub>].

<sup>(4)</sup>ACGIH has established a Biological Exposure Index (BEI) for this substance.

N/A: Not Applicable

STEL: 15-minute Short Term Exposure Limit

Ceiling: Concentration not to be exceeded at any time

**Eye Protection:** Safety glasses are required standard PPE. If contact with liquid condensates is possible, chemical splash goggles or face shield may be required. Ensure that eye wash station is operable and nearby.

**Skin Protection:** Fire Resistant Clothing (FRC) is required standard PPE. Where contact with liquid condensates is possible, use protective clothing and/or gloves made of nitrile rubber or polyvinyl alcohol (PVA). Wash with soap and water before eating, drinking or smoking. Wash contaminated clothing before reuse.

**Inhalation:** A NIOSH-approved respirator must be worn where controls do not maintain airborne concentrations below occupational exposure limits. Positive-pressure, full-face, self-contained breathing apparatus (SCBA) should be available for emergency use. HYDROGEN SULFIDE MAY BE PRESENT OR RELEASED. NIOSH-approved respiratory protection should be used when handling crude of high or unknown hydrogen sulfide content and to reduce airborne concentrations to allowable occupational exposure levels.

**Engineering Controls:** Provide adequate general and local exhaust ventilation to: (1) Maintain airborne chemical concentrations below applicable exposure limits, (2) Prevent accumulation of flammable vapors and formation of explosive atmospheres, and (3) Prevent formation of oxygen deficient atmospheres, especially in confined spaces.

**9. Physical and Chemical Properties**

Values given are typical of similar products. There are no test results for this mixture.

<b>Appearance:</b>	Brown to clear liquid	<b>% Volatile by Volume:</b>	100
<b>Odor:</b>	Petroleum-like, gasoline-like or rotten eggs	<b>Viscosity:</b>	Not available
<b>Boiling Point:</b>	Varies widely based on hydrocarbon content	<b>Melting Point:</b>	-122 °F
<b>Freezing Point:</b>	Not available	<b>Vapor Density (Air = 1):</b>	3-4 (natural gasoline)
<b>Vapor Pressure:</b>	Not available	<b>pH:</b>	Not available
<b>Solubility in H<sub>2</sub>O:</b>	Negligible	<b>Evaporation Rate:</b>	> 1
<b>Specific Gravity @ 60° F &amp; 1 atm:</b>	0.6-0.8	<b>(Ethyl Ether = 1)</b>	
		<b>Molecular Wt.:</b>	Not available

**10. Stability and Reactivity**

**Stability:** Stable under normal conditions of use and normal temperature conditions

**Hazardous Polymerization:** Will not occur.

**Conditions to Avoid/Incompatibilities:** Strong oxidizing agents, strong acids, chlorine, fluorine, bromine and metal catalysts, heat, sparks, flame and build-up of static electricity.

**Hazardous Decomposition Products:** Carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and sulfur dioxide.

**11. Toxicological Information**

Toxicological data does not exist for this mixture. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffers Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline. This substance may have a potential for sensitization. Exposure to light hydrocarbons in the same boiling range as this product have been associated in animal studies with effects to the central nervous system, peripheral nervous system, liver, and kidneys. The significance of these animal models to predict similar human response is uncertain. Observing good work practices and personal hygiene procedures can minimize potential risks to humans. Harmful if swallowed. May cause cancer.

**BENZENE:** This product contains benzene, which can cause degeneration in blood forming bone marrow leading to anemia which may further degrade to leukemia, a type of cancer. Acute benzene poisoning causes central nervous system depression. Chronic exposure affects the hematopoietic system causing blood disorders including anemia and pancytopenia. Mutagenic and clastogenic in mammalian and non-mammalian test systems. Reproductive or developmental toxicant only at doses that are maternally toxic based on tests with animals.

**HYDROGEN SULFIDE:** This product may contain or release hydrogen sulfide, which may be fatal if inhaled. Greater than 15-20 ppm continuous exposure can cause mucous membrane and respiratory tract irritation. 50-500 ppm can cause headache, nausea, dizziness, loss of reasoning and balance, difficulty breathing, fluid in the lungs and possible loss of consciousness. Greater than 500 ppm can cause rapid or immediate unconsciousness due to respiratory paralysis and death by suffocation unless removed from exposure and successfully resuscitated. Inhalation of a single breath at a concentration of 1000 ppm (0.1%) can cause immediate unconsciousness and death. Hydrogen sulfide is corrosive when moist. Skin contact may cause burns. There is a rapid loss of sense of smell on exposure to gas concentrations above 50 ppm. At high concentrations, individuals may not even recognize the odor before becoming unconscious.

**Carcinogenicity:**

Component (CAS No.)	ACGIH <sup>(1)</sup>	IARC Monographs <sup>(2)</sup>	US NTP	OSHA Regulated
Benzene (71-43-2)	A1	1	Yes	Yes
Ethyl benzene (100-41-4)	A3	2B	No	No
Toluene (108-88-3)	A4	3	No	No
Xylene (1330-20-7)	A4	3	No	No

<sup>(1)</sup>ACGIH Carcinogens: A1 = Confirmed human carcinogen, A2 = Suspected human carcinogen, A3 = Confirmed animal carcinogen with unknown relevance to humans, A4 = Not classifiable as a human carcinogen, A5 = Not suspected as a human carcinogen

<sup>(2)</sup>IARC Monographs: 1 = Carcinogenic to humans, 2A = Probably carcinogenic to humans, 2B = Possibly carcinogenic to humans, 3 = Not classifiable as to carcinogenicity to humans, 4 = Probably not carcinogenic to humans

**12. Ecological information**

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations. May be hazardous to waterways/wildlife.

**13. Disposal Information**

Do not dispose of waste into sewer. Do not allow this material to drain into sewers/water supplies. If discarded, this material meets the criteria of

**Safety Data Sheet: Natural Gas Condensates**

being an "ignitable" waste. If hydrogen sulfide, benzene, toluene and/or xylene are present in the waste, the waste may be considered a hazardous U-listed waste. Under RCRA, it is the responsibility of the user to determine, at the time of disposal, if the material meets federal, state, or local criteria to be defined as a hazardous waste.

**14. Transport Information**

**Proper Shipping Name:** Petroleum products, n.o.s (condensate)  
**UN/Identification No:** UN 1268  
**Hazard Class:** 3  
**Packing Group:** II  
**ERG#:** 128

**Proper Shipping Name:** Gasoline  
**UN/Identification No:** UN1203  
**Hazard Class:** 3  
**Packing Group:** II  
**ERG#:** 128

**Additional Info:** Dependent on the product's properties, the shipper may elect to classify as Gasoline UN1203 or Petroleum Crude Oil UN1267 - reference 49 CFR 172.101 for further description.

**15. Regulatory Information**

**EPA SARA TITLE III**

**Section 302 EPCRA Extremely Hazardous Substances (EHS)**

Product Component	CAS No.	Wt%	RQ, lb	TPQ, lb
Hydrogen Sulfide	7783-06-4	0.1-2	100	500

**Section 304 CERCLA Hazardous Substances**

Product Component	CAS No.	Wt%	RQ, lb
Benzene	71-43-2	0-5	10
Toluene	108-88-3	0.1-5	1000
Xylene	1330-20-7	0.1-5	100
Cyclohexane	110-82-7	0.1-5	1000
Hydrogen Sulfide	7783-06-4	0.1-2	100
Ethylbenzene	100-41-4	0.1-5	1000
n-Hexane	110-54-3	1-10	5000

**Section 311/312 Hazard Categorization**

Acute:	Chronic:	Fire:	Pressure:	Reactive:
Yes	Yes	Yes	Yes	No

**Section 313 EPCRA Toxic Substances**

Product Component	CAS No.	Wt. %
Benzene	71-43-2	0-5
Toluene	108-88-3	0.1-5
Xylene	1330-20-7	0.1-5
Cyclohexane	110-82-7	0.1-5
Hydrogen Sulfide	7783-06-4	0.1-2
Ethylbenzene	100-41-4	0.1-5
N-Hexane	110-54-3	1-10

**EPA TSCA**

All components are either on the U.S. EPA TSCA Inventory List, or are not regulated under TSCA.

**Key:** RQ = Reportable Quantity  
 TPQ = Threshold Planning Quantity (EHS)

**CALIFORNIA PROPOSITION 65 WARNING**

Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm may be found in crude oil and petroleum products. Although it is possible to sufficiently refine a crude oil or its end products to remove the potential for cancer, we are advising that one or more of the listed chemicals may be present in some detectable quantities. Read and follow directions and use care when handling crude oil and petroleum products.

**16. Other Information**

Last Revision: 08/01/2012, Date Prepared: 10/27/1985

THIS INFORMATION RELATES ONLY TO THE SPECIFIC MATERIAL DESIGNATED AND MAY NOT BE VALID FOR SUCH MATERIAL USED IN COMBINATION WITH ANY OTHER MATERIALS OR IN ANY PROCESS. SUCH INFORMATION IS TO THE BEST OF THIS COMPANY'S KNOWLEDGE AND BELIEVED ACCURATE AND RELIABLE AS OF THE DATE INDICATED. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE AS TO THE ACCURACY, RELIABILITY OR COMPLETENESS. IT IS THE USER'S RESPONSIBILITY TO SATISFY THEMSELVES AS TO THE SUITABILITY AND COMPLETENESS OF SUCH INFORMATION FOR THEIR OWN PARTICULAR USE.

**Key/Legend:**

ACGIH - American Conference of Governmental Industrial Hygienists  
ADR - Agreement on Dangerous Goods by Road  
CAA - Clean Air Act  
CAS - Chemical Abstracts Service Registry Number  
CDG - Carriage of Dangerous Goods By Road and Rail Manual  
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act  
CFR - Code of Federal Regulations  
CNS - Central Nervous System  
EINECS - European Inventory of Existing Chemical Substances Registry Number  
ERG - Emergency Response Guidebook  
EPCRA - Emergency Planning and Community Right-to-Know Act  
GHS - Globally Harmonized System of Classification and Labeling of Chemicals  
IARC - International Agency for Research on Cancer  
IATA - International Air Transport Association  
ICAO - International Civil Aviation Organization  
IMDG - International Maritime Dangerous Goods Code  
IMO - International Maritime Organization  
MSDS - Material Safety Data Sheet  
N/E - Not Established  
NTP - National Toxicology Program  
OSHA - Occupational Safety and Health Administration  
PEL - Permissible Exposure Limit  
PPE - Personal Protective Equipment  
RCRA - Resource Conservation and Recovery Act  
RID - Regulations Concerning the International Transport of Dangerous Goods by Rail  
RQ - Reportable Quantities  
SARA - Superfund Amendments and Reauthorization Act of 1986  
SDS - Safety Data Sheet  
TCC - Tag Closed Cup  
TDG - Transportation of Dangerous Goods  
TLV - Threshold Limit Value  
TSCA - Toxic Substance Control Act  
UN/NA - United Nations / North American Number  
UNECE - United Nations Economic Commission for Europe  
US DOT - United States Department of Transportation  
US EPA - United States Environmental Protection Agency  
Vol. - Volume  
WHMIS - Workplace Hazardous Materials Information System

This is the end of MSDS A0021.sds

Sodium chloride	7647-14-5	0-20
Benzene	71-43-2	<0.1

**Composition comments** May contain small amounts of condensate or crude oil as a contaminate. All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

**4. First Aid Measures**

**First aid procedures**

- Eye contact** In case of contact, immediately flush eyes with fresh water for at least 15 minutes while holding the eyelids open. Remove contact lenses if worn. Get medical attention if irritation persists.
- Skin contact** Remove contaminated clothing and shoes. Wash affected area with mild soap and water. Get medical attention if irritation develops and persists.
- Inhalation** If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms develop or persist.
- Ingestion** Rinse mouth thoroughly. Get medical attention if any discomfort occurs.

**General advice** If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

**5. Fire Fighting Measures**

**Flammable properties** This product is not flammable; however sufficient hydrocarbon vapors may accumulate from oil or natural gas condensate floating on the surface of the produced water to cause a flash fire. The fire should burn out fairly rapidly depending on the amount of oil and natural gas condensate floating on the surface of the produced water.

**Extinguishing media**  
**Suitable extinguishing media** Dry chemical powder. Foam. Carbon dioxide (CO2).

**Protection of firefighters**  
**Protective equipment and precautions for firefighters** A fire would be associated with vapors related to oil or natural gas condensate floating on the surface of the produced water. Water maybe ineffective on flames and may even spread the fire but should be used to cool pressurized containers in the fire.

**Special protective equipment for fire-fighters** Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with full face-piece operated in positive pressure mode. Use approved gas detectors in confined spaces.

**Specific methods** Promptly isolate the scene by removing persons from the vicinity of the incident if there is a fire. Do not extinguish flames at leak because of the possibility of a uncontrolled re-ignition exists. If it is safe to do so, cut off fuel supply and/or allow fire to burn out. The fire should burn out fairly rapidly depending on the amount of oil and natural gas condensate floating on the surface of the produced water. If leak or spill has not ignited, water spray or ventilation can be used to disperse the vapors.

**Hazardous combustion products** Sodium oxides. Carbon oxides.

**6. Accidental Release Measures**

**Personal precautions** Keep away from sources of ignition - No smoking. The vapors should dissipate fairly rapidly depend on the amount of oil and natural gas condensate floating on the surface of the produced water. Stay upwind. Keep unnecessary personnel away. See Section 8 of the MSDS for Personal Protective Equipment.

**Environmental precautions** Prevent further leakage or spillage if safe to do so. Do not allow to enter drains, sewers or watercourses.

**Methods for containment** Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Prevent entry into waterways, sewer, basements or confined areas.

**Methods for cleaning up** Recover by pumping (use an explosion-proof motor or hand pump) or by sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Where feasible and appropriate, remove contaminated soil or flush with fresh water. On water spills utilize absorbent material to remove oil and natural gas liquid from the surface of the water.

**Other information** Avoid excess skin contact with spilled material.

## 7. Handling and Storage

### Handling

Handle as a flammable liquid. Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, discharging and sampling from storage tanks. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion. Keep away from heat, sparks, and open flame. Electrical equipment should be approved for classified area. Wear appropriate personal protective equipment (see section 8). Special precautions should be taken when entering or handling equipment in this type of produced water service because of possible radioactive contamination. All equipment should be checked for radioactivity or opened to the atmosphere and have forced ventilation applied for at least 4 hours prior to entry or handling. Avoid direct skin contact with any surface. Avoid generation of dust, smoke, fumes, etc. in the work area, or if they cannot be avoided, a tested and certified radionuclide dust respirator should be worn. Smoking, eating or drinking should be prohibited when working with the equipment. Workers should wash thoroughly with soap and water and discard contaminated clothing after entering or handling the equipment. Workers should wash hands and face before eating, drinking and smoking.

### Storage

Keep containers in well-ventilated area away from flame, sparks, excessive temperatures and open flames. Keep the containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition. Do not enter storage areas and confined spaces without adequate ventilation. Use appropriate respiratory protection if there is the potential to exceed the exposure limit(s). Vapors containing benzene may accumulate during storage and transport.

## 8. Exposure Controls / Personal Protection

### Occupational exposure limits

#### ACGIH

##### Components

Components	Type	Value
Benzene (71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm

#### U.S. - OSHA

##### Components

Components	Type	Value
Benzene (71-43-2)	Ceiling	25 ppm
	STEL	5 ppm
	TWA	1 ppm

#### Canada - Alberta

##### Components

Components	Type	Value
Benzene (71-43-2)	STEL	8 mg/m <sup>3</sup>
		2.5 ppm
	TWA	1.6 mg/m <sup>3</sup>
		0.5 ppm

#### Canada - British Columbia

##### Components

Components	Type	Value
Benzene (71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm

#### Canada - Ontario

##### Components

Components	Type	Value
Benzene (71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
Calcium chloride (10043-52-4)	TWA	5 mg/m <sup>3</sup>

#### Canada - Quebec

##### Components

Components	Type	Value
Benzene (71-43-2)	STEL	15.5 mg/m <sup>3</sup>
		5 ppm
	TWA	3 mg/m <sup>3</sup>
		1 ppm

### Engineering controls

Ensure adequate ventilation, especially in confined areas.

### Personal protective equipment

#### Eye / face protection

If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.

<b>Skin protection</b>	No special garments required. Wash contaminated clothing prior to reuse. Avoid unnecessary skin contamination with material. Use of chemical resistant gloves is advised to prevent skin contact.
<b>Respiratory protection</b>	No personal respiratory protective equipment normally required.
<b>General hygiene considerations</b>	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Handle in accordance with good industrial hygiene and safety practice.

## 9. Physical & Chemical Properties

<b>Appearance</b>	Dirty colored liquid with a faint hydrocarbon odor.
<b>Color</b>	Varies from clear to dark brown.
<b>Odor</b>	Faint. Hydrocarbon-like.
<b>Odor threshold</b>	Not available.
<b>Physical state</b>	Liquid.
<b>Form</b>	Liquid.
<b>pH</b>	4.9 - 8.5
<b>Melting point</b>	Not available.
<b>Freezing point</b>	< 32 °F (< 0 °C)
<b>Boiling point</b>	212 °F (100 °C) Approx.
<b>Flash point</b>	Variable organic oil and dissolved gases are flammable.
<b>Evaporation rate</b>	0.36
<b>Flammability</b>	Not available.
<b>Flammability limits in air, upper, % by volume</b>	Not available.
<b>Flammability limits in air, lower, % by volume</b>	Not available.
<b>Vapor pressure</b>	13.6 mm Hg @ 68°F (20°C)
<b>Vapor density</b>	< 1
<b>Specific gravity</b>	1.1 @ 68°F (20°C)
<b>Solubility (water)</b>	Complete
<b>Partition coefficient (n-octanol/water)</b>	Not available.
<b>Auto-ignition temperature</b>	Not available.
<b>Decomposition temperature</b>	Not available.

## 10. Chemical Stability & Reactivity Information

<b>Chemical stability</b>	Stable.
<b>Conditions to avoid</b>	Keep away from heat, sparks and open flame.
<b>Hazardous decomposition products</b>	Carbon Dioxide. Water vapor. May produce oxides of sulfur. Incomplete combustion may generate carbon monoxide.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.

## 11. Toxicological Information

### Toxicological data

#### Components

Calcium chloride (10043-52-4)

Benzene (71-43-2)

#### Test Results

Acute Oral LD50 Rat: 1000 mg/kg  
 Acute Other LD50 Mouse: 42 mg/kg  
 Acute Inhalation LC50 Mouse: 9980 mg/l  
 Acute Inhalation LC50 Rat: 10000 mg/l 7 Hours  
 Acute Oral LD50 Mouse: 4700 mg/kg  
 Acute Oral LD50 Rat: 3306 mg/kg  
 Acute Other LD50 Mouse: 340 mg/kg

**Components****Test Results**

Benzene (71-43-2)

Acute Other LD50 Mouse: 0.000001 ml/kg

Acute Other LD50 Rat: 2.89 mg/kg

Potassium Chloride (7447-40-7)

Acute Oral LD50 Rat: 2600 mg/kg

**Toxicological Information**

This product may contain detectable but varying quantities of the naturally occurring radioactive substance radon 222. The amount in the gas itself is not hazardous, but since radon rapidly decays (t1/2 = 3.82 days) to form other radioactive elements including lead 210, polonium 210, and bismuth 210, equipment may be radioactive. The radon daughters are solids and therefore may attach to dust particles or form films and sludges in equipment. Inhalation, ingestion or skin contact with radon daughters can lead to the deposition of radioactive material in the lungs, bone, blood forming organs, intestinal tract, kidney and colon. Occupational exposure to radon and radon daughters has been associated with an increased risk of lung cancer in underground uranium miners. Follow the special precautions listed in handling and storage section of this document (see section 7).

**Local effects**

Causes eye irritation. May cause skin irritation. May cause discomfort if swallowed.

**Sensitization**

Not a skin sensitizer.

**Chronic effects**

No additional adverse health effects noted.

**Carcinogenicity**

This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

**ACGIH Carcinogens**

Benzene (CAS 71-43-2)

A1 Confirmed human carcinogen.

**IARC Monographs. Overall Evaluation of Carcinogenicity**

Benzene (CAS 71-43-2)

1 Carcinogenic to humans.

**US NTP Report on Carcinogens: Known carcinogen**

Benzene (CAS 71-43-2)

Known carcinogen.

**US OSHA Specifically Regulated Substances: Cancer hazard**

Benzene (CAS 71-43-2)

Cancer hazard.

**Epidemiology**

No epidemiological data is available for this product.

**Mutagenicity**

No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

**Neurological effects**

No data available.

**Reproductive effects**

Contains no ingredient listed as toxic to reproduction

**Teratogenicity**

No known human teratogenic effect.

**Further information**

This product has no known adverse effect on human health.

**12. Ecological Information****Ecotoxicological data****Components****Test Results**

Calcium chloride (10043-52-4)

EC50 Water flea (Daphnia magna): 52 mg/l 48 hours

LC50 Fathead minnow (Pimephales promelas): 3930 - 5360 mg/l 96 hours

Benzene (71-43-2)

EC50 Water flea (Daphnia magna): 8.76 - 15.6 mg/l 48 hours

EC50 Water flea (Daphnia magna): 8.76 - 15.6 mg/l 48 Hours

LC50 Rainbow trout, donaldson trout (Oncorhynchus mykiss): 5 mg/l 96 Hours

Potassium Chloride (7447-40-7)

EC50 Water flea (Daphnia magna): 83 mg/l 48 hours

LC50 Western mosquitofish (Gambusia affinis): 435 mg/l 96 hours

Sodium chloride (7647-14-5)

EC50 Water flea (Daphnia magna): 340.7 - 469.2 mg/l 48 hours

LC50 American eel (Anguilla rostrata): 0 - 27260 mg/l 96 hours

**Ecotoxicity**

Not expected to be harmful to aquatic organisms.

**Environmental effects**

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

**Persistence and degradability**

None known.

Produced water (sweet)

3195 Version #: 01 Revision date: 04-27-2010 Print date: 04-27-2010

DVN NA MSDS

5 / 7

**Bioaccumulation / Accumulation** No data available.  
**Partition coefficient (n-octanol/water)** Not available.  
**Mobility in environmental media** No data available.

### 13. Disposal Considerations

**Disposal instructions** Do not allow this material to drain into sewers/water supplies. This product, in its present state, when discarded or disposed of, is not a hazardous waste according to Federal regulations (40 CFR 261.4 (b)(4)). Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.

**Waste from residues / unused products** Not applicable.

**Contaminated packaging** Offer rinsed packaging material to local recycling facilities.

### 14. Transport Information

**DOT**  
Not regulated as dangerous goods.

**IATA**  
Not regulated as dangerous goods.

**IMDG**  
Not regulated as dangerous goods.

**TDG**  
Not regulated as dangerous goods.

### 15. Regulatory Information

**US federal regulations** This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.  
All components are on the U.S. EPA TSCA Inventory List.

**US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration**

Benzene (CAS 71-43-2) 0.1 %

**US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance**

Benzene (CAS 71-43-2) Listed.

**CERCLA (Superfund) reportable quantity (lbs)**

Benzene 10

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories** Immediate Hazard - Yes  
Delayed Hazard - No  
Fire Hazard - No  
Pressure Hazard - No  
Reactivity Hazard - No

**Section 302 extremely hazardous substance** No

**Section 311 hazardous chemical** No

**Drug Enforcement Agency (DEA)** Not controlled

**WHMIS status** Controlled

**WHMIS classification** D2B - Other Toxic Effects-TOXIC

**WHMIS labeling**



**State regulations** This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

**US - California Hazardous Substances (Director's): Listed substance**  
 Benzene (CAS 71-43-2) Listed.

**US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance**  
 Benzene (CAS 71-43-2) Listed.

**US - California Proposition 65 - CRT: Listed date/Carcinogenic substance**  
 Benzene (CAS 71-43-2) Listed: February 27, 1987 Carcinogenic.

**US - California Proposition 65 - CRT: Listed date/Developmental toxin**  
 Benzene (CAS 71-43-2) Listed: December 26, 1997 Developmental toxin.

**US - California Proposition 65 - CRT: Listed date/Male reproductive toxin**  
 Benzene (CAS 71-43-2) Listed: December 26, 1997 Male reproductive toxin.

**US - Massachusetts RTK - Substance: Listed substance**  
 Benzene (CAS 71-43-2) Listed.

**US - New Jersey Community RTK (EHS Survey): Reportable threshold**  
 Benzene (CAS 71-43-2) 500 LBS

**US - New Jersey RTK - Substances: Listed substance**  
 Benzene (CAS 71-43-2) Listed.

**US - Pennsylvania RTK - Hazardous Substances: Listed substance**  
 Benzene (CAS 71-43-2) Listed.

**US - Pennsylvania RTK - Hazardous Substances: Special hazard**  
 Benzene (CAS 71-43-2) Special hazard.

## 16. Other Information

**Further information** HMIS® is a registered trade and service mark of the NPCA.

**HMIS® ratings** Health: 1  
 Flammability: 1  
 Physical hazard: 0

**NFPA ratings** Health: 1  
 Flammability: 1  
 Instability: 0

**Disclaimer** The information in the sheet was written based on the best knowledge and experience currently available.

**Issue date** 04-27-2010

Product Name: MOBIL DTE OIL EXTRA HEAVY  
Revision Date: 30 Apr 2012  
Page 1 of 10

## MATERIAL SAFETY DATA SHEET

### SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

#### PRODUCT

Product Name: MOBIL DTE OIL EXTRA HEAVY  
Product Description: Base Oil and Additives  
Product Code: 201560501595, 600205-00, 970010  
Intended Use: Circulating oil

#### COMPANY IDENTIFICATION

Supplier: EXXON MOBIL CORPORATION  
3225 GALLOWS RD.  
FAIRFAX, VA. 22037 USA  
24 Hour Health Emergency 609-737-4411  
Transportation Emergency Phone 800-424-9300  
ExxonMobil Transportation No. 281-834-3296  
Product Technical Information 800-662-4525, 800-947-9147  
MSDS Internet Address <http://www.exxon.com>, <http://www.mobil.com>

### SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

### SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

#### POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health: 0	Flammability: 1	Reactivity: 0
HMIS Hazard ID:	Health: 0	Flammability: 1	Reactivity: 0

**NOTE:** This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

### SECTION 4 FIRST AID MEASURES

#### INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use

Product Name: MOBIL DTE OIL EXTRA HEAVY

Revision Date: 30 Apr 2012

Page 2 of 10

adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

#### SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

#### EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

#### INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

### SECTION 5 FIRE FIGHTING MEASURES

#### EXTINGUISHING MEDIA

**Appropriate Extinguishing Media:** Use water fog, foam, dry chemical or carbon dioxide (CO<sub>2</sub>) to extinguish flames.

**Inappropriate Extinguishing Media:** Straight Streams of Water

#### FIRE FIGHTING

**Fire Fighting Instructions:** Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

**Hazardous Combustion Products:** Smoke, Fume, Aldehydes, Sulfur oxides, Incomplete combustion products, Oxides of carbon

#### FLAMMABILITY PROPERTIES

**Flash Point [Method]:** >227°C (441°F) [ASTM D-92]

**Flammable Limits (Approximate volume % in air):** LEL: 0.9 UEL: 7.0

**Autoignition Temperature:** N/D

### SECTION 6 ACCIDENTAL RELEASE MEASURES

#### NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

Product Name: MOBIL DTE OIL EXTRA HEAVY

Revision Date: 30 Apr 2012

Page 3 of 10

## PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders. For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

## SPILL MANAGEMENT

**Land Spill:** Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

**Water Spill:** Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

## ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

## SECTION 7

## HANDLING AND STORAGE

### HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

**Static Accumulator:** This material is a static accumulator.

### STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

## SECTION 8

## EXPOSURE CONTROLS / PERSONAL PROTECTION

Product Name: MOBIL DTE OIL EXTRA HEAVY

Revision Date: 30 Apr 2012

Page 4 of 10

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**Exposure limits/standards for materials that can be formed when handling this product:** When mists/aerosols can occur the following are recommended: 5 mg/m<sup>3</sup> - ACGIH TLV (inhalable fraction), 5 mg/m<sup>3</sup> - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

### ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

### PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

**Respiratory Protection:** If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

**Hand Protection:** Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

**Eye Protection:** If contact is likely, safety glasses with side shields are recommended.

**Skin and Body Protection:** Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

**Specific Hygiene Measures:** Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

Product Name: MOBIL DTE OIL EXTRA HEAVY  
Revision Date: 30 Apr 2012  
Page 5 of 10

## ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**Note:** Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

### GENERAL INFORMATION

Physical State: Liquid  
Form: Clear  
Color: Amber  
Odor: Characteristic  
Odor Threshold: N/D

### IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.89  
Flash Point [Method]: >227°C (441°F) [ASTM D-92]  
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0  
Autoignition Temperature: N/D  
Boiling Point / Range: > 316°C (600°F)  
Vapor Density (Air = 1): > 2 at 101 kPa  
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C  
Evaporation Rate (n-butyl acetate = 1): N/D  
pH: N/A  
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5  
Solubility in Water: Negligible  
Viscosity: 146.2 cSt (146.2 mm<sup>2</sup>/sec) at 40 °C | 14.4 cSt (14.4 mm<sup>2</sup>/sec) at 100°C  
Oxidizing Properties: See Hazards Identification Section.

### OTHER INFORMATION

Freezing Point: N/D  
Melting Point: N/A  
Pour Point: -12°C (10°F)  
DMSO Extract (mineral oil only), IP-346: < 3 %wt

## SECTION 10 STABILITY AND REACTIVITY

**STABILITY:** Material is stable under normal conditions.

**CONDITIONS TO AVOID:** Excessive heat. High energy sources of ignition.

**MATERIALS TO AVOID:** Strong oxidizers

**HAZARDOUS DECOMPOSITION PRODUCTS:** Material does not decompose at ambient temperatures.

**HAZARDOUS POLYMERIZATION:** Will not occur.

## SECTION 11 TOXICOLOGICAL INFORMATION

Product Name: MOBIL DTE OIL EXTRA HEAVY  
 Revision Date: 30 Apr 2012  
 Page 6 of 10

## ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
<b>Inhalation</b>	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
<b>Ingestion</b>	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
<b>Skin</b>	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
<b>Eye</b>	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

## CHRONIC/OTHER EFFECTS

### Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

### --REGULATORY LISTS SEARCHED--

1 = NTP CARC  
 2 = NTP SUS

3 = IARC 1  
 4 = IARC 2A

5 = IARC 2B  
 6 = OSHA CARC

## SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

### ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

### MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

Product Name: MOBIL DTE OIL EXTRA HEAVY

Revision Date: 30 Apr 2012

Page 7 of 10

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## PERSISTENCE AND DEGRADABILITY

### Biodegradation:

Base oil component -- Expected to be inherently biodegradable

### BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

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## SECTION 13

## DISPOSAL CONSIDERATIONS

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Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

### DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

### REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

**Empty Container Warning** Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. **DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.**

---

## SECTION 14

## TRANSPORT INFORMATION

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**LAND (DOT):** Not Regulated for Land Transport

**LAND (TDG):** Not Regulated for Land Transport

**SEA (IMDG):** Not Regulated for Sea Transport according to IMDG-Code

**AIR (IATA):** Not Regulated for Air Transport

Product Name: MOBIL DTE OIL EXTRA HEAVY  
 Revision Date: 30 Apr 2012  
 Page 8 of 10

<b>SECTION 15</b>	<b>REGULATORY INFORMATION</b>
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**OSHA HAZARD COMMUNICATION STANDARD:** When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

**Complies with the following national/regional chemical inventory requirements::** AICS, DSL, EINECS, ENCS, IECSC, KECI, PICCS, TSCA

**EPCRA:** This material contains no extremely hazardous substances.

**SARA (311/312) REPORTABLE HAZARD CATEGORIES:** None.

**SARA (313) TOXIC RELEASE INVENTORY:** This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

<b>SECTION 16</b>	<b>OTHER INFORMATION</b>
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N/D = Not determined, N/A = Not applicable

**THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:**

Revision Changes:

- Section 06: Notification Procedures - Header was modified.
- Section 13: Disposal Considerations - Disposal Recommendations was modified.
- Section 10 Stability and Reactivity - Header was modified.
- Section 13: Disposal Recommendations - Note was modified.
- Section 09: Phys/Chem Properties Note was modified.
- Section 09: Boiling Point C(F) was modified.
- Section 08: Comply with applicable regulations phrase was modified.
- Section 08: Personal Protection was modified.
- Section 08: Hand Protection was modified.

Product Name: MOBIL DTE OIL EXTRA HEAVY  
Revision Date: 30 Apr 2012  
Page 9 of 10

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Section 09: Vapor Pressure was modified.  
Section 07: Handling and Storage - Handling was modified.  
Section 07: Handling and Storage - Storage Phrases was modified.  
Section 11: Dermal Lethality Test Data was modified.  
Section 11: Oral Lethality Test Data was modified.  
Section 05: Hazardous Combustion Products was modified.  
Section 06: Accidental Release - Spill Management - Water was modified.  
Section 09: Relative Density - Header was modified.  
Section 09: Flash Point C(F) was modified.  
Section 09: Viscosity was modified.  
Section 09: Viscosity was modified.  
Section 14: Sea (IMDG) - Header was modified.  
Section 14: Air (IATA) - Header was modified.  
Section 14: LAND (TDG) - Header was modified.  
Section 14: LAND (DOT) - Header was modified.  
Section 15: List Citation Table - Header was modified.  
Section 14: LAND (DOT) - Default was modified.  
Section 14: LAND (TDG) Default was modified.  
Section 14: Sea (IMDG) - Default was modified.  
Section 14: Air (IATA) - Default was modified.  
Section 15: National Chemical Inventory Listing - Header was modified.  
Section 15: National Chemical Inventory Listing was modified.  
Section 16: Code to MHCs was modified.  
Section 08: Exposure limits/standards was modified.  
Hazard Identification: OSHA - May be Hazardous Statement was modified.  
Section 06: Notification Procedures was modified.  
Section 09: Oxidizing Properties was modified.  
Section 01: Company Contact Methods Sorted by Priority was modified.  
Section 06: Protective Measures was added.  
Section 06: Accidental Release - Protective Measures - Header was added.

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Internal Use Only

MHC: 0B, 0B, 0, 0, 0, 0

PPEC: A

DGN: 2007114XUS (1013921)

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**ATTACHMENT I**

**Emission Unit Table**

### Emission Units Table

(includes all emission units and air pollution control devices  
that will be part of this permit application review, regardless of permitting status)

Emission Unit ID <sup>1</sup>	Emission Point ID <sup>2</sup>	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type <sup>3</sup> and Date of Change	Control Device <sup>4</sup>
CE-1	1E	Residue Gas Compressor Engine (Caterpillar 3516 B)	2013	1380 Hp	EXIST	1C (SCR)
CE-2	2E	Residue Gas Compressor Engine (Caterpillar 3516B)	2013	1380 Hp	EXIST	2C (SCR)
CE-3	3E	Residue Gas Compressor Engine (Caterpillar 3516 LE)	2013	1380 Hp	REM	3C (SCR)
CE-4	4E	Residue Gas Compressor Engine (Caterpillar 3606 LE)	2015	2370 Hp	NEW	4C (SCR)
RSV-1	5E	Dehy Still	2013	40 MMSCFD	EXIST	VCU-1
RBV-1	6E	Dehydration Unit Re-Boiler	2013	0.75 MMBTU/Hr	EXIST	None
T05	7E	Produced Fluids Tank	2015	210 BBL	NEW	VCU-2
TL-1	8E	Truck Loading	2015	140,000 Gallons/Yr.	NEW	None
---	---	Fugitive VOC Emissions – Fittings and Connections	2014	N/A	EXIST/NEW	None
---	---	Haul Roads	2014	1 Truck per day max.	EXIST	None

<sup>1</sup> For Emission Units (or Sources) use the following numbering system: 1S, 2S, 3S, ... or other appropriate designation.

<sup>2</sup> For Emission Points use the following numbering system: 1E, 2E, 3E, ... or other appropriate designation.

<sup>3</sup> New, modification, removal

<sup>4</sup> For Control Devices use the following numbering system: 1C, 2C, 3C, ... or other appropriate designation.

---

**ATTACHMENT J**

**Emission Points Data Summary Sheets**

**ATTACHMENT J**

**Emission Points Data Summary Sheet  
New Equipment Only**

**Table 1: Emissions Data**

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup> (Speciate VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Potential Controlled Emissions <sup>5</sup>		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>	Emission Concentration <sup>7</sup> (ppmv or mg/m <sup>3</sup> )
		ID No.	Source	ID No.	Device Type	Short Term <sup>2</sup>	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr			
4E	Upward Vertical Stack	CE-4	Driver Engine	1C	NSCR	C	8760	NO <sub>x</sub>	2.15	9.43	2.15	9.43	GAS	EE	
								CO	10.76	47.13	0.83	3.63	GAS	EE	
								VOC	3.33	14.57	1.83	8.00	GAS	EE	
								SO <sub>2</sub>	0.01	0.04	0.01	0.04	GAS	EE	
								PM/PM10	0.13	0.59	0.13	0.59	Solid	EE	
								Formaldehyde	1.02	4.46	0.268	1.18	Gas	EE	
								CO2e	2144	9392	2144	9392	Gas	EE	
								NO <sub>x</sub>					GAS	EE	
								CO					GAS	EE	
								VOC	15.2	66.3	0.22	2.03	GAS	EE	
7E	Upward Vertical Stack	T05	Driver Engine	VCU-2	C	8760	SO <sub>2</sub>				GAS	EE			
							PM/PM10			<0.01	0.01	Solid	EE		
							Formaldehyde			<0.01	<0.01	Gas	EE		
							CO2e	0.03	0.11	60.9	265	Gas	EE		

Emission Point ID No. (Must match Emission Units Table & Plot Plan)	Emission Point Type <sup>1</sup>	Emission Unit Vented Through This Point (Must match Emission Units Table & Plot Plan)		Air Pollution Control Device (Must match Emission Units Table & Plot Plan)		Vent Time for Emission Unit (chemical processes only)		All Regulated Pollutants - Chemical Name/CAS <sup>3</sup> (Specify VOCs & HAPS)	Maximum Potential Uncontrolled Emissions <sup>4</sup>		Maximum Controlled Emissions <sup>5</sup>		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used <sup>6</sup>	Emission Concentration <sup>7</sup> (ppmv or mg/m <sup>3</sup> )	
		ID No.	Source	ID No.	Device Type	Short Term <sup>2</sup>	Max (hr/yr)		lb/hr	ton/yr	lb/hr	ton/yr				
8E	Upward Vertical Vent	TL-1	Truck Loading	N/A	40 hr/yr			NO <sub>x</sub>					GAS	EE		
								CO						GAS	EE	
								VOC	11.9	0.20	11.9	0.20		GAS	EE	
								PM/PM10						Solid	EE	
								Benzene						Gas	EE	
								Toluene						Gas	EE	
								CO2e						Gas	EE	
								NO <sub>x</sub>						GAS	EE	
								CO						GAS	EE	
								VOC						GAS	EE	
N/A	Fugitive		Road Dust	N/A				PM/PM10	2.75	0.05	2.75	0.05	GAS	EE		
								Benzene						Solid	EE	
								Toluene						Gas	EE	
								CO2e						Gas	EE	

The EMISSION POINTS DATA SUMMARY SHEET provides a summation of emissions by emission unit. Note that un-captured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g., un-captured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

1. Please add descriptors such as upward vertical stack, downward vertical stack, horizontal stack, relief vent, rain cap, etc.
2. Indicate by "C" if venting is continuous. Otherwise, specify the average short-term venting rate with units, for intermittent venting (i.e., 15 min/hr). Indicate as many rates as needed to clarify frequency of venting (e.g., 5 min/day, 2 days/wk).
3. List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. **LIST Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, etc. DO NOT LIST CO<sub>2</sub>, H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.**
4. Give maximum potential emission rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g., 5 lb VOC/20 minute batch).
5. Give maximum potential emission rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g., 5 lb VOC/20 minute batch).

6. Indicate method used to determine emission rate as follows:

MB = material balance;      ST = stack test (give date of test);      EE = engineering estimate;      O = other (specify).

Emission Points Data Summary Sheet  
New Equipment

**Table 2: Release Parameter Data**

Emission Point ID No. <i>(Must match Emission Units Table)</i>	Inner Diameter (ft.)	Exit Gas			Emission Point Elevation (ft)		UTM Coordinates (km)	
		Temp. (°F)	Volumetric Flow <sup>1</sup> (acfm) <i>at operating conditions</i>	Velocity (fps)	Ground Level (Height above mean sea level)	Stack Height <sup>2</sup> (Release height of emissions above ground level)	Northing	Easting
1E	1.67	992	9216	153	800	21		
2E	1.67	992	9216	153	800	21		
3E	1.67	992	9216	153	800	21		
4E	1.67	847	12185	203	800	20		
5E	0.33	Est. 1400	Est. 200	<10	800	11		
6E	0.33	Est. 1100	Est. 400	60	800	16		
7E	0.25 (each)	1400	Est. 200	<10	800	11		

<sup>1</sup> Give at operating conditions. Include inerts.

<sup>2</sup> Release height of emissions above ground level.

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**ATTACHMENT K**

**Fugitive Emissions Summary Sheet**

**Jay-Bee Oil & Gas, Inc.**  
**Ketel Compressor Station**  
**Attachment K**  
**Fugitive Emissions Data**

**Equipment Fugitive Emissions**

As noted in the process description, Jay Bee plans to install a replacement to one of the compressors and associated driver engine at its Ketel Compressor Station. This equipment contains a variety of piping containing natural gas and separated liquids under pressure. During the normal course of operation, minor leaks from valves, pressure release devices and various fittings associated with this piping may occur. The number of valves, flanges, etc. will remain essentially the same with this change of equipment. A potential emission rate of 0.25 tpy of VOCs and 95.9 tpy CO<sub>2</sub>e has been estimated.

Estimates of these emissions are included in the calculations (Attachment N) and summarized on the form included in this section. These calculations are based on emission factors accepted by the American Petroleum Institute and EPA.

**Pigging Emission Estimates**

There will be no pigging operations in association with this planned facility modification.

**Facility Blowdown Emission Estimates**

There are three main gas compressors at this facility that will require blowdowns to allow for routine maintenance. The volume of natural gas released per blowdown event from the two units associated with the CAT 3516 drivers and their associated inlet separator and piping is estimated at 70.1 cubic feet at approximately 59.0 atmospheres pressure (870 psi), yielding approximately 5016 cubic feet of gas at STP (see calculations). There will be a maximum of 26 blow downs per compressor per year. Thus, with two compressors, there is a potential for 52 events or 260,832 cubic feet of gas emitted from blowdowns per year from these two engines. The new compressor associated with the CAT 3606 driver will release 6801 cubic feet at STP (see provided form in calculations). Thus, with a maximum of 26 events per year, this compressor will release 176,826 cubic feet at STP. Together, all three compressors will release 437,658 cubic feet of gas (260,832 + 176,826).

The specific gravity of this gas at STP is 0.673 (see the Inlet Gas spreadsheet in the calculations). With the density of air at STP being 0.0806 pounds per cubic foot, the mass of gas released per year is 23,664 pounds (437,658 cf x 0.0806 x 0.673). As the percentage of VOCs in the gas (by weight) is 12.5 percent (see Inlet Gas spreadsheet in the calculations), the VOC (non-methane/non-ethane) emissions from blowdown operations are estimated at approximately 2954 lbs or 1.48 tons per year. HAPs (almost exclusively n-hexane) are estimated to be 0.5 percent of the mass of the blowdown emissions or 118 lb/yr (23,664 x 0.005) or 0.06 tpy. As the methane concentration in this gas is 68.1 % (by weight), methane emissions will be 16,115 pounds (23,664 x 0.681) per year. Using a GHG factor of 25, methane emissions from blowdowns in CO<sub>2</sub>e will be 201.4 tons CO<sub>2</sub>e (16,115 x 25[GHG factor] /2000).

**Storage Tank and Haul Road Fugitive Emissions**

Produced Fluids (water) received by this facility is accumulated in a single 210 BBL tank prior to off-site shipment. Emissions from this tank were determined by using flash gas measurements from pressurized condensate produced at an area Jay-Bee well pad and working/breathing losses using AP-42 methods using condensate vapor data from this same condensate. Uncontrolled emission from this tank were determined to be 64.8 tons per year of VOCs. These vapors are routed to an enclosed combustor with a minimum efficiency of 98%. Thus, controlled emissions are 1.30 tons per year. There will be a maximum of 36 truck loading trips per year, generating a potential 0.05 tpy of fugitive dust (see calculations section).

Emissions from these sources are summarized in the following fugitive emissions form and the calculations are included in the emissions summary in Attachment N.

## FUGITIVE EMISSIONS DATA SUMMARY SHEET

The FUGITIVE EMISSIONS SUMMARY SHEET provides a summation of fugitive emissions. Fugitive emissions are those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Note that uncaptured process emissions are not typically considered to be fugitive, and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSION POINTS DATA SUMMARY SHEET.

Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions).

APPLICATION FORMS CHECKLIST - FUGITIVE EMISSIONS	
1.) Will there be haul road activities? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, then complete the HAUL ROAD EMISSIONS UNIT DATA SHEET.	
2.) Will there be Storage Piles? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete Table 1 of the NONMETALLIC MINERALS PROCESSING EMISSIONS UNIT DATA SHEET.	
3.) Will there be Liquid Loading/Unloading Operations? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the BULK LIQUID TRANSFER OPERATIONS EMISSIONS UNIT DATA SHEET.	
4.) Will there be emissions of air pollutants from Wastewater Treatment Evaporation? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.	
5.) Will there be Equipment Leaks (e.g. leaks from pumps, compressors, in-line process valves, pressure relief devices, open-ended valves, sampling connections, flanges, agitators, cooling towers, etc.)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If YES, complete the LEAK SOURCE DATA SHEET section of the CHEMICAL PROCESSES EMISSIONS UNIT DATA SHEET.	
6.) Will there be General Clean-up VOC Operations? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET.	
7.) Will there be any other activities that generate fugitive emissions? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If YES, complete the GENERAL EMISSIONS UNIT DATA SHEET or the most appropriate form.	
If you answered "NO" to all of the items above, it is not necessary to complete the following table, "Fugitive Emissions Summary."	

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants - Chemical Name/CAS <sup>1</sup>	Maximum Potential Uncontrolled Emissions <sup>2</sup>		Maximum Potential Controlled Emissions <sup>3</sup>		Est. Metho d Used <sup>4</sup>
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads		2.75	0.05	2.75	0.05	
Unpaved Haul Roads	PM					EE
Loading/Unloading Operations	VOCs	11.09	0.20	11.09	0.20	EE
	Total HAPs	0.76	0.01	0.76	0.01	EE
Equipment Leaks	VOCs	Does Not Apply	0.25	Does Not Apply	0.25	EE
	Total HAPs	Does Not Apply	<0.01	Does Not Apply	<0.01	EE
Blowdowns	VOCs	N/A	1.48	N/A	1.48	EE
	Total HAPs	N/A	0.06	N/A	0.06	EE
Other:						

<sup>1</sup> List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS<sub>2</sub>, VOCs, H<sub>2</sub>S, Inorganics, Lead, Organics, O<sub>3</sub>, NO, NO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub>, all applicable Greenhouse Gases (including CO<sub>2</sub> and methane), etc. DO NOT LIST H<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, and Noble Gases.

<sup>2</sup> Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

<sup>3</sup> Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).

<sup>4</sup> Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; O = other (specify).

---

**ATTACHMENT L**

**Emission Unit Data Sheets**



## NATURAL GAS COMPRESSOR/GENERATOR ENGINE DATA SHEET

Source Identification Number <sup>1</sup>		CE-4					
Engine Manufacturer and Model		CAT G3606 LE					
Manufacturer's Rated bhp/rpm		1775 @ 1000					
Source Status <sup>2</sup>		NS					
Date Installed/Modified/Removed <sup>3</sup>		Upon Receipt of Permit					
Engine Manufactured/Reconstruction Date <sup>4</sup>		After July 1 2010					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60 Subpart JJJJ? (Yes or No) <sup>5</sup>		No					
Engine, Fuel and Combustion Data	Engine Type <sup>6</sup>	LB4S					
	APCD Type <sup>7</sup>	SCR					
	Fuel Type <sup>8</sup>	RG					
	H <sub>2</sub> S (gr/100 scf)	<1					
	Operating bhp/rpm	1775 @ 1000					
	BSFC (Btu/bhp-hr)	7576					
	Fuel throughput (ft <sup>3</sup> /hr)	11,435					
	Fuel throughput (MMft <sup>3</sup> /yr)	100.17					
	Operation (hrs/yr)	8760					
Reference <sup>9</sup>	Potential Emissions <sup>10</sup>	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
AP	NO <sub>x</sub>	2.15	9.43				
AP	CO	0.83	3.63				
AP	VOC	1.83	8.00				
AP	SO <sub>2</sub>	0.008	0.035				
AP	PM <sub>10</sub>	0.13	0.59				
AP	Formaldehyde	0.268	1.18				
AP	Total HAPs	0.516	2.26				
AP	CO <sub>2e</sub>	1730	7576				

1. Enter the appropriate Source Identification Number for each natural gas-fueled reciprocating internal combustion compressor/generator engine located at the compressor station. Multiple compressor engines should be designated CE-1, CE-2, CE-3 etc. Generator engines should be designated GE-1, GE-2, GE-3 etc. If more than three (3) engines exist, please use additional sheets.

2. Enter the Source Status using the following codes:

NS Construction of New Source (installation)	ES Existing Source
MS Modification of Existing Source	RS Removal of Source

3. Enter the date (or anticipated date) of the engine's installation (construction of source), modification or removal.

4. Enter the date that the engine was manufactured, modified or reconstructed.
5. Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart JJJJ. If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance according to 40CFR§60.4243a(2)(i) through (iii), as appropriate.

**Provide a manufacturer's data sheet for all engines being registered.**

6. Enter the Engine Type designation(s) using the following codes:
 

LB2S Lean Burn Two Stroke	RB4S Rich Burn Four Stroke
LB4S Lean Burn Four Stroke	
7. Enter the Air Pollution Control Device (APCD) type designation(s) using the following codes:
 

A/F Air/Fuel Ratio	IR Ignition Retard
HEIS High Energy Ignition System	SIPC Screw-in Precombustion Chambers
PSC Prestratified Charge	LEC Low Emission Combustion
NSCR Rich Burn & Non-Selective Catalytic Reduction	SCR Lean Burn & Selective Catalytic Reduction
8. Enter the Fuel Type using the following codes:
 

PQ Pipeline Quality Natural Gas	RG Raw Natural Gas
---------------------------------	--------------------
9. Enter the Potential Emissions Data Reference designation using the following codes. Attach all referenced data to this *Compressor/Generator Data Sheet(s)*.
 

MD	Manufacturer's Data	AP	AP-42
GR	GRI-HAPCalc™	OT	Other _____ (please list)
10. Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

## NATURAL GAS FIRED BOILER/LINE HEATER DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Design Heat Input (mmBtu/hr) <sup>3</sup>	Hours of Operation (hrs/yr) <sup>4</sup>	Fuel Heating Value (Btu/scf) <sup>5</sup>	
RBV-1	EXIST	0.75 MMBTU/Hr	8760	1190 BTU/scf (HHV)	

1. Enter the appropriate Source Identification Numbers (Source ID #) for each boiler or line heater located at the compressor station. Boilers should be designated BLR-1, BLR-2, BLR-3, etc. Heaters or Line Heaters should be designated HTR-1, HTR-2, HTR-3, etc. Enter glycol dehydration unit Reboiler Vent data on the *Glycol Dehydration Unit Data Sheet*.
2. Enter the Status for each boiler or line heater using the following:
 

EXIST Existing Equipment	NEW Installation of New Equipment
REM Equipment Removed	
3. Enter boiler or line heater design heat input in mmBtu/hr.
4. Enter the annual hours of operation in hours/year for each boiler or line heater.
5. Enter the fuel heating value in Btu/standard cubic foot.

## STORAGE TANK DATA SHEET

Source ID # <sup>1</sup>	Status <sup>2</sup>	Content <sup>3</sup>	Volume <sup>4</sup>	Dia <sup>5</sup>	Throughput <sup>6</sup>	Orientation <sup>7</sup>	Liquid Height <sup>8</sup>
T01	EXIST	Oil	300 Gallons	4.0	500 gallons/yr	HORZ	3 feet
T02	REM	Produced Fluid	100 BBL	8.0	500 gallons/yr	VERT	4 feet
T03	EXIST	OIL	300 Gallons	4.0	500 gallons/yr	HORZ	3 feet
T04	EXIST	OIL	300 Gallons	4.0	500 gallons/yr	HORZ	3 feet
T05	NEW	Produced Fluid	210 BBL	10.0	142,000 gallons/yr	VERT	8 feet

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the compressor station. Tanks should be designated T01, T02, T03, etc.
2. Enter storage tank Status using the following:
 

EXIST Existing Equipment	NEW Installation of New Equipment
REM Equipment Removed	
3. Enter storage tank content such as condensate, pipeline liquids, glycol (DEG or TEG), lube oil, etc.
4. Enter storage tank volume in gallons.
5. Enter storage tank diameter in feet.
6. Enter storage tank throughput in gallons per year.
7. Enter storage tank orientation using the following:
 

VERT Vertical Tank	HORZ Horizontal Tank
--------------------	----------------------
8. Enter storage tank average liquid height in feet.

## GLYCOL DEHYDRATION EMISSION UNIT DATA SHEET

General Glycol Dehydration Unit Data		Manufacturer and Model		Cameron 450/750	
		Max Dry Gas Flow Rate (mmscf/day)		40 MMSCFD	
		Design Heat Input (mmBtu/hr)		0.75 MMBTU/Hr (re-boiler)	
		Design Type (DEG or TEG)		TEG	
		Source Status <sup>2</sup>		ES	
		Date Installed/Modified/Removed <sup>3</sup>		August 2013	
		Regenerator Still Vent APCD <sup>4</sup>		TO	
		Control Device ID <sup>4</sup>		VCU-1	
		Fuel HV (Btu/scf)		1190 (HHV)	
		H <sub>2</sub> S Content (gr/100 scf)		<0.001%	
		Operation (hrs/yr)		8760	
Emission Unit ID/ Emission Point ID <sup>1</sup>	Vent	Reference <sup>5</sup>	Potential Emissions <sup>6</sup>	lbs/hr	tons/yr
RBV-1	Reboiler Vent	AP-42	NO <sub>x</sub>	0.075	0.329
		AP-42	CO	0.063	0.276
		AP-42	VOC	0.0041	0.018
		AP-42	SO <sub>2</sub>	<0.0001	<0.001
		AP-42	PM <sub>10</sub>	0.0057	0.025
VCU-1	Glycol Regenerator Still Vent	GRI-GLYCalc™	VOC	1.55	6.81
		GRI-GLYCalc™	Benzene	0.11	0.47
		GRI-GLYCalc™	Ethylbenzene	0.01	0.03
		GRI-GLYCalc™	Toluene	0.14	0.63
		GRI-GLYCalc™	Xylenes	0.07	0.30
		GRI-GLYCalc™	n-Hexane	0.02	0.10

1. Enter the appropriate Emission Unit ID Numbers and Emission Point ID Numbers for the glycol dehydration unit reboiler vent and glycol regenerator still vent. The glycol dehydration unit reboiler vent and glycol regenerator still vent should be designated RBV-1 and RSV-1, respectively. If the compressor station incorporates multiple glycol dehydration units, a *Glycol Dehydration Emission Unit Data Sheet* shall be completed for each, using Source Identification #s RBV-2 and RSV-2, RBV-3 and RSV-3, etc.

2. Enter the Source Status using the following codes:

NS Construction of New Source	ES Existing Source
MS Modification of Existing Source	RS Removal of Source

3. Enter the date (or anticipated date) of the glycol dehydration unit's installation (construction of source), modification or removal.

4. Enter the Air Pollution Control Device (APCD) type designation using the following codes and the control device ID number:

NA	None	CD	Condenser
FL	Flare	CC	Condenser/Combustion Combination
TO	Thermal Oxidizer		

5. Enter the Potential Emissions Data Reference designation using the following codes:

MD	Manufacturer's Data	AP	AP-42	
GR	GRI-GLYCalc™	OT	Other _____	(please list)

6. Enter the Reboiler Vent and Glycol Regenerator Still Vent Potential to Emit (PTE) for the listed regulated pollutants in lbs per hour and tons per year. The Glycol Regenerator Still Vent potential emissions may be determined using the most recent version of the thermodynamic software model GRI-GLYCalc™ (Radian International LLC & Gas Research Institute). Attach all referenced Potential Emissions Data (or calculations) and the GRI-GLYCalc *Aggregate Calculations Report* to this *Glycol Dehydration Emission Unit Data Sheet(s)*. This PTE data shall be incorporated in the *Emissions Summary Sheet*.

**Include a copy of the GRI-GLYCalc™ analysis. This includes a printout of the aggregate calculations report, which shall include emissions reports, equipment reports, and stream reports.**

Division of Air Quality

40 CFR Part 63; Subpart HH & HHH Registration Form

Complete this form for any oil and natural gas production or natural gas transmission and storage facility that uses an affected unit under HH/HHH, whether subject or not.

Section A: Facility Description			
Affected facility actual annual average natural gas throughput (scf/day):	40 MMSCF/Day		
Affected facility actual annual average hydrocarbon liquid throughput: (bbl/day):	N/A		
The affected facility processes, upgrades, or stores hydrocarbon liquids prior to custody transfer.	Yes	X	No
The affected facility processes, upgrades, or stores natural gas prior to the point at which natural gas (NG) enters the NG transmission and storage source category or is delivered to the end user.	Yes	X	No
The affected facility is: <input checked="" type="checkbox"/> prior to a NG processing plant <input type="checkbox"/> a NG processing plant <input type="checkbox"/> prior to the point of custody transfer and there is no NG processing plant			
The affected facility transports or stores natural gas prior to entering the pipeline to a local distribution company or to a final end user (if there is no local distribution company).	Yes	X	No
The affected facility exclusively processes, stores, or transfers black oil.	Yes	X	No
Initial producing gas-to-oil ratio (GOR): _____ scf/bbl      API gravity: _____ degrees			
Section B: Dehydration Unit (if applicable) <sup>1</sup>			
Description: 40 MMCFD Glycol Dehydrator			
Date of Installation: August 20132	Annual Operating Hours: 8760	Burner rating (MMBtu/hr): 0.75	
Exhaust Stack Height (ft): 15	Stack Diameter (ft): 1.0	Stack Temp. (°F): 212 (Still Vent)	
Glycol Type: <input checked="" type="checkbox"/> TEG <input type="checkbox"/> EG <input type="checkbox"/> Other:			
Glycol Pump Type: <input type="checkbox"/> Electric <input checked="" type="checkbox"/> Gas    If gas, what is the volume ratio? _____ ACFM/gpm			
Condenser installed? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No    Exit Temp. 80°F    Condenser Pressure 14.7 psig			
Incinerator/flare installed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No    Destruction Eff. 95%			
Other controls installed? <input type="checkbox"/> Yes <input type="checkbox"/> No    Describe:			
Wet Gas <sup>2</sup> : Gas Temp.: 115°F    Gas Pressure 950 psig (Upstream of Contact Tower) Saturated Gas? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No    If no, water content _____ lb/MMSCF			
Dry Gas: Gas Flowrate(MMSCFD) Actual Varies _____ Design 40 MMSCF/Day (Downstream of Contact Tower) Water Content 7.0 lb/MMSCF			
Lean Glycol: Circulation rate (gpm) Actual <sup>3</sup> 7.1    Maximum <sup>4</sup> 7.1 Pump make/model: Kimray 10015SC			
Glycol Flash Tank (if applicable): Temp.: _____°F    Pressure _____ psig    Vented? Yes <input type="checkbox"/> No <input type="checkbox"/> If no, describe vapor control: Recycle/recompression			
Stripping Gas (if applicable): Source of gas: N/A    Rate _____ scfm			

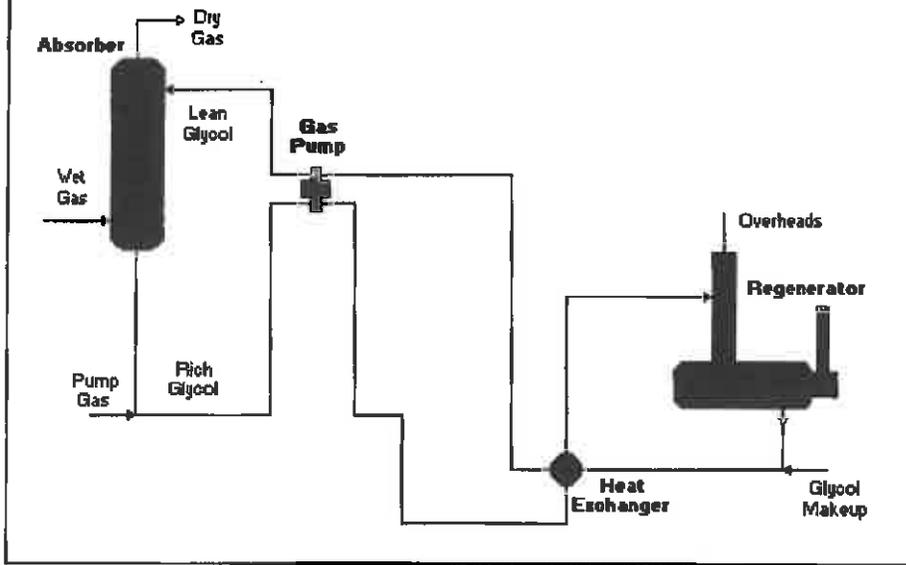
**Please attach the following required dehydration unit information:**

1. System map indicating the chain of custody information. See Page 43 of this document for an example of a gas flow schematic. It is not intended that the applicant provide this level of detail for all sources. The level of detail that is necessary is to establish where the custody transfer points are located. This can be accomplished by submitting a process flow diagram indicating custody transfer points and the natural gas flow. However, the DAQ reserves the right to request more detailed information in order to make the necessary decisions.
2. Extended gas analysis from the Wet Gas Stream including mole percents of C<sub>1</sub>-C<sub>8</sub>, benzene, ethylbenzene, toluene, xylene and n-Hexane, using Gas Processors Association (GPA) 2286 (or similar). A sample should be taken from the inlet gas line, downstream from any inlet separator, and using a manifold to remove entrained liquids from the sample and a probe to collect the sample from the center of the gas line. GPA standard 2166 reference method or a modified version of EPA Method TO-14, (or similar) should be used.
3. GRI-GLYCalc Ver. 3.0 aggregate report based on maximum Lean Glycol circulation rate and maximum throughput.
4. Detailed calculations of gas or hydrocarbon flow rate.

**Section C: Facility NESHAPS Subpart HH/HHH status**

	<input type="checkbox"/>	Subject to Subpart HH
Affected facility	<input type="checkbox"/>	Subject to Subpart HHH
status:	<input checked="" type="checkbox"/>	Not Subject
(choose only one)		<input checked="" type="checkbox"/> < 10/25 TPY
	because:	<input type="checkbox"/> Affected facility exclusively handles black oil
		<input type="checkbox"/> The facility wide actual annual average NG throughput is < 650 thousand scf/day and facility wide actual annual average hydrocarbon liquid is < 250 bpd
		<input type="checkbox"/> No affected source is present

# TEG Dehydration Flowsheet



## GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Ketel Compressor Station  
 File Name: C:\Rogers\_Files\Misc\Jay-Bee Oil & Gas\Ketel\40 MMSCF.ddf  
 Date: June 02, 2015

## DESCRIPTION:

Description: 40 MMSCFD  
 Inlet Pressure 950 psi  
 Inlet Temp 115 Deg. F  
 Still Vent Controlled at 95%

Annual Hours of Operation: 8760.0 hours/yr

## WET GAS:

Temperature: 115.00 deg. F  
 Pressure: 950.00 psig  
 Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.1320
Nitrogen	0.3340
Methane	83.9000
Ethane	11.2000
Propane	2.8100
Isobutane	0.3680
n-Butane	0.5470
Isopentane	0.1770
n-Pentane	0.1170
n-Hexane	0.0336
Other Hexanes	0.1450
Heptanes	0.0156
2,2,4-Trimethylpentane	0.0061
Benzene	0.0075
Toluene	0.0065
Ethylbenzene	0.0003
Xylenes	0.0016
C8+ Heavies	0.0109

## DRY GAS:

Flow Rate: 40.0 MMSCF/day  
 Water Content: 7.0 lbs. H2O/MMSCF

## LEAN GLYCOL:

Glycol Type: TEG  
 Water Content: 1.5 wt% H2O  
 Flow Rate: 7.1 gpm

## PUMP:

Glycol Pump Type: Gas Injection

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

Page: 2

REGENERATOR OVERHEADS CONTROL DEVICE:

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Control Device:	Combustion Device
Destruction Efficiency:	95.0 %
Excess Oxygen:	2.0 %
Ambient Air Temperature:	60.0 deg. F

## GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Ketel Compressor Station

File Name: C:\Rogers\_Files\Misc\Jay-Bee Oil &amp; Gas\Ketel\40 MMSCF.ddf

Date: June 02, 2015

## DESCRIPTION:

Description: 40 MMSCFD  
 Inlet Pressure 950 psi  
 Inlet Temp 115 Deg. F  
 Still Vent Controlled at 95%

Annual Hours of Operation: 8760.0 hours/yr

## EMISSIONS REPORTS:

## CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	4.7270	113.449	20.7044
Ethane	1.4313	34.351	6.2691
Propane	0.5995	14.388	2.6259
Isobutane	0.1139	2.733	0.4988
n-Butane	0.1891	4.539	0.8284
Isopentane	0.0738	1.772	0.3233
n-Pentane	0.0547	1.312	0.2395
n-Hexane	0.0236	0.566	0.1033
Other Hexanes	0.0882	2.117	0.3863
Heptanes	0.0180	0.433	0.0790
2,2,4-Trimethylpentane	0.0047	0.113	0.0206
Benzene	0.1073	2.575	0.4699
Toluene	0.1437	3.449	0.6294
Ethylbenzene	0.0099	0.239	0.0435
Xylenes	0.0690	1.657	0.3024
C8+ Heavies	0.0595	1.428	0.2607
<b>Total Emissions</b>	<b>7.7133</b>	<b>185.120</b>	<b>33.7844</b>
<b>Total Hydrocarbon Emissions</b>	<b>7.7133</b>	<b>185.120</b>	<b>33.7844</b>
<b>Total VOC Emissions</b>	<b>1.5550</b>	<b>37.320</b>	<b>6.8110</b>
<b>Total HAP Emissions</b>	<b>0.3583</b>	<b>8.598</b>	<b>1.5691</b>
<b>Total BTEX Emissions</b>	<b>0.3300</b>	<b>7.920</b>	<b>1.4453</b>

## UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	94.5404	2268.970	414.0871
Ethane	28.6259	687.023	125.3816
Propane	11.9902	287.765	52.5171
Isobutane	2.2778	54.667	9.9767
n-Butane	3.7826	90.783	16.5679
Isopentane	1.4764	35.434	6.4668
n-Pentane	1.0935	26.243	4.7894
n-Hexane	0.4715	11.316	2.0651
Other Hexanes	1.7640	42.336	7.7262
Heptanes	0.3606	8.655	1.5794

2,2,4-Trimethylpentane	0.0939	2.255	0.4115
Benzene	2.1459	51.500	9.3988
Toluene	2.8741	68.977	12.5884
Ethylbenzene	0.1988	4.770	0.8705
Xylenes	1.3809	33.142	6.0484
C8+ Heavies	1.1902	28.566	5.2132
-----			
Total Emissions	154.2668	3702.402	675.6884
-----			
Total Hydrocarbon Emissions	154.2668	3702.402	675.6884
Total VOC Emissions	31.1004	746.409	136.2197
Total HAP Emissions	7.1650	171.960	31.3828
Total BTEX Emissions	6.5996	158.390	28.9062

## EQUIPMENT REPORTS:

## COMBUSTION DEVICE

Ambient Temperature: 60.00 deg. F  
 Excess Oxygen: 2.00 %  
 Combustion Efficiency: 95.00 %  
 Supplemental Fuel Requirement: 7.26e-001 MM BTU/hr

Component	Emitted	Destroyed
-----	-----	-----
Methane	5.00%	95.00%
Ethane	5.00%	95.00%
Propane	5.00%	95.00%
Isobutane	5.00%	95.00%
n-Butane	5.00%	95.00%
Isopentane	5.00%	95.00%
n-Pentane	5.00%	95.00%
n-Hexane	5.00%	95.00%
Other Hexanes	5.00%	95.00%
Heptanes	5.00%	95.00%
2,2,4-Trimethylpentane	5.00%	95.00%
Benzene	5.00%	95.00%
Toluene	5.00%	95.00%
Ethylbenzene	5.00%	95.00%
Xylenes	5.00%	95.00%
C8+ Heavies	5.00%	95.00%

## ABSORBER

Calculated Absorber Stages: 1.25  
 Specified Dry Gas Dew Point: 7.00 lbs. H2O/MMSCF  
     Temperature: 115.0 deg. F  
     Pressure: 950.0 psig  
 Dry Gas Flow Rate: 40.0000 MMSCF/day  
 Glycol Losses with Dry Gas: 1.2211 lb/hr  
     Wet Gas Water Content: Saturated  
 Calculated Wet Gas Water Content: 92.20 lbs. H2O/MMSCF  
 Calculated Lean Glycol Recirc. Ratio: 3.00 gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
-----	-----	-----

Water	7.58%	92.42%
Carbon Dioxide	99.79%	0.21%
Nitrogen	99.98%	0.02%
Methane	99.98%	0.02%
Ethane	99.95%	0.05%
Propane	99.92%	0.08%
Isobutane	99.90%	0.10%
n-Butane	99.87%	0.13%
Isopentane	99.88%	0.12%
n-Pentane	99.85%	0.15%
n-Hexane	99.77%	0.23%
Other Hexanes	99.82%	0.18%
Heptanes	99.62%	0.38%
2,2,4-Trimethylpentane	99.83%	0.17%
Benzene	91.83%	8.17%
Toluene	89.19%	10.81%
Ethylbenzene	86.81%	13.19%
Xylenes	82.01%	17.99%
C8+ Heavies	98.68%	1.32%

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 REGENERATOR
 

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No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	29.60%	70.40%
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	0.23%	99.77%
n-Pentane	0.26%	99.74%
n-Hexane	0.31%	99.69%
Other Hexanes	0.56%	99.44%
Heptanes	0.37%	99.63%
2,2,4-Trimethylpentane	0.82%	99.18%
Benzene	4.92%	95.08%
Toluene	7.81%	92.19%
Ethylbenzene	10.31%	89.69%
Xylenes	12.85%	87.15%
C8+ Heavies	10.99%	89.01%

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 STREAM REPORTS:
 

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 WET GAS STREAM
 

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Temperature: 115.00 deg. F  
 Pressure: 964.70 psia  
 Flow Rate: 1.67e+006 scfh

Component	Conc.	Loading
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	(vol%)	(lb/hr)
Water	1.94e-001	1.54e+002
Carbon Dioxide	1.32e-001	2.56e+002
Nitrogen	3.34e-001	4.12e+002
Methane	8.39e+001	5.92e+004
Ethane	1.12e+001	1.48e+004
Propane	2.81e+000	5.45e+003
Isobutane	3.68e-001	9.41e+002
n-Butane	5.47e-001	1.40e+003
Isopentane	1.77e-001	5.62e+002
n-Pentane	1.17e-001	3.72e+002
n-Hexane	3.36e-002	1.27e+002
Other Hexanes	1.45e-001	5.50e+002
Heptanes	1.56e-002	6.88e+001
2,2,4-Trimethylpentane	6.06e-003	3.05e+001
Benzene	7.51e-003	2.58e+001
Toluene	6.47e-003	2.62e+001
Ethylbenzene	3.19e-004	1.49e+000
Xylenes	1.63e-003	7.62e+000
C8+ Heavies	1.09e-002	8.17e+001
Total Components	100.00	8.45e+004

DRY GAS STREAM

Temperature: 115.00 deg. F  
 Pressure: 964.70 psia  
 Flow Rate: 1.67e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.47e-002	1.17e+001
Carbon Dioxide	1.32e-001	2.55e+002
Nitrogen	3.35e-001	4.12e+002
Methane	8.41e+001	5.92e+004
Ethane	1.12e+001	1.48e+004
Propane	2.81e+000	5.45e+003
Isobutane	3.68e-001	9.41e+002
n-Butane	5.47e-001	1.40e+003
Isopentane	1.77e-001	5.61e+002
n-Pentane	1.17e-001	3.71e+002
n-Hexane	3.36e-002	1.27e+002
Other Hexanes	1.45e-001	5.49e+002
Heptanes	1.56e-002	6.86e+001
2,2,4-Trimethylpentane	6.06e-003	3.04e+001
Benzene	6.91e-003	2.37e+001
Toluene	5.78e-003	2.34e+001
Ethylbenzene	2.77e-004	1.29e+000
Xylenes	1.34e-003	6.25e+000
C8+ Heavies	1.08e-002	8.07e+001
Total Components	100.00	8.44e+004

LEAN GLYCOL STREAM

Temperature: 115.00 deg. F  
 Flow Rate: 7.10e+000 gpm

Component	Conc.	Loading
-----------	-------	---------

	(wt%)	(lb/hr)
TEG	9.85e+001	3.94e+003
Water	1.50e+000	6.00e+001
Carbon Dioxide	1.37e-012	5.46e-011
Nitrogen	2.08e-013	8.33e-012
Methane	8.93e-018	3.57e-016
Ethane	9.01e-008	3.60e-006
Propane	4.34e-009	1.73e-007
Isobutane	7.09e-010	2.83e-008
n-Butane	1.12e-009	4.46e-008
Isopentane	8.55e-005	3.42e-003
n-Pentane	7.13e-005	2.85e-003
n-Hexane	3.66e-005	1.46e-003
Other Hexanes	2.49e-004	9.95e-003
Heptanes	3.31e-005	1.32e-003
2,2,4-Trimethylpentane	1.94e-005	7.73e-004
Benzene	2.78e-003	1.11e-001
Toluene	6.09e-003	2.43e-001
Ethylbenzene	5.72e-004	2.29e-002
Xylenes	5.09e-003	2.04e-001
C8+ Heavies	3.68e-003	1.47e-001
Total Components	100.00	4.00e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 115.00 deg. F  
 Pressure: 964.70 psia  
 Flow Rate: 7.72e+000 gpm  
 NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.16e+001	3.94e+003
Water	4.72e+000	2.03e+002
Carbon Dioxide	2.11e-002	9.08e-001
Nitrogen	1.55e-002	6.67e-001
Methane	2.20e+000	9.45e+001
Ethane	6.67e-001	2.86e+001
Propane	2.79e-001	1.20e+001
Isobutane	5.30e-002	2.28e+000
n-Butane	8.81e-002	3.78e+000
Isopentane	3.45e-002	1.48e+000
n-Pentane	2.55e-002	1.10e+000
n-Hexane	1.10e-002	4.73e-001
Other Hexanes	4.13e-002	1.77e+000
Heptanes	8.43e-003	3.62e-001
2,2,4-Trimethylpentane	2.21e-003	9.47e-002
Benzene	5.26e-002	2.26e+000
Toluene	7.26e-002	3.12e+000
Ethylbenzene	5.16e-003	2.22e-001
Xylenes	3.69e-002	1.58e+000
C8+ Heavies	3.11e-002	1.34e+000
Total Components	100.00	4.29e+003

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F

Pressure: 14.70 psia  
Flow Rate: 5.82e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	5.16e+001	1.43e+002
Carbon Dioxide	1.35e-001	9.08e-001
Nitrogen	1.55e-001	6.67e-001
Methane	3.85e+001	9.45e+001
Ethane	6.21e+000	2.86e+001
Propane	1.77e+000	1.20e+001
Isobutane	2.56e-001	2.28e+000
n-Butane	4.25e-001	3.78e+000
Isopentane	1.34e-001	1.48e+000
n-Pentane	9.89e-002	1.09e+000
n-Hexane	3.57e-002	4.71e-001
Other Hexanes	1.34e-001	1.76e+000
Heptanes	2.35e-002	3.61e-001
2,2,4-Trimethylpentane	5.37e-003	9.39e-002
Benzene	1.79e-001	2.15e+000
Toluene	2.03e-001	2.87e+000
Ethylbenzene	1.22e-002	1.99e-001
Xylenes	8.49e-002	1.38e+000
C8+ Heavies	4.56e-002	1.19e+000
Total Components	100.00	2.98e+002

## COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F  
Pressure: 14.70 psia  
Flow Rate: 1.40e+002 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	8.00e+001	4.73e+000
Ethane	1.29e+001	1.43e+000
Propane	3.69e+000	6.00e-001
Isobutane	5.32e-001	1.14e-001
n-Butane	8.83e-001	1.89e-001
Isopentane	2.78e-001	7.38e-002
n-Pentane	2.06e-001	5.47e-002
n-Hexane	7.42e-002	2.36e-002
Other Hexanes	2.78e-001	8.82e-002
Heptanes	4.88e-002	1.80e-002
2,2,4-Trimethylpentane	1.12e-002	4.70e-003
Benzene	3.73e-001	1.07e-001
Toluene	4.23e-001	1.44e-001
Ethylbenzene	2.54e-002	9.94e-003
Xylenes	1.77e-001	6.90e-002
C8+ Heavies	9.48e-002	5.95e-002
Total Components	100.00	7.71e+000

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**ATTACHMENT M**

**Air Pollution Control Device Sheets**



**JayBee Ketel CS 10/31/14 Unit TBD Caterpillar G3606TALE Engine Emissions**

Date of Manufacture	<u>after 7/2010</u>	Engine Serial Number	<u>TBD</u>	Date Modified/Reconstructed	<u>Not Any</u>
Driver Rated HP	<u>1775</u>	Rated Speed in RPM	<u>1000</u>	Combustion Type	<u>Spark Ignited 4 Stroke</u>
Number of Cylinders	<u>6</u>	Compression Ratio	<u>9:1</u>	Combustion Setting	<u>Ultra Lean Burn</u>
Total Displacement, in <sup>3</sup>	<u>7762</u>	Fuel Delivery Method	<u>Fuel Injection</u>	Combustion Air Treatment	<u>T.C./Aftercooled</u>

**Raw Engine Emissions (Customer Supplied Fuel Gas with little to no H2S)**

Fuel Consumption      6860 LHV BTU/bhp-hr    or      7576 HHV BTU/bhp-hr  
 Altitude                    1200 ft  
 Maximum Air Inlet Temp      90 F

	<u>g/bhp-hr<sup>1</sup></u>	<u>lb/MMBTU<sup>2</sup></u>	<u>lb/hr</u>	<u>TPY</u>
Nitrogen Oxides (NOx)	0.5		1.96	8.57
Carbon Monoxide (CO)	2.75		10.76	47.13
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0.85		3.33	14.57
Formaldehyde (CH2O)	0.26		1.02	4.46
Particulate Matter (PM) <small>Filterable+Condensable</small>		9.99E-03	1.34E-01	5.88E-01
Sulfur Dioxide (SO2)		5.88E-04	7.91E-03	3.46E-02
	<u>g/bhp-hr<sup>1</sup></u>		<u>lb/hr</u>	<u>Metric Tonne/yr</u>
Carbon Dioxide (CO2)	442		1730	6871
Methane (CH4)	4.23		16.55	65.76

<sup>1</sup> g/bhp-hr are based on Caterpillar Specifications (GERP) Customer supplied fuel gas, 1200 ft elevation, and 100 F Max Air Inlet Temperature.

Note that g/bhp-hr values are based on 100% Load Operation. For air permitting, it is recommended to use a 20% safety margin for CO, VOC and other organic compounds to allow for variation in operating parameters and fuel gas quality.

<sup>2</sup> Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combustion Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-2).

**Catalytic Converter Emissions**

Catalytic Converter Make and Model:      DCL, DC64-L2  
 Element Type:                                    DC-24.23" Round  
 Number of Elements in Housing:            2  
 Air/Fuel Ratio Control                         Caterpillar ADEM A3, Burn Time

	<u>% Reduction</u>	<u>lb/hr</u>	<u>TPY</u>
Nitrogen Oxides (NOx)	0	1.96	8.57
Carbon Monoxide (CO)	93	0.75	3.30
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	50	1.66	7.28
Formaldehyde (CH2O)	76	0.24	1.07
Particulate Matter (PM)	0	1.34E-01	5.88E-01
Sulfur Dioxide (SO2)	0	7.91E-03	3.46E-02
	<u>% Reduction</u>	<u>lb/hr</u>	<u>Metric Tonne/yr</u>
Carbon Dioxide (CO2)	0	1730	6871
Methane (CH4)	0	16.55	65.76



**DCL America Inc.**

12620 FM 1960 W. Ste A+ Box # 560, Houston, TX 77065  
Tel.: 877-897-9759 Fax: 281-605-5858 E-mail: info@dclamerica.com

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<b>To</b>	Chris Magee	<b>Phone</b>	
	USA Compression	<b>Fax</b>	
<b>Date</b>	October 31, 2014	<b>Email</b>	cmagee@usacompression.com

**RE: EMISSIONS GUARANTEE**

Chris,

We hereby guarantee that our QUICK-LID™ Model DC64AL2-16 Hospital+ Grade Catalytic Silencer described below:

Catalyst model	DC64AL2
Catalyst coating	Oxidation (A coating)
Outside Diameter of catalyst substrate	24.23"
No. Of Catalyst Layers	1
No. of catalyst substrates	2
Cell Density	300 cpsi
Approx. Attenuation	40-52 dBA

and sized for the following engine:

Engine model	CAT G3606LE
Power	1775 hp @ 1000 rpm
Fuel	Pipeline Quality Natural Gas

will perform as follows:

Emissions	After Catalyst (% destruction)
Carbon Monoxide (CO)	93%
Formaldehyde (HCHO)	76%
VOC (NMNEHC)	50%

for a period of 1 year (after invoice date) or 8000 hours, whichever comes first, subject to all terms and conditions contained in the attached warranty document being respected and met.

Best regards,  
DCL America

**Sam Kirk**  
Regional Account Manager

Confidential Communication

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ENGINE SPEED (rpm): 1000  
 COMPRESSION RATIO: 9.2:1  
 AFTERCOOLER TYPE: SCAC  
 AFTERCOOLER WATER INLET (°F): 130  
 JACKET WATER OUTLET (°F): 190  
 ASPIRATION: TA  
 COOLING SYSTEM: JW, OC+AC  
 CONTROL SYSTEM: CIS/ADEM3  
 EXHAUST MANIFOLD: DRY  
 COMBUSTION: LOW EMISSION  
 NOx EMISSION LEVEL (g/bhp-hr NOx): 0.5

RATING STRATEGY:  
 RATING LEVEL:  
 FUEL SYSTEM:

STANDARD CONTINUOUS GAV WITH AIR FUEL RATIO CONTROL

**SITE CONDITIONS:**

FUEL: Jaybee Ketel 10-14-14  
 FUEL PRESSURE RANGE(psig): 42.8-47.0  
 FUEL METHANE NUMBER: 59.5  
 FUEL LHV (Btu/scf): 1076  
 ALTITUDE(ft): 1200  
 MAXIMUM INLET AIR TEMPERATURE(°F): 90  
 STANDARD RATED POWER: 1775 bhp@1000rpm

RATING	NOTES	LOAD	MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
			100%	100%	75%	53%
ENGINE POWER (WITHOUT FAN)	(1)	bhp	1775	1687	1265	888
INLET AIR TEMPERATURE		°F	33	90	90	90

ENGINE DATA						
FUEL CONSUMPTION (LHV)	(2)	Btu/bhp-hr	6860	6908	7179	7620
FUEL CONSUMPTION (HHV)	(2)	Btu/bhp-hr	7576	7629	7929	8415
AIR FLOW (@inlet air temp, 14.7 psia)	(3)(4) (WET)	ft <sup>3</sup> /min	4335	4617	3557	2518
AIR FLOW	(3)(4) (WET)	lb/hr	20927	19988	15400	10902
FUEL FLOW (80°F, 14.7 psia)		scfm	189	180	141	105
INLET MANIFOLD PRESSURE	(5)	in Hg(abs)	74.3	71.0	55.4	41.2
EXHAUST TEMPERATURE - ENGINE OUTLET	(6)	°F	847	852	880	937
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(7)(4) (WET)	ft <sup>3</sup> /min	12185	11681	9199	6805
EXHAUST GAS MASS FLOW	(7)(4) (WET)	lb/hr	21506	20542	15832	11224

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)	(8)(9)	g/bhp-hr	0.50	0.50	0.50	0.50
CO	(8)(9)	g/bhp-hr	2.75	2.75	2.75	2.75
THC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	6.31	6.34	6.56	6.79
NMHC (mol. wt. of 15.84)	(8)(9)	g/bhp-hr	2.08	2.09	2.16	2.24
NMNEHC (VOCs) (mol. wt. of 15.84)	(8)(9)(10)	g/bhp-hr	0.85	0.85	0.88	0.91
HCHO (Formaldehyde)	(8)(9)	g/bhp-hr	0.26	0.27	0.29	0.31
CO2	(8)(9)	g/bhp-hr	442	445	466	495
EXHAUST OXYGEN	(8)(11)	% DRY	12.8	12.7	11.9	11.1

HEAT REJECTION						
HEAT REJ. TO JACKET WATER (JW)	(12)	Btu/min	18724	18301	15440	13009
HEAT REJ. TO ATMOSPHERE	(12)	Btu/min	7103	7068	6651	6199
HEAT REJ. TO LUBE OIL (OC)	(12)	Btu/min	9133	9126	8777	8453
HEAT REJ. TO AFTERCOOLER (AC)	(12)(13)	Btu/min	16173	16173	7494	1714

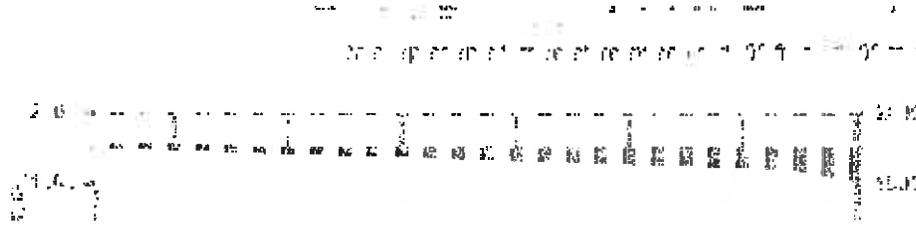
COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW)	(13)	Btu/min	20597
TOTAL AFTERCOOLER CIRCUIT (OC+AC)	(13)(14)	Btu/min	27941

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

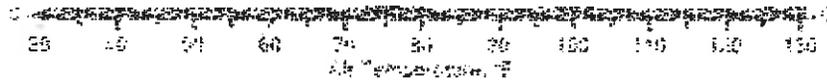
**CONDITIONS AND DEFINITIONS**

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

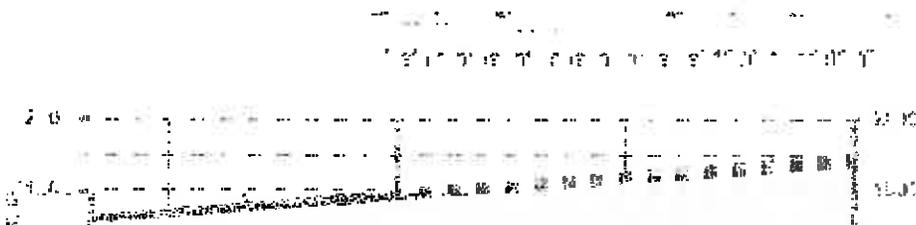
For notes information consult page three.



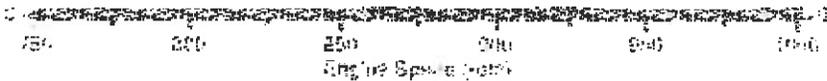
At site conditions of 1200 ft elevation and 90°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.



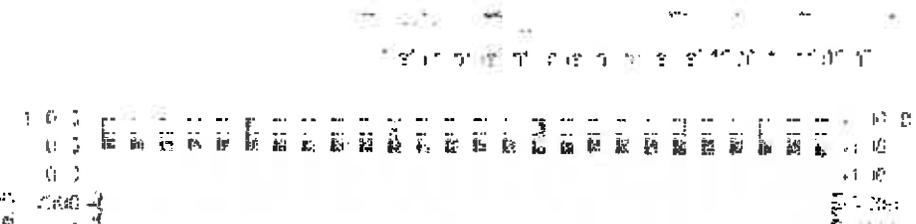
Operating Range



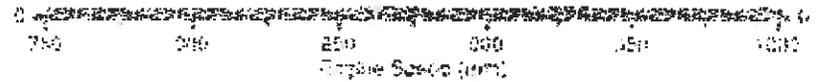
At site conditions of 1200 ft elevation and 90°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.



Operating Range



At site conditions of 1200 ft elevation and 90°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.



Operating Range

**Note:** At site conditions of 1200 ft and 90°F inlet air temp., constant torque can be maintained down to 750 rpm. The minimum speed for loading at these conditions is 750 rpm.

**NOTES**

1. Engine rating is with two engine driven water pumps. Tolerance is  $\pm 3\%$  of full load.
2. Fuel consumption tolerance is  $\pm 2.5\%$  of full load data.
3. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of  $\pm 5\%$ .
4. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
5. Inlet manifold pressure is a nominal value with a tolerance of  $\pm 5\%$ .
6. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
7. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of  $\pm 6\%$ .
8. Emissions data is at engine exhaust flange prior to any after treatment.
9. Emission values are based on engine operating at steady state conditions. Fuel methane number cannot vary more than  $\pm 3$ . Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate "Not to Exceed" values. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.
10. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
11. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is  $\pm 0.5$ .
12. Heat rejection values are nominal. Tolerances, based on treated water, are  $\pm 10\%$  for jacket water circuit,  $\pm 50\%$  for radiation,  $\pm 20\%$  for lube oil circuit, and  $\pm 5\%$  for aftercooler circuit.
13. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.
14. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	82.7190	82.7190
Ethane	C2H6	12.0440	12.0440
Propane	C3H8	3.0650	3.0650
Isobutane	iso-C4H10	0.4170	0.4170
Norbutane	nor-C4H10	0.6450	0.6450
Isopentane	iso-C5H12	0.1870	0.1870
Norpentane	nor-C5H12	0.1380	0.1380
Hexane	C6H14	0.2460	0.2460
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	0.3930	0.3930
Carbon Dioxide	CO2	0.1460	0.1460
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0000	100.0000

Fuel Makeup: Jaybee Ketel 10-14-14  
Unit of Measure: English

**Calculated Fuel Properties**

Caterpillar Methane Number:	59.5
Lower Heating Value (Btu/scf):	1076
Higher Heating Value (Btu/scf):	1189
WOBBE Index (Btu/scf):	1312
THC: Free Inert Ratio:	184.53
Total % Inerts (% N2, CO2, He):	0.54%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.997
Stoich A/F Ratio (Vol/Vol):	11.18
Stoich A/F Ratio (Mass/Mass):	16.63
Specific Gravity (Relative to Air):	0.673
Specific Heat Constant (K):	1.290

**CONDITIONS AND DEFINITIONS**

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

**FUEL LIQUIDS**

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.



# Certificate of Analysis

Number: 2030-14090166-001A

Carencro Laboratory  
4790 NE Evangeline Thruway  
Carencro, LA 70520

Gary Vermillion  
Gas Analytical Services  
PO Box 1028  
Bridgeport, WV 26330

Sep. 17, 2014

Field: Jay Bee Oil & Gas  
Station Name: FG3/Kettle Fuel Gas  
Station Number:  
Sample Point: Submeter  
Analyzed: 09/16/2014 16:00:06 by CC39

Sampled By: TD-GAS  
Sample Of: Gas Spot  
Sample Date: 08/28/2014 13:30  
Sample Conditions: 170 psig  
Method: GPA 2286  
Cylinder No: 0201

## Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia	
Nitrogen	0.393	0.565		GPM TOTAL C2+ 4.640
Carbon Dioxide	0.146	0.330		
Methane	82.719	68.051		
Ethane	12.044	18.572	3.230	
Propane	3.065	6.931	0.847	
Iso-Butane	0.417	1.243	0.137	
n-Butane	0.645	1.923	0.203	
Iso-Pentane	0.187	0.692	0.068	
n-Pentane	0.138	0.511	0.050	
i-Hexanes	0.088	0.381	0.035	
n-Hexane	0.045	0.193	0.018	
Benzene	0.002	0.006	NIL	
Cyclohexane	0.006	0.025	0.002	
i-Heptanes	0.047	0.235	0.021	
n-Heptane	0.016	0.081	0.007	
Toluene	0.003	0.012	0.001	
i-Octanes	0.030	0.170	0.014	
n-Octane	0.004	0.028	0.002	
Ethylbenzene	NIL	0.001	NIL	
Xylenes	NIL	0.007	NIL	
i-Nonanes	0.004	0.028	0.003	
n-Nonane	0.001	0.006	0.001	
Decane Plus	NIL	0.011	0.001	
	100.000	100.000	4.640	

Physical Properties	Total	C10+
Calculated Molecular Weight	19.50	151.52
GPA 2172-09 Calculation:		
Calculated Gross BTU per ft <sup>3</sup> @ 14.73 psia & 60°F		
Real Gas Dry BTU	1192.3	8058.5
Water Sat. Gas Base BTU	1171.5	7918.3
Relative Density Real Gas	0.6751	5.2113
Compressibility Factor	0.9969	

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



# Certificate of Analysis

Number: 2030-14090166-001A

Carencro Laboratory  
4790 NE Evangeline Thruway  
Carencro, LA 70520

Gary Vermillion  
Gas Analytical Services  
PO Box 1028  
Bridgeport, WV 26330

Sep. 17, 2014

Field: Jay Bee Oil & Gas  
Station Name: FG3/Kettle Fuel Gas  
Station Number:  
Sample Point: Submeter  
Analyzed: 09/16/2014 18:00:06 by CC39

Sampled By: TD-GAS  
Sample Of: Gas Spot  
Sample Date: 08/26/2014 13:30  
Sample Conditions: 170 psig  
Method: GPA 2286  
Cylinder No: 0201

## Analytical Data

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Nitrogen	0.393	0.565		GPM TOTAL C2+	4.640
Carbon Dioxide	0.146	0.330		GPM TOTAL C3+	1.410
Methane	82.719	68.051		GPM TOTAL IC5+	0.223
Ethane	12.044	18.572	3.230		
Propane	3.065	6.931	0.847		
iso-butane	0.417	1.243	0.137		
n-Butane	0.645	1.923	0.203		
Iso-pentane	0.187	0.692	0.068		
n-Pentane	0.138	0.511	0.050		
Hexanes Plus	0.246	1.182	0.105		
	100.000	100.000	4.840		

Physical Properties	Total	C6+
Relative Density Real Gas	0.6751	3.2243
Calculated Molecular Weight	19.50	93.38
Compressibility Factor	0.9969	

### GPA 2172-09 Calculation:

Calculated Gross BTU per ft<sup>3</sup> @ 14.73 psia & 60°F

Real Gas Dry BTU 1192.3 5103.0

Water Sat. Gas Base BTU 1171.5 5014.2

Comments: H2O Mol% : 1.740 ; Wt% : 1.610

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.



**Certificate of Analysis**  
 Number: 2030-14090166-001A

**Carencro Laboratory**  
 4790 NE Evangeline Thruway  
 Carencro, LA 70520

Gary Vermillion  
 Gas Analytical Services  
 PO Box 1028  
 Bridgeport, WV 26330

Sep. 17, 2014

Field: Jay Bee Oil & Gas  
 Station Name: FG3/Kettle Fuel Gas  
 Station Number:  
 Sample Point: Submeter  
 Analyzed: 09/16/2014 16:00:06 by CC39

Sampled By: TD-GAS  
 Sample Of: Gas Spot  
 Sample Date: 08/28/2014 13:30  
 Sample Conditions: 170 psig  
 Method: GPA 2286  
 Cylinder No: 0201

**Analytical Data**

Components	Mol. %	Wt. %	GPM at 14.73 psia		
Nitrogen	0.393	0.565		GPM TOTAL C2+	4.640
Carbon Dioxide	0.146	0.330		GPM TOTAL C3+	1.410
Methane	82.719	88.051		GPM TOTAL IC5+	0.223
Ethane	12.044	18.572	3.230		
Propane	3.065	6.931	0.847		
Iso-Butane	0.417	1.243	0.137		
n-Butane	0.645	1.923	0.203		
Iso-Pentane	0.187	0.692	0.068		
n-Pentane	0.138	0.511	0.050		
Hexanes	0.133	0.574	0.053		
Heptanes Plus	0.113	0.608	0.052		
	100.000	100.000	4.640		

Physical Properties	Total	C7+
Relative Density Real Gas	0.6751	3.5341
Calculated Molecular Weight	19.50	102.36
Compressibility Factor	0.9969	
<b>GPA 2172-09 Calculation:</b>		
<b>Calculated Gross BTU per ft<sup>3</sup> @ 14.73 psia &amp; 60°F</b>		
Real Gas Dry BTU	1192.3	5539.1
Water Sat. Gas Base BTU	1171.5	5442.7

Comments: H2O Mol% : 1.740 ; Wt% : 1.610

*Patti L. Petro*

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

# AIR POLLUTION CONTROL DEVICE

## Vapor Combustion Control Device Sheet

*Complete this vapor combustion control device sheet for each enclosed combustion device, flare, thermal oxidizer, or completion combustion device that is located at the natural gas production pad for the purpose of thermally destructing waste gas to control emissions of regulated pollutants to the atmosphere.*

**IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS FORM BEFORE COMPLETING.**

### General Information

1. Control Device ID#: VCU-2	2. Installation Date: Upon Receipt of Permit <input checked="" type="checkbox"/> New	
3. Maximum Rated Total Flow Capacity: 15 scfm    22,110 scfd	4. Maximum Design Heat Input: 2.39 MMBtu/hr	5. Design Heat Content:

### Control Device Information

6. Select the type of vapor combustion control device being used:  Enclosed Combustion Device  
 Elevated Flare    Ground Flare    Thermal Oxidizer    Completion Combustion Device

7. Manufacturer: Hy-Bon Engineering Company, Inc. Model No.: Abutec 20	8. Hours of operation per year: 8760
---	--------------------------------------

9. List the emission units whose emissions are controlled by this vapor combustion control device:  
(Emission Point ID#: 7E)

10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
T02	Produced Fluids Tank		

*If this vapor combustor controls emissions from more than six emission units, please attach additional pages.*

11. Assist Type	12. Flare Height	13. Tip Diameter	14. Was the design per §60.18?
<input type="checkbox"/> Steam - <input type="checkbox"/> Air - <input type="checkbox"/> Pressure - <input checked="" type="checkbox"/> Non -	11.25 ft	1.55 ft	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

### Waste Gas Information

15. Maximum waste gas flow rate (scfm):	16. Heat value of waste gas stream (BTU/ft <sup>3</sup> )	17. Temperature of the emissions stream (°F)	18. Exit Velocity of the emissions stream (ft/s)
2.5	2845	1400-2100	

19. Provide an attachment with the characteristics of the waste gas stream to be burned.

Pilot Information				
20. Type/Grade of pilot fuel:	21. Number of pilot lights:	22. Fuel flow rate to pilot flame per pilot (scf/hr):	23. Heat input per pilot (BTU/hr):	24. Will automatic re-ignition be used?
Natural Gas	1	78		<input type="checkbox"/> Yes <input type="checkbox"/> No
25. If automatic re-ignition will be used, describe the method: If the pilot is not on, gas cannot flow to the combustor. The unit will try to reignite 25 times. After that, it will go into the manual mode whereby it will not function until repaired.				
26. Describe the method of controlling flame: N/A				
27. Is pilot flame equipped with a monitor to detect the presence of the flame?  <input type="checkbox"/> Yes <input type="checkbox"/> No		28. If yes, what type? <input type="checkbox"/> Thermocouple <input type="checkbox"/> Infra-Red <input type="checkbox"/> Ultra Violet <input type="checkbox"/> Camera with monitoring control room <input type="checkbox"/> Other, describe:		

29. Pollutant(s) Controlled	30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)
VOCs	99.5+ (Hard Piped)	99
Organic HAPs	99.5+ (Hard Piped)	99
32. Has the control device been tested by the manufacturer and certified? Yes		
33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty: <b>Combustor burner, pilot and air inlet arrestor must be checked for foreign debris (e.g. dust, sand, etc.) and cleaned at least quarterly.</b>		
34. Additional Information Attached? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
<i>Please attach a copy of manufacturer's data sheet.</i> <i>Please attach a copy of manufacturer's drawing.</i> <i>Please attach a copy of the manufacturer's performance testing.</i>		

**If any of the requested information is not available, please contact the manufacturer.**



**DATE:** 4/1/13  
**TO:** Shane Dowell  
**QUOTE NO.:** N/A  
**REFERENCE:** (Ketel)  
**MODEL:** The Abutec 20

Dear Shane Dowell:

**ADVANTAGES OF USING HY-BON's UNIQUE Combustor Technology:**

- **Operating Temperatures** up to 2100 degrees Fahrenheit
- **Compact & Easy to Install Design** (UNIT ARRIVES FULLY ASSEMBLED AND TESTED)
- **Eliminate Pilot Gas and operate on Process Gas ONLY**
- **Completely Enclosed Combustion** prevents the environment from being exposed to IR radiation, heat and light. Low risk of fire.

**Economically Efficient Vapor Elimination:**

- Our enclosed VCU is a stainless steel enclosed flare design capable of meeting industry's regulations while offering you significant cost savings. This flare is proven throughout the world and is scalable to your application.
- Highest Destruction Removal Efficiency (DRE) in the industry
- Our Combustors are tested and certified according to EPA 40 CFR 60, subpart OOOO. The MTF model achieves 99%+ DRE
- Offers "Alternate Operating Scenario" for Permit Compliance during maintenance of Vapor Recovery Units and other site operations.

**Other relative points to note for the Abutec 20:**

- CDM Compliant
- EPA 40 CFR 60, Subpart OOOO Compliant
- Completely Enclosed Combustion
- Low Capital and Operating Costs
- Meets 40 CFR 60.18 regulations
- 99%+ Destruction Efficiency (third party verified)

CUSTOMER: Jay-Bee Oil and Gas  
QUOTE #: 20442WA

- Very High Turndown Ratio
- Only requires 220 btu/ft<sup>3</sup> gas to maintain combustion
- Fully automated system based on pressure, with data logging on temperature, pressure, run time (additional parameters optional).
- Output via thumb drive, to a SCADA system, or wireless connection to company computer or IPHONE.
- High Temperature Flares (HTF) with 99.99% DRE are also available

**Technical Summary:**

**Flare Gas Stream: Abutec 20 Mscfd**

**Type:** Enclosed Tank Battery Flare Composition: 2200 btu/ft<sup>3</sup> gas

**Temperature:** Ambient to 100°F +/- 20 deg°F

**Flow Rate:** up to 22,110 scfd (standard cubic feet per day) or 15 scfm

**Auxiliary Fuel Requirements:** N/A

**Burner Size:** 2.39 million BTU/hr (0.7 MW)

**Inlet Pressure Requirements:** 2-4 oz/in<sup>2</sup> (3.5-7.0 "w.c.")

**Turndown Ratio:** 2:1

**Mechanical**

**Design Wind Speed:** 100 mph

**Ambient Temperature:** -30 deg°F up to 120 deg°F

**Electrical Area Classification:** General Area Classification (non-hazardous)

**Elevation:** Up to 3,000 ft ASL – please advise if higher elevation

**Process**

**Smokeless Capacity:** 100% Operating Temperature 1400 deg°F to 2100 deg°F (1500 deg°F Nominal); Retention Time 0.3 sec Flare Inlet Pressure 2-4 oz/in<sup>2</sup> (3.5-7.0 "w.c.")

**Utilities**

**Pilot Gas Process Gas**

**Electricity** 1 Phase, 60 Hz, 120V / 10A (Solar Option) Auxiliary Fuel N/A

**Emissions**

**Destruction Efficiency:** 99% DRE

**EPA Federal Environmental Compliance:**

- The recent publication of the Federal Register applies the Quad O New Point Source regulations that state that all Storage Tank facilities constructed on or after August 23, 2011 will need to be at or below 6 Tons of VOC's per year.
  - Includes new source performance standards for VOC's and sulfur dioxide and new air toxics standards for oil and natural gas production and natural gas transmission.
  - "Condensate & crude oil storage tanks – Effects every tank battery (and all major modifications) installed since August 2011 with the "potential to emit" 6 tons or more of VOC's. This equates to 20 to 50 barrels of oil a day throughput, or 1 to 10 barrels of condensate – *basically every new tank battery in the United States.*
  - Requires all crude oil and condensate tanks to control their air toxics by at least 95 percent. In addition, emissions from these tanks will be counted towards determining whether a facility is a major source.

**CUSTOMER: Jay-Bee Oil and Gas**  
**QUOTE #: 20442WA**

- These new regulations require, by federal statute, a VRU, Combustor or a Flare on every new or modified oil and condensate tank battery across the United States installed or modified since August 23, 2011. Each site must be in full compliance by October 15, 2013
- The use of a HY-BON Enclosed Vapor Combustor, when combined with a HY-BON Vapor Recovery Tower and/or, HY-BON Vapor Recovery Unit (VRU) is considered a "Total Solutions Approach" to reducing emissions.

**Health and Safety Concerns:**

- Capturing storage tank vapors with an EVC reduces the potential for dangerous flammable vapors collecting in low areas on location during still days and/or potentially hazardous gases (Hydrogen Sulfide Gas) escaping, threatening human and animal life.

CUSTOMER: Jay-Bee Oil and Gas  
QUOTE #: 20442WA

### QUAD O COMPLIANT ENCLOSED VAPOR COMBUSTORS

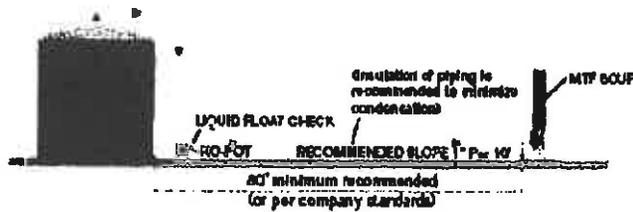
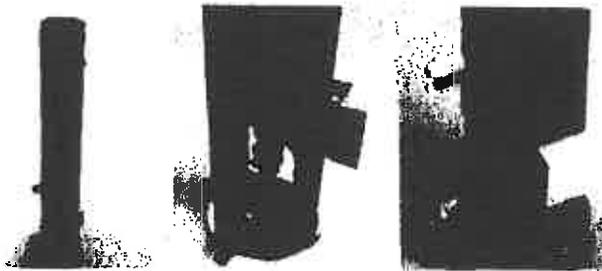
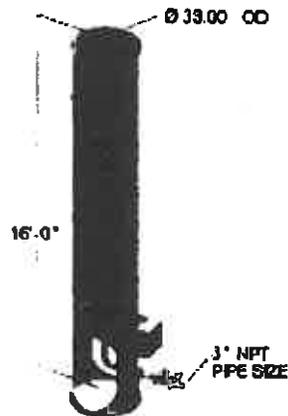


#### ABUTEC 20

- Flow - 0 - 20MSCFD
- Inlet pressure - as low as 2oz/in<sup>2</sup> and up to 120psig

#### ABUTEC 100

- Flow - 20 - 100MSCFD
- Inlet pressure - as low as 2oz/in<sup>2</sup> and up to 120psig



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**ATTACHMENT N**

**Supporting Calculations**

Jay-Bee Oil & Gas, LLC

Ketel Compressor Station  
Tyler County, WV

Source	Description	NOx lb/hr	CO lb/hr	CO2e lb/hr	VOC lb/hr	SO2 lb/hr	PM lb/hr	n-Hexane lb/Hr	benzene lb/hr	formaldehyde lb/hr	Total HAPs lb/hr
CE-1	Compressor Engine #1	1.52	0.61	1,750.1	0.88	0.007	0.11	0.013	0.005	0.307	0.513
CE-2	Compressor Engine #2	1.52	0.61	1,750.1	0.88	0.007	0.11	0.013	0.005	0.307	0.513
CE-3	Compressor Engine #3 (REM)	0.00	0.00	0.0	0.00	0.000	0.00	0.000	0.000	0.000	0.513
CE-4	Compressor Engine #4 (NEW)	2.15	0.83	2,144.3	1.83	0.008	0.13	0.015	0.006	0.268	0.516
RBV-1	750 MBTU/Hr Reboiler	0.08	0.06	90.6	0.00	0.000	0.01	0.001	0.002	0.000	0.001
RSV-1	Dehy Still Vent (controlled)	0.35	0.29	2,777.9	1.71		0.03	0.471	2.144		0.188
—	Blowdowns <sup>1</sup>			N/A	N/A						N/A
T02	Tank Emissions (NEW)	0.04	0.16	60.9	0.22		0.00	0.005	0.005	0.000	0.005
—	Fugitive Dust (NEW)						2.75				
TL-1	Truck Loading Emissions (NEW)				N/A						N/A
—	Fittings Fugitive Emissions			21.9	0.06						0.001
<b>Total</b>		<b>5.65</b>	<b>2.56</b>	<b>8,596</b>	<b>5.58</b>	<b>0.02</b>	<b>3.14</b>	<b>0.52</b>	<b>2.17</b>	<b>0.88</b>	<b>2.25</b>

Source		NOx tpy	CO tpy	CO2e tpy	VOC tpy	SO2 tpy	PM tpy	n-Hexane TPY	benzene tpy	formaldehyde tpy	Total HAPs tpy
CE-1	Compressor Engine #1	6.66	2.67	7,665	3.86	0.030	0.50	0.06	0.02	1.34	2.246
CE-2	Compressor Engine #2	6.66	2.67	7,665	3.86	0.030	0.50	0.06	0.02	1.34	2.246
CE-3	Compressor Engine #3 (REM)	0.00	0.00	0	0.00	0.000	0.00	0.00	0.00	0.00	2.246
CE-4	Compressor Engine #4 (NEW)	9.43	3.63	9,392	8.00	0.035	0.59	0.07	0.03	1.18	2.259
RBV-1	750 MBTU/Hr Reboiler	0.33	0.28	397	0.02	0.002	0.02	0.01	0.00	0.00	0.006
RSV-1	Dehy Still Vent (controlled)	1.52	1.28	2,340	6.81		0.12	0.10	0.47		1.567
—	Blowdowns <sup>1</sup>			201	1.48						0.060
T02	Tank Emissions (NEW)	0.16	0.72	265.47	2.03		0.01	0.04	0.00	0.00	0.051
—	Fugitive Dust (NEW)						0.05				
TL-1	Truck Loading Emissions (NEW)				0.20						0.014
—	Fittings Fugitive Emissions			96	0.25						0.003
<b>Total</b>	<b>Proposed</b>	<b>24.76</b>	<b>11.23</b>	<b>28,022</b>	<b>26.52</b>	<b>0.10</b>	<b>1.78</b>	<b>0.33</b>	<b>0.54</b>	<b>3.86</b>	<b>10.70</b>
	<b>Permitted</b>	<b>21.89</b>	<b>9.62</b>	<b>26,029</b>	<b>20.14</b>	<b>0.09</b>	<b>1.64</b>	<b>0.27</b>	<b>0.53</b>	<b>4.02</b>	<b>10.77</b>
	<b>Change</b>	<b>2.87</b>	<b>1.61</b>	<b>1,993</b>	<b>6.38</b>	<b>0.01</b>	<b>0.14</b>	<b>0.06</b>	<b>0.01</b>	<b>-0.16</b>	<b>-0.07</b>

<sup>1</sup> See Attachment C for Blowdown Calculations

**Jay-Bee Oil & Gas, LLC**  
ENGINE EMISSIONS

**Ketel Compressor Station**  
**Tyler County, WV**

Proposed Emission Rates

**Sources CE-1, CE-2 and CE-3**

**Engine Data:**

Engine Manufacturer	CAT	
Engine Model	3516B	
Type (Rich-burn or Low Emission)	Low Emissions	
Aspiration (Natural or Turbocharged)	Natural	
Turbocharge Cooler Temperature	130	deg. F
Manufacturer Rating	1,380	hp
Speed at Above Rating	1,400	rpm
Configuration (In-line or Vee)	V-16	
Number of Cylinders	16	
Engine Bore	6.700	inches
Engine Stroke	7.500	inches
Fuel Heat Content	1,018	BTU/scf
Engine Displacement	4,231	cu. in.
Fuel Consumption (HHV)	8,210	Btu/bhp-hr

**Emission Rates:**

	g/bhp-hr	lb/hr	tons/year	g/hr	lb/day	lb/mmbtu	
Oxides of Nitrogen, NOx	0.50	1.52	6.66	690	36.51		Comment
Carbon Monoxide CO	0.20	0.61	2.67	276	14.60		453.59 grams = 1 pound
VOC (NMNEHC)	0.29	0.88	3.86	400	21.17		2,000 pounds = 1 ton
CO2e		1750	7665.30				
CO2	494	1503	6582.66	681,720	36070.48		

**Total Annual Hours of Operation**

<b>Total Annual Hours of Operation</b>	<b>8,760</b>						
SO2		0.0068	0.0298			0.0006	
PM (Condensable+ Filterable)		0.1132	0.4957			0.00999	
CH <sub>4</sub> as CO <sub>2e</sub>	3.24	246.43	1079.4			0.0022	Mfg. Spec Used
N <sub>2</sub> O as CO <sub>2e</sub>		0.7024	3.0767			0.0002	Factor From 40 CFR 98, Table C-2
acrolein		0.0582	0.2551			0.00514	
acetaldehyde		0.0947	0.4149			0.00636	
formaldehyde	0.1008	0.3087	1.3432			0.0528	Mfg. Spec Used
biphenyl		0.0002	0.0010			0.000212	
benzene		0.005	0.0218			0.00044	
toluene		0.0046	0.0202			0.000408	
ethylbenzene		0.0004	0.0020			3.97E-05	
xylene		0.0021	0.0091			0.000184	
methanol		0.0283	0.1241			0.0025	
n-hexane		0.0126	0.0551			0.00111	
total HAPs		0.5129	2.2464			0.071194	

**Exhaust Parameters:**

Exhaust Gas Temperature	992	deg. F
Exhaust Gas Flow Rate	9216	acfm
Total Exhaust Gas Volume Flow, wet	9,216	acfm
Total Exhaust Gas Volume Flow, wet	153.6	acf per sec
Exhaust Stack Height	260	inches
	21.67	feet
Exhaust Stack Inside Diameter	20	inches
	1.667	feet
Exhaust Stack Velocity	70.4	ft/sec
	4,224.3	ft/min

$$V = \frac{4}{3.1416} \times \frac{acfm}{(stack\ diameter)^2}$$

**Jay-Bee Oil & Gas, LLC**  
ENGINE EMISSIONS

**Ketel Compressor Station**  
**Tyler County, WV**

**Proposed Emission Rates**

**Source CE-4**

**Engine Data:**

Engine Manufacturer	CAT	
Engine Model	3606 LE	
Type (Rich-burn or Low Emission)	Low Emissions	
Aspiration (Natural or Turbocharged)	Natural	
Turbocharge Cooler Temperature	N/A	deg. F
Manufacturer Rating	1,775	hp
Speed at Above Rating	1,000	rpm
Configuration (In-line or Vee)	In-Line	
Number of Cylinders	8	
Engine Bore	11.800	inches
Engine Stroke	11.800	inches
Fuel Heat Content (HHV)	1,190	BTU/scf
Engine Displacement	10,323	cu. in.
Fuel Consumption (HHV)	7,576	Btu/bhp-hr

**AP-42**  
**4strokeclean**

**Emission Rates:**

	<u>g/bhp-hr</u>	<u>lb/hr</u>	<u>tons/year</u>	<u>g/hr</u>	<u>lb/day</u>	<u>lb/mmBtu</u>	
Oxides of Nitrogen, NOx	0.55	2.15	9.43	976	51.65		Comments
Carbon Monoxide CO	0.21	0.83	3.63	376	19.89		453.59 grams = 1 pound
VOC (NMNEHC)	0.47	1.83	8.00	829	43.86		2,000 pounds = 1 ton
CO2e		2144	9,391.97				<b>MFG Spec +10% Used for NOx, CO</b>
CO2	442	1730	7,575.81	784,550	41511.31		<b>Emission factors</b>

**Total Annual Hours of Operation**

<b>SO2</b>	<b>8,760</b>						0.0006
PM (Condensable+ Filterable)		0.0081	0.0353				0.00999
CH <sub>4</sub> as CO <sub>2e</sub>	4.23	413.81	1812.5				<b>Mfg. Spec Used</b>
N <sub>2</sub> O as CO <sub>2e</sub>		0.8337	3.6518				0.0002 Factor From 40 CFR 98, Table C-2
acrolein		0.0691	0.3027				0.00514
acetaldehyde		0.1124	0.4924				0.00836
formaldehyde	0.0686	0.2684	1.1758				<b>Mfg. Spec + 10% Used</b>
biphenyl		0.0029	0.0125				0.000212
benzene		0.0059	0.0259				0.00044
toluene		0.0055	0.0240				0.000408
ethylbenzene		0.0005	0.0023				3.97E-05
xylene		0.0025	0.0108				0.000184
methanol		0.0336	0.1472				0.0025
n-hexane		0.0149	0.0654				0.00111
total HAPs		0.5158	2.2592				0.018394

**Exhaust Parameters:**

Exhaust Gas Temperature	992	deg. F
Exhaust Gas Flow Rate	9216	acfm
Total Exhaust Gas Volume Flow, wet	9,216	acfm
Total Exhaust Gas Volume Flow, wet	153.6	acf per sec
Exhaust Stack Height	280	inches
	21.67	feet
Exhaust Stack Inside Diameter	20	inches
	1.667	feet
Exhaust Stack Velocity	70.4	ft/sec
	4,224.3	ft/min

$$3.1416 \times \frac{4}{x} \times \frac{\text{acfm}}{(\text{stack diameter})^2}$$

# Jay-Bee Oil & Gas,LLC

Ketel Compressor Station  
Tyler County, WV

## Delty Still Vent Emissions

### SOURCE RSV-1

### Still Vent Emissions (Un-Controlled)

From Gri GlyCalc 4.0

Dry Gas Rate 40 MMSCFD  
Glycol Circulation Rate 7.1 GPM  
Treating Temperature 115 Deg F  
Treating Pressure 950 psi

Data From GLYCalc:

Total HC	154.2942	lbs/hr	675.809	TPY
Methane	94.4716	lbs/hr	413.786	TPY
Total VOC	31.0918	lbs/hr	136.182	TPY
Total HAP	7.1561	lbs/hr	31.344	TPY
benzene	2.1437	lbs/hr	9.389	TPY
toluene	2.8713	lbs/hr	12.576	TPY
ethyl benzene	0.1989	lbs/hr	0.871	TPY
xylene	1.3775	lbs/hr	6.033	TPY
n-hexane	0.4708	lbs/hr	2.062	TPY

### Combustor Combustion Exhaust Gases

Burner Efficiency 95.0 %  
Gas Heat Content (HHV) 607.7 Btu/scf  
Total Gas Stream 139680.0 scfd 50.98 MMscf/yr  
H2S Concentration 0.000 Mole %

NOx	0.3467	lbs/hr	1.519	TPY
CO	0.2913	lbs/hr	1.276	TPY
VOC	4.7236	lb/hr	6.809	TPY

# Jay-Bee Oil & Gas, LLC

Ketel Compressor Station  
Tyler County, WV

## Potential Emission Rates

### Source RBV-1

Burner Duty Rating	750.0 Mbtu/hr
Burner Efficiency	98.0 %
Gas Heat Content (HHV)	1190.0 Btu/scf
Total Gas Consumption	15,435 scfd
H2S Concentration	0.000 Mole %
Hours of Operation	8760

NOx	0.0750	lbs/hr	0.329	TPY
CO	0.0630	lbs/hr	0.276	TPY
CO2	90.0	lbs/hr	394.4	TPY
CO2e	91	lbs/hr	397	tpy
VOC	0.0041	lbs/hr	0.018	TPY
SO2	0.0005	lbs/hr	0.002	TPY
H2S	0.0000	lbs/hr	0.000	TPY
PM10	0.0057	lbs/hr	0.025	TPY
CHOH	0.0001	lbs/hr	0.000	TPY
Benzene	0.0000	lbs/hr	0.000	TPY
N-Hexane	0.0014	lbs/hr	0.006	TPY
Toluene	0.0000	lbs/hr	0.000	TPY
Total HAPs	0.0014	lbs/hr	0.006	TPY

### AP-42 Factors Used

NOx	100 Lbs/MMCF
CO	84 Lbs/MMCF
CO <sub>2</sub>	120,000 Lbs/MMCF
VOC	5.5 Lbs/MMCF
PM	7.6 Lbs/MMCF
SO <sub>2</sub>	0.6 Lbs/MMCF
CH <sub>4</sub>	2.3 Lbs/MMCF
N <sub>2</sub> O	2.2 Lbs/MMCF
HCOH	0.075 Lbs/MMCF
Benzene	0.0021 Lbs/MMCF
n-Hexane	1.8 Lbs/MMCF
Toluene	0.0034 Lbs/MMCF

Global Warming Potential = 1

Global Warming Potential = 25

Global Warming Potential =310

**Ketel Compressor Station  
Tyler County, WV**

**Potential Emission Rate**

**Enclosed Combustor Pilot**

Burner Duty Rating            80.0 Mbtu/hr  
 Burner Efficiency              99.0 %  
 Gas Heat Content (HHV)      1190.0 Btu/scf  
 Total Gas Consumption       1629.7 scfd  
 H2S Concentration            0.000 Mole %  
 Hours of Operation            8760

NOx	0.0079	lbs/hr	0.035	TPY
CO	0.0067	lbs/hr	0.029	TPY
CO2	9.5	lbs/hr	41.6	TPY
CO2e	10	lbs/hr	42	TPY
VOC	0.0004	lbs/hr	0.002	TPY
SO2	0.0000	lbs/hr	0.000	TPY
H2S	0.0000	lbs/hr	0.000	TPY
PM10	0.0006	lbs/hr	0.003	TPY
CHOH	0.0000	lbs/hr	0.000	TPY
Benzene	0.0000	lbs/hr	0.000	TPY
N-Hexane	0.0001	lbs/hr	0.001	TPY
Toluene	0.0000	lbs/hr	0.000	TPY
Total HAPs	0.0001	lbs/hr	0.001	TPY

**AP-42 Factors Used (Tables 1.4.1-1.4.3)**

NOx                    100 Lbs/MMCF  
 CO                     84 Lbs/MMCF  
 CO<sub>2</sub>                  120,000 Lbs/MMCF  
 VOC                    5.5 Lbs/MMCF  
 PM                     7.6 Lbs/MMCF  
 SO<sub>2</sub>                    0.6 Lbs/MMCF  
 CH<sub>4</sub>                    2.3 Lbs/MMCF  
 N<sub>2</sub>O                    2.2 Lbs/MMCF  
 HCOH                  0.075 Lbs/MMCF  
 Benzene               0.0021 Lbs/MMCF  
 n-Hexane             1.8 Lbs/MMCF  
 Toluene               0.0034 Lbs/MMCF

**Global Warming Potential = 1**

**Global Warming Potential = 25**

**Global Warming Potential =310**

Ketel Compressor Station  
Tyler County, WV

Potential Emission Rates

Source EC-2

Enclosed Vapor Combustor - Control of Tank Emissions

Destruction Efficiency	98.0 %		
Gas Heat Content (HHV)	2844.5 Btu/scf		
Max Flow to T-E	0.0036 MMSCFD	1.317 MMCF/Yr	
Max BTUs to Flare	0.427 MMBTU/Hr	3,745 MMBTU/Yr	

NOx	0.03	lbs/hr	0.13	tpy
CO	0.16	lbs/hr	0.69	tpy
CO2	49.87	lbs/hr	218.9	tpy
CO2e	51.32	lb/hr	223.6	tpy
VOC	0.22	lb/hr	2.03	tpy
CH4	0.03	lbs/hr	0.1800	tpy
N2O	0.0001	lbs/hr	0.0004	tpy
PM	0.0011	lb/hr	0.0050	tpy
Benzene	0.0000	lb/hr	0.0000	tpy
CHOH	0.0000	lb/hr	0.0000	tpy
n-Hexane	0.0050	lb/hr	0.0400	tpy
Toluene	0.0000	lb/hr	0.0000	tpy
Total HAP	0.0050	lb/hr	0.0500	tpy

- Notes:
1. VOC, Total HAP, N-Hexane and CH4 emissions are taken from the Condensate and Produced Water Tank Emissions sheet in the Calculations Section.
  2. HAP emissions are based on AP-42 factors for combustion.

Factors Used

AP-42 Table 13.5-1	NOx	0.068 Lbs/MMBTU
AP-42 Table 13.5-1	CO	0.37 Lbs/MMBTU
40 CFR 98 Table C-1	CO2	116.89 Lbs/MMBTU
40 CFR 98 Table C-2	CH4	0.0022 Lbs/MMBTU
40 CFR 98 Table C-2	N2O	0.00022 Lbs/MMBTU
AP-42 Table 1.4-2	PM	7.6 lb/MMSCF
AP-42 Table 1.4-3	Benzene	0.0021 lb/MMSCF
AP-42 Table 1.4-3	Toluene	0.0034 lb/MMSCF
AP-42 Table 1.4-3	Hexane	1.8 lb/MMSCF
AP-42 Table 1.4-3	CHOH	0.075 lb/MMSCF

# Jay-Bee Oil & Gas, LLC

Ketel Compressor Station  
Tyler County, WV

## Fugitive VOC Emissions

Volatile Organic Compounds, NMNEHC from gas analysis:	12.46	weight percent
Methane from gas analysis:	68.07	weight percent
Total HAPs from Gas Analysis	0.050	weight percent
Total HAP from Condensate Analysis	10.080	weight percent
Carbon Dioxide from gas analysis:	0.330	weight percent
Gas Density	0.0543	lb/scf

Emission Source:	Number	Oil & Gas Production*	VOC %	VOC, lb/hr	VOC TPY	HAP, lb/Hr	HAP TPY	CO2 lb/Hr	CO2 TPY	CH4 lb/hr	CH4 TPY	CO2e
<b>Valves:</b>												
Gas/Vapor:	135	0.02700 scf/hr	12.5	0.025	0.108	0.0001	0.000	0.001	0.003	0.135	0.5896	14.743
Light Liquid:	-	0.05000 scf/hr	100.0	0.000	0.000	0.0000	0.000					0.000
Heavy Liquid (Oil):	-	0.00050 scf/hr	100.0	0.000	0.000							0.000
Low Bleed Pneumatic	12	1.39000 scf/hr	12.5	0.113	0.494	0.0005	0.002	0.616	2.698	0.616	2.6981	70.151
Relief Valves:	6	0.04000 scf/hr	12.5	0.002	0.007	0.0000	0.000	0.000	0.000	0.009	0.0388	0.971
Open-ended Lines, gas:		0.06100 scf/hr	12.5	0.000	0.000	0.0000	0.000					0.000
Open-ended Lines, liquid:	-	0.05000 lb/hr	100.0	0.000	0.000							0.000
<b>Pump Seals:</b>												
Gas:	-	0.00529 lb/hr	12.5	0.000	0.000			0.000	0.000	0.000	0.0000	0.000
Light Liquid:	-	0.02866 lb/hr	100.0	0.000	0.000							0.000
Heavy Liquid (Oil):	-	0.00133 lb/hr	100.0	0.000	0.000							0.000
Compressor Seals, Gas:	6	0.01940 lb/hr	12.5	0.015	0.064	0.0000	0.000	0.000	0.002	0.004	0.0188	0.472
<b>Connectors:</b>												
Gas:	548	0.00300 scf/hr	12.5	0.011	0.049	0.0000	0.000	0.000	0.001	0.061	0.2659	6.650
Light Liquid:	0	0.00700 scf/hr	100.0	0.000	0.000	0.0000	0.000					0.000
Heavy Liquid (Oil):	-	0.00030 scf/hr	100.0	0.000	0.000							0.000
<b>Flanges:</b>												
Gas:	45	0.00086 lb/hr	12.5	0.005	0.021	0.0000	0.000	0.000	0.001	0.026	0.1154	2.885
Light Liquid:	0	0.00300 scf/hr	100.0	0.000	0.000	0.0000	0.000					0.000
Heavy Liquid:		0.0009 scf/hr	100.0	0.000	0.000							0.000

### Fugitive Calculations:

	lb/hr	t/y
VOC	0.057	0.248
HAP	0.001	0.003
CH4	0.235	1.029
CO2	0.001	0.007
CO2e	21.888	95.87

Notes: \*Factors are from 40 CFR 98, Table W-1A (scf/hr), where available. Remaining are API (lb/hr)

## Jay-Bee Oil & Gas, LLC

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Ketel Compressor Station  
Tyler County, WV

### Engine Fuel (Inlet) Gas Composition Information:

	Fuel Gas mole %	Fuel M.W. lb/lb-mole	Fuel S.G.	Fuel Wt. %	LHV, dry Btu/scf	HHV, dry Btu/scf	AFR vol/vol	VOC NM / NE	Z Factor	GPM
Nitrogen, N2	0.393	0.110	0.004	0.565			-		0.0039	
Carbon Dioxide, CO2	0.146	0.064	0.002	0.330			-		0.0015	
Hydrogen Sulfide, H2S	0.000	0.000	0.000	0.000	0.0	0.0	0.000		0.0000	
Helium, He	-	-	-	-			-		-	
Oxygen, O2	-	-	-	-			-		-	
Methane, CH4	82.719	13.271	0.458	68.066	752.2	835.5	7.883		0.8255	
Ethane, C2H6	12.044	3.622	0.125	18.576	195.0	213.1	2.009		0.1195	3.204
Propane	3.065	1.352	0.047	6.932	71.0	77.1	0.730	6.932	0.0301	0.840
Iso-Butane	0.417	0.242	0.008	1.243	12.5	13.6	0.129	1.243	0.0040	0.136
Normal Butane	0.645	0.375	0.013	1.923	19.4	21.0	0.200	1.923	0.0062	0.202
Iso Pentane	0.187	0.135	0.005	0.692	6.9	7.5	0.071	0.692	0.0019	0.068
Normal Pentane	0.138	0.100	0.003	0.511	5.1	5.5	0.053	0.511	0.0014	0.050
Hexane	0.141	0.122	0.004	0.623	6.2	6.7	0.064	0.623	0.0014	0.058
Heptane+	0.105	0.105	0.004	0.540	5.4	5.8	0.055	0.540	0.0010	0.048
	100.000	19.497	0.673		1,073.7	1,185.8	11.194	12.464	0.9965	4.605

**Gas Density (STP) = 0.054**

Ideal Gross (HHV)	1,185.8
Ideal Gross (sat'd)	1,165.9
GPM	-
Real Gross (HHV)	1,190.0
Real Net (LHV)	1,077.5

## Jay-Bee Oil & Gas, LLC

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Ketel Compressor Station  
Tyler County, WV

### Still Vent Gas Composition Information:

	Fuel Gas mole %	Fuel M.W. lb/lb-mole	Fuel S.G.	Fuel Wt. %	LHV, dry Btu/scf	HHV, dry Btu/scf	AFR vol/vol	VOC NM / NE	Z Factor	GPM
Nitrogen, N2	0.1540	0.043	0.001	0.222			-		0.0015	
Carbon Dioxide, CO2	0.1300	0.057	0.002	0.295			-		0.0013	
Hydrogen Sulfide, H2S		-	-	-			-		-	
Water	51.8200	9.328	0.322	48.080			-		0.5185	
Oxygen, O2		-	-	-			-		-	
Methane, CH4	38.3500	6.152	0.212	31.713	348.8	387.3	3.655		0.3827	
Ethane, C2H6	6.2000	1.864	0.064	9.610	100.4	109.7	1.034		0.0615	1.649
Propane	1.7800	0.785	0.027	4.046	41.2	44.8	0.424	4.046	0.0175	0.488
Iso-Butane	0.2700	0.157	0.005	0.809	8.1	8.8	0.084	0.809	0.0026	0.088
Normal Butane	0.4300	0.250	0.009	1.288	12.9	14.0	0.133	1.288	0.0042	0.135
Iso Pentane	0.1310	0.095	0.003	0.487	4.8	5.2	0.050	0.487	0.0013	0.048
Normal Pentane	0.1050	0.076	0.003	0.391	3.9	4.2	0.040	0.391	0.0011	0.038
Hexane	0.2700	0.233	0.008	1.199	11.9	12.8	0.122	1.199	0.0027	0.110
Heptane	0.3600	0.361	0.012	1.859	18.4	19.8	0.189	1.859	0.0036	0.165
	100.000	19.400	0.670		550.4	606.7	5.731	10.080	0.9985	2.721

**Gas Density (STP) = 0.054**

Ideal Gross (HHV)	606.7
Ideal Gross (sat'd)	597.0
GPM	-
Real Gross (HHV)	607.7
Real Net (LHV)	551.2

## Jay-Bee Oil & Gas, LLC

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Ketel Compressor Station  
Tyler County, WV

### Tank Vent Gas Composition Information

	Fuel Gas mole %	Fuel M.W. lb/lb-mole	Fuel S.G.	Fuel Wt. %	LHV, dry Btu/scf	HHV, dry Btu/scf	AFR vol/vol	VOC NM / NE	Z Factor	GPM
Nitrogen, N2	0.0250	0.007	0.000	0.014			-		0.0002	
Carbon Dioxide, CO2	0.1570	0.069	0.002	0.139			-		0.0016	
Hydrogen Sulfide, H2S		-	-	-			-		-	
Water		-	-	-			-		-	
Oxygen, O2		-	-	-			-		-	
Methane, CH4	9.9300	1.593	0.055	3.211	90.3	100.3	0.946		0.0991	
Ethane, C2H6	19.7190	5.930	0.205	11.951	319.2	348.9	3.289		0.1956	5.245
Propane	25.9200	11.430	0.395	23.037	600.0	652.2	6.174	23.037	0.2547	7.104
Iso-Butane	7.0130	4.076	0.141	8.216	210.4	228.1	2.172	8.216	0.0681	2.282
Normal Butane	16.1320	9.377	0.324	18.898	485.7	526.3	4.996	18.898	0.1559	5.059
Iso Pentane	5.7180	4.126	0.142	8.315	211.5	228.8	2.179	8.315	0.0572	2.082
Normal Pentane	5.7910	4.178	0.144	8.421	214.7	232.2	2.207	8.421	0.0579	2.086
Hexane	5.5870	4.815	0.166	9.704	246.0	265.7	2.529	9.704	0.0552	2.285
Heptane	4.0080	4.016	0.139	8.095	204.4	220.5	2.101	8.095	0.0399	1.839
	100.000	49.616	1.713		2,582.3	2,802.9	26.593	84.685	0.9854	27.982

**Gas Density (STP) = 0.138**

Ideal Gross (HHV)	2,802.9
Ideal Gross (sat'd)	2,754.8
GPM	-
Real Gross (HHV)	2,844.5
Real Net (LHV)	2,620.6



**Jay-Bee Oil & Gas, Incorporated**  
**Ketel Compressor Station**  
**Condensate and Produced Water Tank Emissions**

Utilizing direct measurements of the Gas to Oil (GOR) ratio and flash gas composition from a nearby Jay-Bee well pad, the attached calculation spreadsheet was used to determine uncontrolled VOC and HAP emissions from the condensate in the accumulation tank of 62.7 tpy and 2.05 tpy respectively for the maximum annual throughput of 3,240 BBL/Yr. In a similar manner, emissions from the produced water were projected to be 0.03 tpy of VOCs and less than 0.01 tpy of HAPs. Thus, total uncontrolled tank flash emissions are projected to be 64.8 tpy of VOCs and 2.05 tpy of HAPs.

Additionally, working and breathing losses from the condensate were determined utilizing EPA's Tanks 4.0.9 software using RVP 13 gasoline as a surrogate for condensate. Annual emissions (assumed to be 100% VOCs) were calculated at 3009 lb/yr or 1.50 tpy (see Tanks report in the calculations). HAP emissions are assumed to be proportional to those in the flash emissions (2.05/64.8 x 1.5 or 0.05 tpy). Thus, total annual un-controlled potential VOC emissions are estimated at 66.3 tpy (64.8 + 1.50). In a similar manner, total un-controlled HAP emissions are estimated at 2.1 tpy.

The largest component to the HAPs is Hexane. Using the process described above, potential un-controlled n-Hexane emissions were determined to be 0.6 tons per year or 0.14 pounds per hour.

Methane will also be emitted at a maximum rate of 8.87 tpy from the condensate and less than 0.01 tpy from the produced water. Using the GHG factor of 25 for Methane, the CO<sub>2e</sub> uncontrolled emission rate is 8.87 x 25 or 222 tpy. This is equivalent to 50.6 lb/hr of CO<sub>2e</sub>

Organic emissions will be controlled at a minimum of 98% via an enclosed combustor. Actual control efficiency is anticipated to be much higher, but only 98% is conservatively claimed. Thus, when in operation, VOC emissions will be controlled to 0.3 pounds per hour and 1.33 tpy of VOCs and 0.01 pounds per hour and 0.04 tpy of HAPs. N-hexane emissions will be controlled to less than 0.01 lb/hr. and 0.01 tpy.

Loading to the combustor will be a combination of the flash gas and working/breathing losses or 90.85 tpy [89.31 tpy condensate flash gas + 0.04 tpy produced water flash gas + working/breathing losses of 1.5 tpy]. As shown in the calculation spreadsheet, the anticipated composition of this tank vapor has a density of 0.138 lb/scf. Thus, 3600 SCFD and 1.3167 MMSCF/yr [90.85x2000/0.138] are routed to the combustor. As this gas is estimated to have a HHV of 2844 BTU/scf, maximum heat loading to the combustor is estimated at 0.427 MMBTU/hr and 3744 MMBTU/yr. Emissions from the combustor are shown in the combustor worksheet.

## Flash Emission Calculations

Using Gas-Oil Ratio Method

### Un-Controlled

#### Site specific data

Gas-Oil-ratio	=	500 scf/bbl Using Actual GOR from RPT-8
Throughput	=	3,240 bbl/yr
Stock tank gas molecular weight	=	39.56 g/mole

#### Conversions

1 lb	=	453.6 g
1 mole	=	22.4 L
1 scf	=	28.32 L
1 ton	=	2000 lb

#### Equations

$$E_{TOT} = Q \frac{(bbl)}{(yr)} \times R \frac{(scf)}{(bbl)} \times \frac{28.32(L)}{1(scf)} \times \frac{1(mole)}{22.4(L)} \times MW \frac{(g)}{(mole)} \times \frac{1(lb)}{453.6(g)} \times \frac{1(ton)}{2000(lb)}$$

- $E_{TOT}$  = Total stock tank flash emissions (TPY)
- $R$  = Measured gas-oil ratio (scf/bbl)
- $Q$  = Throughput (bbl/yr)
- $MW$  = Stock tank gas molecular weight (g/mole)

$$E_{spec} = E_{TOT} \times X_{spec}$$

- $E_{spec}$  = Flash emission from constituent
- $X_{spec}$  = Weight fraction of constituent in stock tank gas

## Flash Emissions

Constituent	TPY	
Total	89.3128	
<b>VOC</b>	<b>62.6699</b>	
Nitrogen	2.23E-02	
Carbon Dioxide	1.40E-01	
Methane	8.87E+00	
Ethane	1.76E+01	
Propane	2.31E+01	
Isobutane	6.26E+00	
n-Butane	1.44E+01	
2,2 Dimethylpropane	1.76E-01	
Isopentane	4.93E+00	
n-Pentane	5.17E+00	
2,2 Dimethylbutane	1.87E-01	
Cyclopentane	0.00E+00	
2,3 Dimethylbutane	2.71E-01	
2 Methylpentane	1.44E+00	
3 Methylpentane	8.58E-01	
n-Hexane	1.88E+00	HAP
Methylcyclopentane	1.37E-01	
Benzene	3.22E-02	HAP
Cyclohexane	1.94E-01	
2-Methylhexane	4.16E-01	
3-Methylhexane	4.09E-01	
2,2,4 Trimethylpentane	0.00E+00	
Other C7's	3.89E-01	
n-Heptane	6.02E-01	
Methylcyclohexane	3.74E-01	
Toluene	7.32E-02	HAP
Other C8's	6.12E-01	
n-Octane	2.04E-01	
Ethylbenzene	4.47E-03	HAP
M & P Xylenes	5.27E-02	HAP
O-Xylene	7.15E-03	HAP
Other C9's	2.54E-01	
n-Nonane	6.07E-02	
Other C10's	9.56E-02	
n-Decane	1.25E-02	
Undecanes (11)	1.34E-02	

$E_{TOT}$

Sum of C3+



FESCO, Ltd.  
1100 Fesco Avenue - Alice, Texas 78332

April 24, 2014

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Date Sampled: 04/07/14

Date Analyzed: 04/21/14

Sample: RPT 8-1

Job Number: J42794

FLASH LIBERATION OF HEAVY CARBON LIQUID		
	Separator (1) (2) (3)	Stock Tank
Pressure, psig	340	0
Temperature, °F	65	70
Gas Oil Ratio (1)	---	500
Gas Specific Gravity (2)	---	1.387
Separator Volume Factor (3)	1.2987	1.000

STOCK TANK BUILD UP DATA	
Shrinkage Recovery Factor (4)	0.7700
Oil API Gravity at 60 °F	70.79
Reid Vapor Pressure, psi (5)	5.25

Cylinder No.	Sampling Conditions		Test Results	
	Pressure, psig	Temperature, °F	W-2408*	W-2423
	340	65	299	297
			66	66

(1) - Gal of flashed vapor per barrel of stock tank oil

(2) - Air = 1.000

(3) - Separator volume / Stock tank volume

(4) - Fraction of first stage separator liquid

(5) - Absolute pressure at 100 deg F

Analyst: M. G.

\* Sample used for flash study

Base Conditions: 14.65 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-861-7015

April 23, 2014

FESCO, Ltd.  
1100 Fesco Ave. - Alice, Texas 78332

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Sample: RPT 8-1

Gas Evolved from Hydrocarbon Liquid Fished  
From 340 psig & 66 °F to 0 psig & 70 °F

Date Sampled: 04/07/14

Job Number: 42784.001

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT - GPA 2286

COMPONENT	MOL%	OPR
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.038	
Carbon Dioxide	0.141	
Methane	24.485	
Ethane	26.943	6.983
Propane	23.253	6.457
Isobutane	4.773	1.574
n-Butane	10.980	3.489
2-2 Dimethylpropane	0.108	0.042
Isopentane	3.027	1.116
n-Pentane	3.175	1.180
Hexenes	2.378	0.988
Heptanes Plus	1.701	0.781
Totals	100.000	22.579

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity \_\_\_\_\_ 3.509 (Air=1)  
Molecular Weight \_\_\_\_\_ 102.69  
Gross Heating Value \_\_\_\_\_ 6488 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity \_\_\_\_\_ 1.387 (Air=1)  
Compressibility (Z) \_\_\_\_\_ 0.9850  
Molecular Weight \_\_\_\_\_ 39.68  
Gross Heating Value  
Dry Basis \_\_\_\_\_ 2321 BTU/CF  
Saturated Basis \_\_\_\_\_ 2282 BTU/CF

\*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)  
Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.850 PSI & 60 Deg F

Analyst: MR  
Processor: AL  
Cylinder ID: ST# 20

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7016

**CHROMATOGRAPH EXTENDED ANALYSIS  
TOTAL REPORT - GPA 2286**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.036		0.026
Carbon Dioxide	0.141		0.157
Methane	24.485		9.930
Ethane	25.843	6.993	19.719
Propane	23.259	6.467	25.920
Isobutane	4.773	1.574	7.013
n-Butane	10.980	3.489	16.132
2,2 Dimethylpropane	0.108	0.042	0.197
Isopentane	3.027	1.116	5.621
n-Pentane	3.176	1.160	6.791
2,2 Dimethylbutane	0.096	0.040	0.209
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.139	0.057	0.303
2 Methylpentane	0.739	0.309	1.608
3 Methylpentane	0.441	0.181	0.981
n-Hexane	0.964	0.409	2.100
Methylcyclopentane	0.072	0.025	0.153
Benzene	0.018	0.005	0.039
Cyclohexane	0.102	0.035	0.217
2-Methylhexane	0.184	0.068	0.466
3-Methylhexane	0.181	0.063	0.458
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.174	0.076	0.436
n-Heptane	0.266	0.124	0.674
Methylcyclohexane	0.189	0.068	0.419
Toluene	0.035	0.012	0.082
Other C8's	0.246	0.115	0.665
n-Octane	0.079	0.041	0.228
Ethylbenzene	0.002	0.001	0.005
M & P Xylenes	0.022	0.009	0.059
O-Xylene	0.003	0.001	0.008
Other C9's	0.089	0.046	0.284
n-Nonane	0.021	0.012	0.069
Other C10's	0.030	0.018	0.107
n-Decane	0.004	0.002	0.014
Undecanes (11)	0.004	0.002	0.015
Totals	100.000	22.579	100.000

**Computed Real Characteristics Of Total Sample:**

Specific Gravity	1.367	(Air=1)
Compressibility (Z)	0.9880	
Molecular Weight	39.66	
Gross Heating Value		
Dry Basis	2321	BTU/CF
Saturated Basis	2292	BTU/CF

## Flash Emission Calculations - Produced Water

Using Gas-Water Ratio Method

### Un-Controlled

#### Site specific data

Gas-Water-ratio	=	5 scf/bbl Using GOW from well pads
Throughput	=	150 bbl/yr
Stock tank gas molecular weight	=	39.56 g/mole

#### Conversions

1 lb	=	453.6 g
1 mole	=	22.4 L
1 scf	=	28.32 L
1 ton	=	2000 lb

#### Equations

$$E_{TOT} = Q \frac{(bbl)}{(yr)} \times R \frac{(scf)}{(bbl)} \times \frac{28.32(L)}{1(scf)} \times \frac{1(mole)}{22.4(L)} \times MW \frac{(g)}{(mole)} \times \frac{1(lb)}{453.6(g)} \times \frac{1(ton)}{2000(lb)}$$

- $E_{TOT}$  = Total stock tank flash emissions (TPY)
- $R$  = Measured gas-oil ratio (scf/bbl)
- $Q$  = Throughput (bbl/yr)
- $MW$  = Stock tank gas molecular weight (g/mole)

$$E_{spec} = E_{TOT} \times X_{spec}$$

- $E_{spec}$  = Flash emission from constituent
- $X_{spec}$  = Weight fraction of constituent in stock tank gas

## Flash Emissions

Constituent	TPY	
Total	0.0413	
<b>VOC</b>	<b>0.0290</b>	
Nitrogen	1.03E-05	
Carbon Dioxide	6.49E-05	
Methane	4.11E-03	
Ethane	8.15E-03	
Propane	1.07E-02	
Isobutane	2.90E-03	
n-Butane	6.67E-03	
2,2 Dimethylpropane	8.15E-05	
Isopentane	2.28E-03	
n-Pentane	2.39E-03	
2,2 Dimethylbutane	8.64E-05	
Cyclopentane	0.00E+00	
2,3 Dimethylbutane	1.25E-04	
2 Methylpentane	6.65E-04	
3 Methylpentane	3.97E-04	
n-Hexane	8.68E-04	HAP
Methylcyclopentane	6.33E-05	
Benzene	1.49E-05	HAP
Cyclohexane	8.97E-05	
2-Methylhexane	1.93E-04	
3-Methylhexane	1.89E-04	
2,2,4 Trimethylpentane	0.00E+00	
Other C7's	1.80E-04	
n-Heptane	2.79E-04	
Methylcyclohexane	1.73E-04	
Toluene	3.39E-05	HAP
Other C8's	2.83E-04	
n-Octane	9.43E-05	
Ethylbenzene	2.07E-06	HAP
M & P Xylenes	2.44E-05	HAP
O-Xylene	3.31E-06	HAP
Other C9's	1.17E-04	
n-Nonane	2.81E-05	
Other C10's	4.42E-05	
n-Decane	5.79E-06	
Undecanes (11)	6.20E-06	

$E_{TOT}$   
Sum of C3+

**TANKS 4.0.9d**  
**Emissions Report - Summary Format**  
**Tank Identification and Physical Characteristics**

**Identification**

User Identification: Ketel Compressor Station  
 City: Huntington  
 State: West Virginia  
 Company: Jay-Bee Oil & Gas  
 Type of Tank: Vertical Fixed Roof Tank  
 Description: Ketel 210 BBL Produced Fluids Tank

**Tank Dimensions**

Shell Height (ft): 15.00  
 Diameter (ft): 10.00  
 Liquid Height (ft) : 14.00  
 Avg. Liquid Height (ft): 8.00  
 Volume (gallons): 8,225.29  
 Turnovers: 16.65  
 Net Throughput(gal/yr): 135,717.25  
 Is Tank Heated (y/n): N

**Paint Characteristics**

Shell Color/Shade: Gray/Light  
 Shell Condition: Good  
 Roof Color/Shade: Gray/Light  
 Roof Condition: Good

**Roof Characteristics**

Type: Cone  
 Height (ft): 0.10  
 Slope (ft/ft) (Cone Roof): 0.02

**Breather Vent Settings**

Vacuum Settings (psig): -0.03  
 Pressure Settings (psig): 0.03

Meteorological Data used in Emissions Calculations: Huntington, West Virginia (Avg Atmospheric Pressure = 14.33 psia)

**TANKS 4.0.9d**  
**Emissions Report - Summary Format**  
**Liquid Contents of Storage Tank**

**Ketel Compressor Station - Vertical Fixed Roof Tank**  
**Huntington, West Virginia**

Mixture/Component	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
	Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 13)	61.42	53.10	69.74	57.09	7.1329	6.0961	8.3046	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

**TANKS 4.0.9d**  
**Emissions Report - Summary Format**  
**Individual Tank Emission Totals**

**Emissions Report for: Annual**

**Ketel Compressor Station - Vertical Fixed Roof Tank**  
**Huntington, West Virginia**

Components	Losses(lbs)		Total Emissions
	Working Loss	Breathing Loss	
Gasoline (RVP 13)	1,429.03	1,580.31	3,009.35

## Condensate Truck Loading Lost Emissions Per AP-42

Per AP-42, Chapter 5.2.2.1.1, the uncontrolled loading loss emission factor  $L_L$  can be estimated as follows:

$$L_L = 12.46[SPM/T]$$

Where:

$L_L$  = uncontrolled loading loss in pounds per 1000 gallons of liquid loaded

S= saturation factor (0.6)

P=true vapor pressure of liquid loaded: 3.1 psia (see attached condensate analysis report)

M= Molecular weight of vapor in lb/lb-mole 66.64(see attached condensate analysis report)

T= temperature of bulk liquid loaded in deg R or 460+deg F (70 Deg F)

Thus,  $L_L = 12.46[0.6 \times 3.1 \times 66.64]/[460+60]$

$L_L = 2.97$  lb/1000 gallons loaded

Based on sample data of breathing vapor at a nearby Jay-Bee facility (attached), these emissions are 99.6% VOCs. It is assumed that vapor composition from truck loading is the same as that from the tank breathing vapors.

Given a maximum loading of 85 BBL (3750 gallons) a day, uncontrolled VOC emissions are estimated at 11.09 lb of VOC per day [ $3.75 \times 2.97 \times .996$ ]. There is no control on tank truck loading. With all daily loading taking place within 1 hour, the average hourly un-controlled emission rate is therefore estimated at 11.09 lb/hr.

Maximum annual throughput is 136,000 gallons (3238 barrels) of condensate per year. Thus, un-captured/un-controlled VOC emissions are conservatively estimated at 402 pounds per year [ $136 \times 2.97 \times .996$ ] or 0.20 tons per year.

Based on the attached analysis of a representative tank's breathing emissions, HAPs represent 6.8 percent of the emissions. Thus, daily HAPs emissions equal  $3.75 \times 2.97 \times 0.068$  or 0.76 lb/hr. Annual maximum HAPs emissions are estimated at 27.4 lb/yr [ $136 \times 2.97 \times 0.068$ ] or 0.014 tpy.

There are no significant VOC or HAP emissions anticipated from the loading of produced water.

May 2, 2014

FESCO, Ltd.  
1100 Fesco Ave. - Aliso, Texas 78332

For: Jay-Bee Oil & Gas, Inc.  
1720 Route 22 East  
Union, New Jersey 07083

Sample: RPT 6-1  
Breathing Vapor  
From 0 psig & 70 °F to 0 psig & 100 °F

Date Sampled: 04/07/14

Job Number: 42794.011

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT - GPA 2286

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	< 0.001	
Nitrogen	0.185	
Carbon Dioxide	0.018	
Methane	0.000	
Ethane	0.202	0.054
Propane	10.137	2.815
Isobutane	8.852	2.920
n-Butane	30.167	9.588
2-2 Dimethylpropane	0.370	0.142
Isopentane	15.123	5.574
n-Pentane	17.412	6.381
Hexanes	13.180	5.488
Heptanes Plus	<u>4.374</u>	<u>1.881</u>
Totals	100.000	34.799

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity \_\_\_\_\_ 3.947 (Air=1)  
Molecular Weight \_\_\_\_\_ 98.01  
Gross Heating Value \_\_\_\_\_ 5251 BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity \_\_\_\_\_ 2.412 (Air=1)  
Compressibility (Z) \_\_\_\_\_ 0.9539  
Molecular Weight \_\_\_\_\_ 66.64  
Gross Heating Value  
Dry Basis \_\_\_\_\_ 3921 BTU/CF  
Saturated Basis \_\_\_\_\_ 3853 BTU/CF

\*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)  
Results: <0.013 Gr/100 CF, <0.2 PPMV or <0.001 Mol %

Base Conditions: 14.860 PSI & 60 Deg F

Analyst: MR  
Processor: AL  
Cylinder ID: ST# 21

Certified: FESCO, Ltd. - Aliso, Texas

David Dannhaus 361-561-7016

**CHROMATOGRAPH EXTENDED ANALYSIS  
TOTAL REPORT - GPA 2288**

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	< 0.001		< 0.001
Nitrogen	0.155		0.078
Carbon Dioxide	0.019		0.012
Methane	0.000		0.001
Ethane	0.202	0.054	0.091
Propane	10.137	2.815	6.708
Isobutane	8.882	2.920	7.721
n-Butane	30.167	8.588	28.312
2,2 Dimethylpropane	0.370	0.142	0.401
Isopentane	15.123	5.574	16.874
n-Pentane	17.412	6.361	18.862
2,2 Dimethylbutane	0.570	0.240	0.737
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.805	0.332	1.041
2 Methylpentane	4.259	1.782	5.509
3 Methylpentane	2.477	1.019	3.203
n-Hexane	5.049	2.093	6.529
Methylcyclopentane	0.358	0.124	0.450
Benzene	0.076	0.022	0.081
Cyclohexane	0.432	0.148	0.545
2-Methylhexane	0.808	0.284	0.911
3-Methylhexane	0.569	0.251	0.858
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.849	0.285	0.986
n-Heptane	0.958	0.305	0.989
Methylcyclohexane	0.408	0.165	0.601
Toluene	0.071	0.024	0.098
Other C8's	0.379	0.178	0.627
n-Octane	0.082	0.042	0.141
Ethylbenzene	0.002	0.001	0.003
M & P Xylenes	0.020	0.008	0.032
O-Xylene	0.002	0.001	0.003
Other C9's	0.048	0.025	0.091
n-Nonane	0.007	0.004	0.013
Other C10's	0.005	0.003	0.011
n-Decane	0.002	0.001	0.004
Undecanes (11)	0.000	0.000	0.000
<b>Totals</b>	<b>100.000</b>	<b>34.788</b>	<b>100.000</b>

**Computed Real Characteristics Of Total Sample:**

Specific Gravity	2.412	(At=1)
Compressibility (Z)	0.8539	
Molecular Weight	69.84	
Gross Heating Value		
Dry Basis	3921	BTU/CF
Saturated Basis	3953	BTU/CF

## COMPRESSOR BLOWDOWN VOLUME - (CAT 3516B Driven Compressors)

Given:

$Q_a =$	70.10 Cubic feet	yields	1.98500768 Cubic Meters	Volume of compressor, scrubbers and piping
$P_i =$	64.60 Atm	yields	6545.60 kPa	Pressure of Pipeline
$T_i =$	25.00 Deg C	yields	298.15 Deg K	Temperature in Pipeline
$P_f =$	1.00 Atm	yields	101.33 kPa	Ambient Pressure (Usually 1 ATM)
$T_f =$	25.00 Deg C	yields	298.15 Deg K	Ambient Temperature (Usually 10-25 Deg. C or Standard Temp -15Deg. C)
$z_i =$	0.86100			See Compressibility spreadsheet
$z_f =$	1.00111			See Compressibility spreadsheet

$Q_i =$  142.032 Cubic Meters      or      5015.81 Cubic Feet

Based on EPA's Addendum 1 to the Oil and Gas Production Protocol, Version 1.1, Equation 22-23

$$Q_i = Q_a \times \left( \frac{T_i}{T_f} \right) \times \left( \frac{P_i}{P_f} \right) \times \left( \frac{z_i}{z_f} \right) - \left( P_f \left( \frac{z_i}{z_f} \right) \left( \frac{T_i}{T_f} \right) \right)$$

Where :

$Q_i$  = Total volume of gas released in cubic meters at STP (15 Deg C and 1 Atm)

$Q_a$  = Actual volume of gas at process conditions in cubic meters

$P_s$  = Standard Pressure in kPa (101.3)

$T_s$  = Standard Temperature in K (288.1)

$z$  = Compressibility factor for the gas

$i$  = initial pressure and temperature

$f$  = final temperature and pressure (generally STP)

## COMPRESSABILITY FACTOR

**Given:**

**Pressure**                                      **1.0 Atm.**                                      **101.3 kPa**

**Temperature**                                      **25 Deg. C**

**Compressibility Factor (z)**                                      **1.0011085**

Based on EPA's Addendum 1 to the Oil and Gas Production Protocol, Version 1.1 , Equation 22.25

$$z = a + bP + cT + dP^2 + eT^2 + fPT$$

where

P = Pressure in kPa

T = Temperature in Deg. C

a = 0.99187

b=-3.3501E-05

c=6.9652E-04

d=6.3134E-10

e=-8.6023E-06

f=2.3290E-07

## COMPRESSABILITY FACTOR

**Given:**

**Pressure**                      **59.00 Atm.**                      **5978.2 kPa**                      **867.30 PSIG**

**Temperature**                      **25 Deg. C**

**Compressibility Factor (z)**                      **0.8610014**

Based on EPA's Addendum 1 to the Oil and Gas Production Protocol, Version 1.1 , Equation 22.25

$$z = a + bP + cT + dP^2 + eT^2 + fPT$$

where

P = Pressure in kPa

T = Temperature in Deg. C

a = 0.99187

b=-3.3501E-05

c=6.9652E-04

d=6.3134E-10

e=-8.6023E-06

f=2.3290E-07



## FUGITIVE EMISSIONS FROM UNPAVED HAULROADS

*UNPAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)*

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	10	3
p =	Number of days per year with precipitation >0.01 in.	157	157

Item Number	Description	Number of Wheels	Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	Produced Fluids Tanker Truck	18	27	10	0.38	1	36	None	0
2									
3									
4									
5									
6									
7									
8									

**Source:** AP-42 Fifth Edition – 13.2.2 Unpaved Roads

$$E = k \times 5.9 \times (s + 12) \times (S + 30) \times (W + 3)^{0.7} \times (w + 4)^{0.5} \times ((365 - p) + 365) = \text{lb/Vehicle Mile Traveled (VMT)}$$

Where:

		PM	PM-10
k =	Particle size multiplier	0.80	0.36
s =	Silt content of road surface material (%)	10	3
S =	Mean vehicle speed (mph)	10	10
W =	Mean vehicle weight (tons)	27	27
w =	Mean number of wheels per vehicle	18	18
p =	Number of days per year with precipitation >0.01 in.	157	157

For lb/hr:  $[\text{lb} + \text{VMT}] \times [\text{VMT} + \text{trip}] \times [\text{Trips} + \text{Hour}] = \text{lb/hr}$

For TPY:  $[\text{lb} + \text{VMT}] \times [\text{VMT} + \text{trip}] \times [\text{Trips} + \text{Hour}] \times [\text{Ton} + 2000 \text{ lb}] = \text{Tons/year}$

### SUMMARY OF UNPAVED HAULROAD EMISSIONS

Item No.	PM				PM-10			
	Uncontrolled		Controlled		Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	2.75	0.05	2.75	0.05	0.37	<0.01	0.37	<0.01
2								
3								
4								
5								
6								
7								
8								
<b>TOTALS</b>	2.75	0.05	2.75	0.05	0.37	<0.01	0.37	<0.01

## FUGITIVE EMISSIONS FROM PAVED HAULROADS

*INDUSTRIAL PAVED HAULROADS (including all equipment traffic involved in process, haul trucks, endloaders, etc.)*

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	

Item Number	Description	Mean Vehicle Weight (tons)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)
1	None						
2							
3							
4							
5							
6							
7							
8							

**Source:** AP-42 Fifth Edition – 11.2.6 Industrial Paved Roads

$$E = 0.077 \times I \times (4 + n) \times (s + 10) \times (L + 1000) \times (W + 3)^{0.7} =$$

lb/Vehicle Mile Traveled (VMT)

Where:

I =	Industrial augmentation factor (dimensionless)	
n =	Number of traffic lanes	
s =	Surface material silt content (%)	
L =	Surface dust loading (lb/mile)	
W =	Average vehicle weight (tons)	

For lb/hr:  $[lb \div VMT] \times [VMT \div trip] \times [Trips \div Hour] =$  lb/hr

For TPY:  $[lb \div VMT] \times [VMT \div trip] \times [Trips \div Hour] \times [Ton + 2000 lb] =$  Tons/year

### SUMMARY OF PAVED HAULROAD EMISSIONS

Item No.	Uncontrolled		Controlled	
	lb/hr	TPY	lb/hr	TPY
1				
2				
3				
4				
5				
6				
7				
8				
<b>TOTALS</b>				

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**Attachment O**  
**Monitoring, Recordkeeping, Reporting and**  
**Testing Plan**

## ATTACHMENT O

### JAY-BEE OIL & GAS, Inc.

#### Ketel Compressor Station

### Monitoring, Recordkeeping, Reporting and Testing Plan

#### I. Monitoring

##### Engines

Jay-Bee Oil & Gas (Jay-Bee) will monitor and record engine hours of operation on a daily basis. Additionally, Jay-Bee will monitor the amount of gas managed by the station on a daily basis as well as gas consumed in operating the compressor engines on a daily basis. Together, this information will allow the company to determine emissions for each engine, utilizing the catalyst manufacturer's warranted emission factors.

The air to fuel ratio will be monitored on a weekly basis to ensure proper operation of the catalytic converters. Additionally, the catalytic converters will be inspected and maintained in accordance with the manufacturer's specifications.

##### Dehydration Unit

Jay-Bee will monitor and record the throughput of wet gas to the dehydration unit on a daily basis.

##### Condensate Tanks

Jay-Bee will monitor and record the volume of produced water and condensate being loading out on a monthly basis.

#### II. Recordkeeping

Jay-Bee will maintain accurate operating records of all engines and the dehydration unit for each calendar year. Records will include monthly fuel consumption (facility-wide), hours of operation for each engine and the amount of gas managed by the facility. These records will be signed and dated by an authorized representative.

All inspections, preventive maintenance, failures, duration of failure events, replacements and/or repair of catalytic converters will be recorded, signed and dated by an authorized representative.

All inspections, maintenance, failures, replacements and/or repair of valves and non-welded connections will be recorded, signed and dated by an authorized representative.

All records will be kept either on site or at the nearest office location for a period of at least five (5) years.

### **III. Testing**

Within 180 days of achieving the maximum facility throughput, Jay-Bee will conduct emissions testing of the replacement engine as stipulated under Subpart JJJJ to demonstrate compliance with the emission rates set forth in the permit application. Subsequent testing of engine emissions will also be performed in accordance with Subpart JJJJ..

### **IV. Reporting**

Jay-Bee will submit certified emission statements on an annual basis in accordance with WVDEP, Division of Air Quality requirements.

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**Attachment P**  
**Public Notice Affidavit**

**Affidavit Notice Will Be Submitted  
Upon Receipt**

**AIR QUALITY PERMIT NOTICE**  
**Notice of Application**

Notice is given that Jay-Bee Oil & Gas, Inc. has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Modification to the Permit for its Ketel Compressor Station located off of Big Moses Road near Alma, WV in Tyler County., West Virginia (Lat.39.44200, Long. -80.72609)

The applicant estimates the increase in potential to discharge the following regulated air pollutants:

2.87 tons of Nitrogen Oxides per year  
1.61 tons of Carbon Monoxide per year  
6.38 tons of Volatile Organics per year  
0.01 tons of Sulfur Dioxide per year  
0.14 tons of Particulate Matter per year  
0.01 tons of Benzene  
1,193 tons of CO<sub>2e</sub> per year

The proposed modifications will also result in a *decrease* of the following air pollutants:

0.16 tons of Formaldehyde per year

Startup of the modified operation took place on or about the 15th day of February, 2015. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57<sup>th</sup> Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

Any questions regarding this permit application should be directed to the DAQ at (304) 926-0499, extension 1227, during normal business hours.

Dated this the (Day) day of (Month), (Year).

By: Mr. Shane Dowell  
Office Manager  
Jay-Bee Oil & Gas, Inc.