Midstream Dehydrator Emission Reductions and BMP’s
CMP Operations

Map showing operational areas with locations marked as follows:
- Rodger Settle
- JC Coleman
- Sam DeFoor
- Terry Hobock
- Future Tech

[Map of operational areas with Chesapeake Energy logo at the bottom]
Opportunities & Challenges – STAR

**Adopted BMPs**
- Dehy BMPs (as discussed)
- Low-Bleed Pneumatics on all New Equipment
- Solar/Electric/Zero-Exhaust Chemical Injection Pumps
- Instrument Air
- Pipeline Hot Taps
- Leak Repairs
- VRU on Tanks

**Opportunities**
- Documenting what is already being done!
- Pipeline blow-downs using compressors
- Replacing/ Retrofitting/ Upgrading older equipment
## CMP STAR Reductions For 2008

### Mid-Continent

<table>
<thead>
<tr>
<th>BMP</th>
<th>Reduction (MCF)</th>
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<tbody>
<tr>
<td>Blow Down to Sales</td>
<td>282</td>
</tr>
<tr>
<td>Install Elec Glycol Pump</td>
<td>39,288</td>
</tr>
<tr>
<td>Flir Camera Leak Repair</td>
<td>596</td>
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<tr>
<td>Pipeline Hot Tap</td>
<td>1,121</td>
</tr>
<tr>
<td>Low Bleed Pressure Controllers</td>
<td>7,851</td>
</tr>
<tr>
<td>No-Bleed Chem Pump</td>
<td>19,195</td>
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<tr>
<td>Optimize Glycol Circ Rate</td>
<td>238,694</td>
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<tr>
<td>Low Bleed Pneumatic Level Controllers</td>
<td>42,496</td>
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<tr>
<td>Recover Dehy Flash Gas</td>
<td>761,071</td>
</tr>
<tr>
<td>Recover Dehy FG to Suction</td>
<td>7,226</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,117,820</strong></td>
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</table>
Glycol Reboiler Flow Diagram
Electric/Energy Exchange Pumps
New Reductions Technology

- Flash Tanks/Separators
- BTEX Destruction
- Pneumatic Thermostat Elimination
Flash Tanks/Separators
(a.k.a. Pump Gas Separators)
Flash Tank Installations

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
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<tbody>
<tr>
<td>2004</td>
<td>3</td>
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<tr>
<td>2005</td>
<td>17</td>
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<tr>
<td>2006</td>
<td>24</td>
</tr>
<tr>
<td>2007</td>
<td>24</td>
</tr>
<tr>
<td>2008</td>
<td>38</td>
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</table>
Flash Separator
Eclipse Compound Injected Burner
Reference: Burner Assembly Standards

1. 350,000 btu/hr net duty (500,000 gross release)
   For a 8” firetube x approximately 20’ overall length (8,000 flux)
   Model No. SB16-8, O-Type, Burner Assembly
   One piece design (no hinge), aluminum construction
   Includes: (1) 2” H-80 Compound Injector,
   w/ 1-1/2” HO-6 Air/Gas Mixer
   w/ HO rod assembly (external primary air adjustment)
   w/ MTD 26 orifice @ 8 psi (469 scfh)
   (1) 2” Bell Nozzle (this assembly extends 13” past the mating
   flange using a 2” x close nipple)
   (1) 16” OD x 4” thk. Aluminum Flame Cell w/ 6” hand hole,
   cover plate with a 1” peep sight & CGB194 fitting for the
   external primary air adjusting rod
   Couplings:
   (1) 1/4” @ 90 (1-1/4” from flange)
   (1) 1” @ 90 (4” from flange)
   (1) 3/4” @ 115-3” flat (2-1/2” from flange)
   (2) 1” @ 0 (2-1/2” & 5” from flange)

2. 500,000 - 550,000 btu/hr net duty (714,00 - 785,000 gross release)
   For a 12” firetube x approximately 20’ overall length (8,000 flux)
   Model No. SB18-12, O-Type, Burner Assembly
   One piece design (no hinge), aluminum construction
   Includes: (1) 2-1/2” H-10 Compound Injector,
   w/ 2” HO-8 Air/Gas Mixer
   w/ HO rod assembly (external primary air adjustment)
   w/ MTD 14 orifice @ 8 psi (749 scfh)
Standard 500k BTU Reboiler will have a MTD 14 Orifice that will consume about 526 cfh at 4psi Constant. Normal Run operation of Our burners is Constant at about 60-70%.

Kimray 210-15 Glycol Pump will exhaust 1050cf / Hr of gas Maximum.
Pneumatic Thermostat Elimination
CMV Standard

Patton Burner Management System
Unique combination of Flame Ignition, Data Acquisition and Control

- 12V Low Draw DC
- Solar Panel
- Multi language Modbus
- 4 Gig SD Card
- Flexible Data Graphs

The Patton Burner Management System (PBMS) is a unique combination of flame ignition, data acquisition, and control.

**Ignition**
The PBMS is designed for users to easily set parameters for ignition sequence. The number of ignition retries, delay to sense fuel, time for ignition delay to open the fuel valve, and flame sense intensity are all configurable from the easy to use menu on the controller screen.

**Power**
The standard unit is powered by 12 Volts DC, making solar charging an easy option for remote, or non-potable applications. Other power combinations are also readily available.

**Control**
With on board input and outputs, the PBMS can be easily configured for a variety of control sequences and shutdowns. Examples of alarm conditions would be high stack or reboiler temperature, reheater and flash tank levels, and remote input shutdowns (based on external conditions: example-compressor temperature). Control examples would be automated valve or valve control to maintain temperature.

12 Volts
24 Volts
Useable Solar Power

Modbus
Control and Logging

Call 806-358-7993
12V DC Control Valve

Valve is controlled to allow continuous burning of BTEX's
BTEX Destruction

VOC’s from BTEX Unit are sent to BTEX Burner through SST Piping
B-TEX Burner

BTEX Burner mounted below and to the side of Main Burner.
FLUE GAS ANALYSIS ON HIGH BURNER

TAKEN FROM STACK WITH TUBE DIPPED INSIDE TO CHECK EMISSIONS

SKIMMER GAS ANALYSIS
1108 South Madison
Shreveport, LA 71109
(318) 242-5246

GAS ANALYSIS REPORT NO.: (14930XH)
FOR: Chesapeake
Attr: Chinooks

SAMPLE IDENTIFICATION
COMP: Chesapeake
FIELD: Chinooks
LEASE: Kobar C P. Stock High Burner
STA #: Not Rec

SAMPLE DATA
DATE: 03-Mar-09
BY: M. Brennan
FIELD GRAVITY: Not Rec
DEW POINT: Not Rec
LBS H2O: 0

FLOW: 326 mg/s
DIFF: 264 In. Hg

REMARKS: Extended Analysis

CYL #: 0289
LAB #: G14930XH

COMPONENT ANALYSIS

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>MOL PERCENT</th>
<th>GPM @ 14.75 psia</th>
</tr>
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<tbody>
<tr>
<td>CARBON DIOXIDE (CO2)</td>
<td>10.12</td>
<td></td>
</tr>
<tr>
<td>NITROGEN (N2)</td>
<td>89.85</td>
<td></td>
</tr>
<tr>
<td>METHANE (C1)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>ETHANE (C2)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>PROPAINE (C3)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>ISOBUTANE (C4)</td>
<td>0.00</td>
<td></td>
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<tr>
<td>N-BUTANE (C4)</td>
<td>0.01</td>
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<tr>
<td>ISOPENTANE (C5)</td>
<td>0.00</td>
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<tr>
<td>N-PENTANE (C5)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>HEXANES PLUS (C6+)</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

MOLECULAR WEIGHT: 29.646

ETHANE+ GPM: 0.010
PROPANE+ GPM: 0.010
ISO-PENTANE+ GPM: 0.006

Compressibility Factor (Z): 0.9995
Specific Gravity @ 60 Deg. F. (real): 1.024

BTU/ CU. FT. @ 60 Deg. F.: 14.750
BSA (REAL): DRY 1.2 WET 1.2
# FLUE GAS ANALYSIS ON LOW BURNER

**GAS ANALYSIS REPORT NO:** G1464X0H  
**DATE:** 01-Mar-09  
**FOR:** Chesapeake  
**COMP:** Chesapeake

### SAMPLE IDENTIFICATION
- **FIELD:** Chockastha Area  
- **LEASE:** Not Req.  
- **STA. #:** Not Req.

### SAMPLE DATA
- **DATE:** 01-Mar-09  
- **FLOW:** 33 scf  
- **DEG. F.:** 291  
- **MC/AD:** Not Req.  
- **MC/AD DIFF:** Not Req.  
- **DEW POINT:** Not Req.  
- **LAB #:** G1464X0H

### COMPONENT ANALYSIS

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>MOL. PERCENT</th>
<th>QPM @ 14,700 psia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide (CO2)</td>
<td>2.00</td>
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</tr>
<tr>
<td>Nitrogen (N2)</td>
<td>97.97</td>
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</tr>
<tr>
<td>Methane (CH4)</td>
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</tr>
<tr>
<td>Propane (C3)</td>
<td>0.00</td>
<td>0.000</td>
</tr>
<tr>
<td>Isobutane (C4)</td>
<td>0.00</td>
<td>0.000</td>
</tr>
<tr>
<td>N-Butane (C5)</td>
<td>0.01</td>
<td>0.003</td>
</tr>
<tr>
<td>Iso-Pentane (C5)</td>
<td>0.00</td>
<td>0.000</td>
</tr>
<tr>
<td>N-Pentane (C5)</td>
<td>0.00</td>
<td>0.000</td>
</tr>
<tr>
<td>HEXANE PLUS (C6+)</td>
<td>0.01</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**TOTALS**: 100.00

- **ETHANE+ QPM:** 0.006  
- **PROPANE+ QPM:** 0.006  
- **ISO-PENTANE+ QPM:** 0.006  
- **Compressibility Factor (Z):** 0.9997

- **Specific Gravity @ 60 Deg. F. (real):** 0.979  
- **BTU / CU. FT. @ 60 Deg. F.:** 14,730  
- **PSIA (REAL):** 1.0  
  - **DRY:** 1.0  
  - **WET:** 1.0

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**Chesapeake Energy**
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