



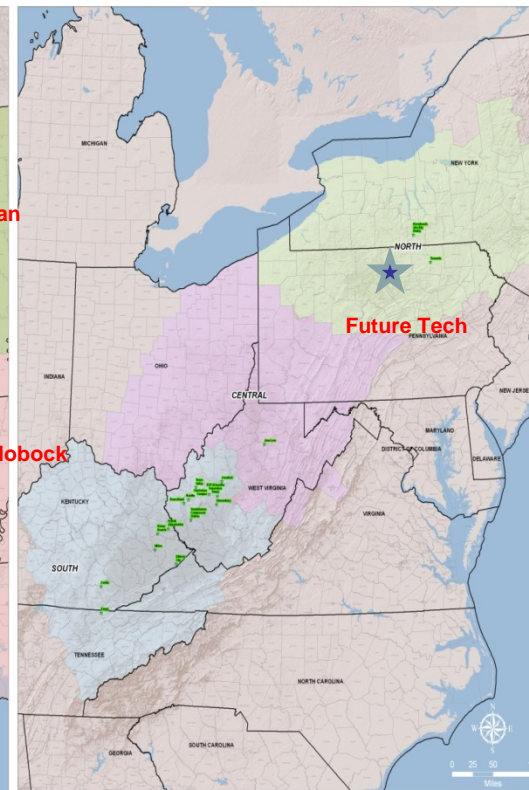
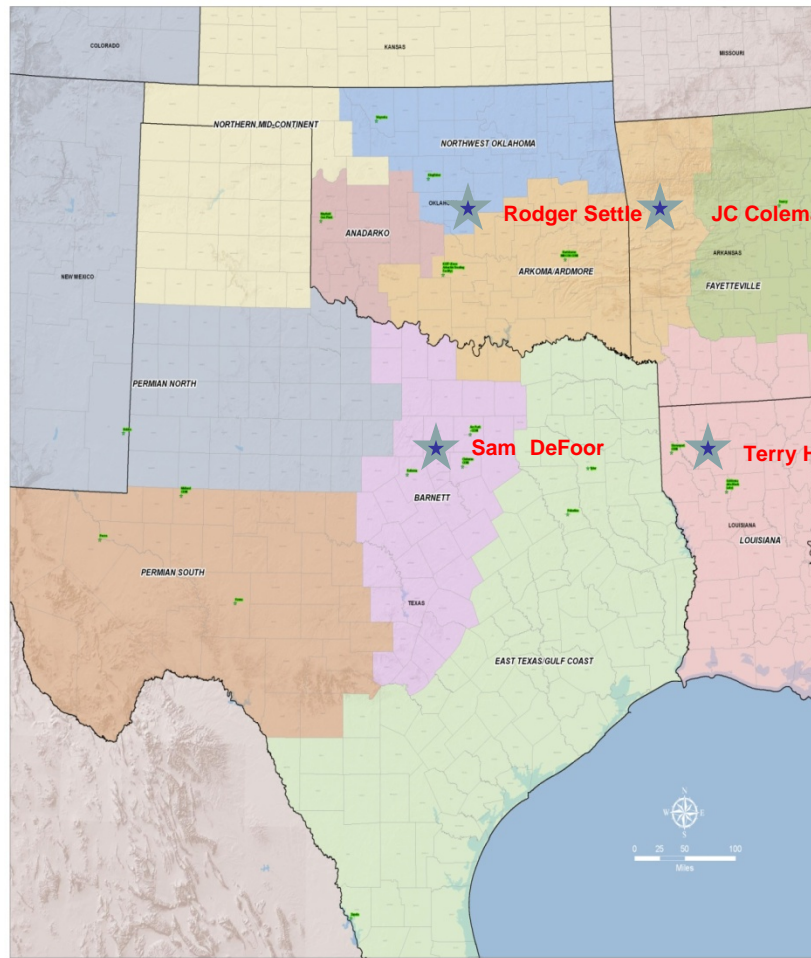
# Midstream Dehydrator Emission Reductions and BMP's



THE AGE OF  
Natural  
Gas



# CMP Operations



CHESAPEAKE MIDSTREAM PARTNERS, L.P.  
OPERATIONAL AREAS MAP  
APRIL 2009

• Field Office



Chesapeake Midstream Partners, L.P.

# 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

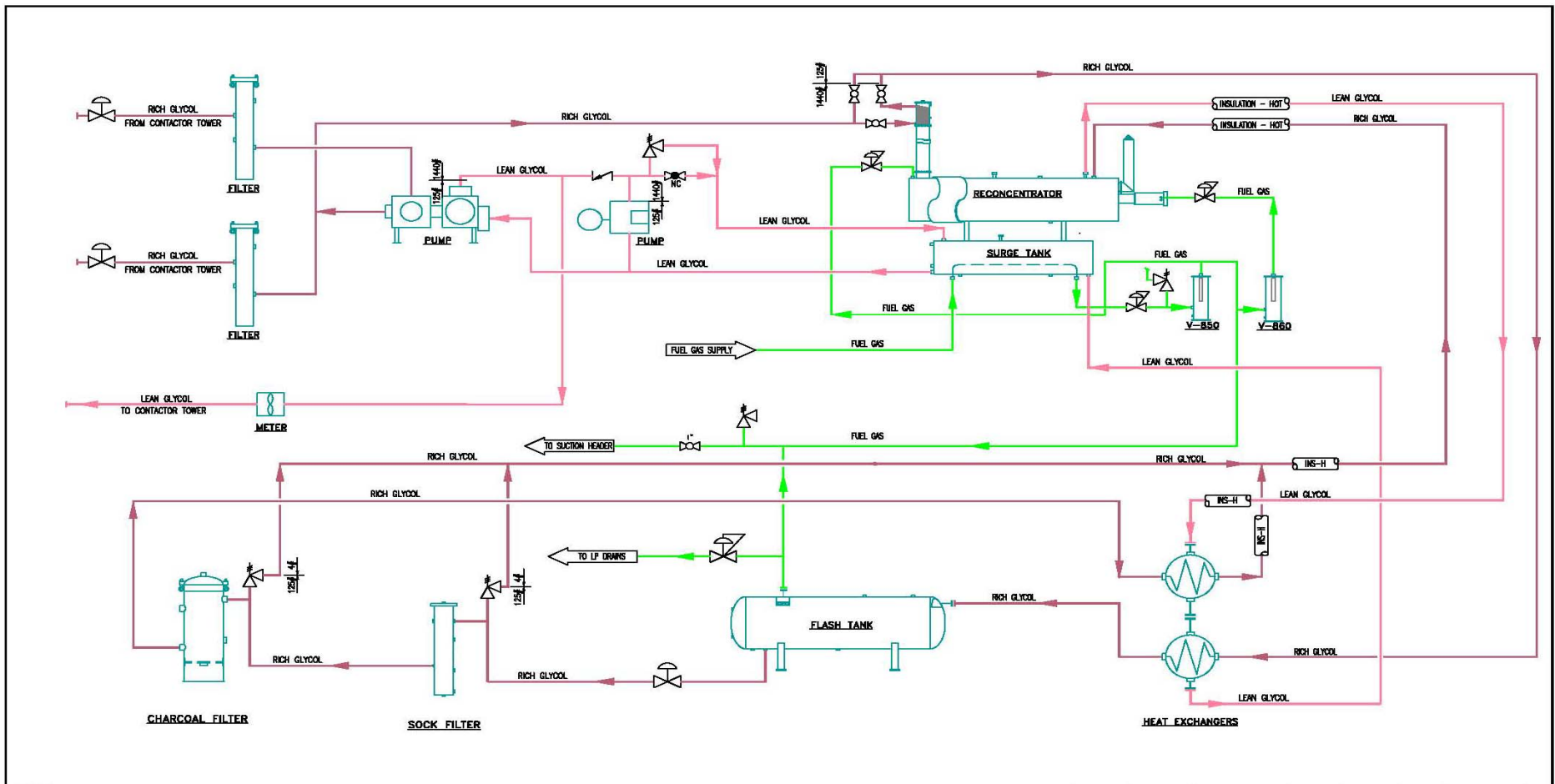
- Documenting what is already being done!
- Pipeline blow-downs using compressors
- Replacing/ Retrofitting/ Upgrading older equipment

# Emission Reductions



CMP STAR Reductions For 2008	
Mid-Continent	
BMP	Reduction (MCF)
Blow Down to Sales	282
Install Elec Glycol Pump	39,288
Flir Camera Leak Repair	596
Pipeline Hot Tap	1,121
Low Bleed Pressure Controllers	7,851
No-Bleed Chem Pump	19,195
Optimize Glycol Circ Rate	238,694
Low Bleed Pneumatic Level Controllers	42,496
Recover Dehy Flash Gas	761,071
Recover Dehy FG to Suction	7,226
<b>TOTAL</b>	<b>1,117,820</b>

# Glycol Reboiler Flow Diagram



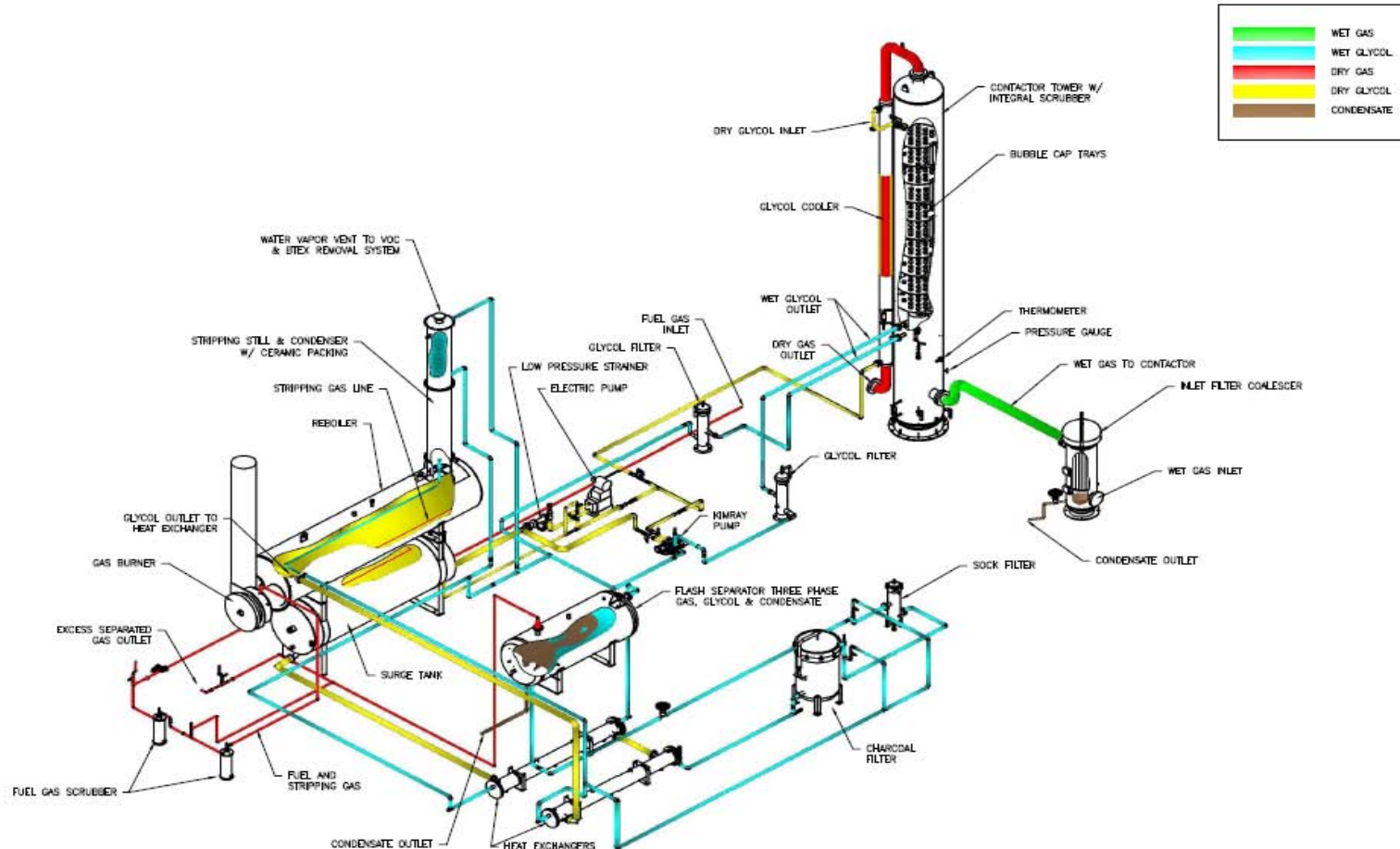
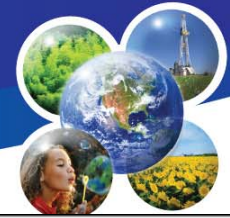
PDF File Name: W:\CON-ADMIN\OPERATIONS\ENGINEERING FILES\DRAWING\STANDARDS\REBOILER\GREG-1MM-CE\PID

REVISIONS													Drawn by	Date	Scale
No.	Description	AFE	Drawn	Date	Chk'd	Date	Proj. Eng.	Date	Reg. Tech	Date	Eng. Mang.	Date	CEB	9/20/09	NONE


Checked by:	Date	Location
Project Engineer:	Date	
Negotiated Task:	Date	AFE Number
Engineering Manager:	Date	Sheet Name SHEET 1

GLYCOL RECONCENTRATOR PFD	
Drawing File Name:	GLYCOL SCHEMATIC PFD
Rev.:	D

# Dehy Schematic Flow Diagram



CMP OPERATIONS\DRAWING\

REVISIONS													Drawn by	Date	Scale		SCHEMATIC FLOW DIAGRAM GLYCOL DEHYDRATION UNIT
No.	Description	AFE	Drawn	Date	CM'd	Date	Proj. Eng.	Date	Des. Coord.	Date	Eng. Mang.	Date	CBS	9/29/08	NONE		

Drawing File Name: SCHEMATIC FLOW DIAGRAM Set Rev: 0

# 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



Year	Number
2004	3
2005	17
2006	24
2007	24
2008	38

# Flash Separator



# Eclipse Compound Injected Burner



# Burner Standards



## FLAMECO

FLAMECO INDUSTRIES, INCORPORATED  
P.O. BOX 4303 TULSA, OKLAHOMA 74159  
(918) 832-1100 Fax: (918) 832-8100

October 3, 2008

Chesapeake Energy  
Ok City, Ok  
Attn: Danny Ford

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)

# 500 MBTU Orifice Chart



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.

D.S. No. 503

ORIFICE SIZE		CAPACITY IN CFH AT VARIOUS GAS PRESSURES (PSIG)													
DIA. IN.	MTD AREA	1	2	3	4	5	6	7	8	9	10	12	14		
9/64	.01560	154	225	275	317	354	388	420	449	475	502	549	593		
	.01630	165	235	287	331	370	406	438	469	496	525	574	619		
	.01740	177	251	306	353	395	433	468	501	530	566	612	661		
	.01750	178	257	313	358	397	436	471	504	533	568	616	665		
	.01810	184	261	319	367	411	451	487	521	551	583	637	688		
	.01860	189	268	327	378	422	463	500	536	566	599	655	707		
5/32	.01920	195	276	338	390	436	478	516	553	585	618	676	730		
	.01930	196	278	340	392	438	481	519	556	588	621	679	733		
	.02030	206	292	357	412	461	505	546	585	618	654	715	771		
	.02160	219	311	380	438	490	538	581	622	658	696	760	821		
	.02260	229	325	398	459	513	563	608	651	688	728	796	859		
	.02320	235	334	408	471	527	578	624	668	706	747	817	882		
11/64	.02350	239	338	414	477	533	585	632	677	716	757	827	893		
	.02460	250	354	433	499	558	613	662	708	749	792	868	935		
	.02540	258	366	447	516	577	632	683	732	773	818	894	965		
	.02600	264	374	458	528	590	647	699	749	792	837	915	988		
	.02690	273	387	473	546	611	670	724	775	819	866	947	1022		
3/16	.02760	280	397	486	560	627	687	742	795	840	889	972	1049		
	.02805	285	404	494	569	637	698	755	808	854	903	987	1066		
	.02865	291	413	504	582	650	713	771	825	872	923	1008	1089		
	.02940	298	423	517	597	667	732	791	847	895	947	1035	1117		
	.03020	307	435	532	613	686	752	812	870	920	972	1063	1148		
	.03110	316	448	547	631	706	774	833	894	947	1001	1095	1182		
	.03160	321	455	556	641	717	787	850	910	962	1018	1112	1201		
13/64	.03240	329	467	570	658	735	807	872	933	987	1043	1140	1231		
	.03270	332	471	576	664	742	814	880	942	998	1055	1151	1243		
	.03320	337	478	584	674	754	827	893	956	1011	1069	1169	1262		
	.03430	348	494	604	696	779	854	923	988	1044	1104	1207	1303		
	.03460	351	513	627	723	808	886	959	1025	1084	1146	1253	1353		
7/32	.03760	382	541	662	763	854	936	1011	1083	1145	1211	1324	1429		
	.03840	390	553	676	780	872	956	1033	1106	1169	1236	1352	1459		
	.04090	415	589	720	830	928	1018	1105	1178	1245	1317	1440	1554		
	.04300	436	619	757	873	976	1071	1157	1238	1309	1385	1514	1634		
15/64	.04310	437	621	759	875	978	1073	1159	1241	1312	1388	1517	1638		
	.04440	451	639	781	901	1008	1106	1194	1279	1352	1430	1563	1687		
	.04600	467	667	810	934	1044	1145	1237	1325	1401	1481	1619	1748		
	.04750	482	684	836	964	1078	1185	1278	1368	1446	1530	1672	1805		
1/4	.04910	498	707	864	997	1115	1223	1321	1414	1495	1581	1728	1866		
	.05190	527	747	913	1054	1178	1292	1396	1495	1580	1671	1827	1972		
17/64	.05350	543	770	942	1086	1214	1332	1439	1541	1629	1723	1883	2033		
	.05560	567	798	975	1125	1257	1379	1480	1596	1687	1784	1950	2105		
	.05800	594	831	1021	1177	1317	1444	1560	1670	1766	1868	2042	2204		
	.06010	610	865	1058	1220	1364	1498	1617	1731	1820	1935	2116	2284		
	.06200	629	897	1091	1259	1407	1544	1665	1788	1888	1996	2182	2356		
	.06310	630	904	1093	1261	1410	1546	1670	1788	1891	2000	2186	2360		
9/32	.06600	670	950	1162	1340	1498	1643	1775	1901	2010	2125	2323	2508		
	.06830	693	984	1202	1386	1550	1701	1837	1967	2080	2199	2404	2595		
19/64	.06920	707	996	1218	1405	1571	1723	1861	1993	2107	2228	2436	2630		
	.07180	727	1031	1260	1453	1625	1783	1925	2062	2180	2306	2520	2721		
5/16	.07470	759	1104	1350	1557	1741	1910	2061	2209	2336	2470	2700	2915		
	.07840	796	1129	1380	1592	1780	1952	2109	2258	2387	2524	2760	2979		
	.08200	837	1181	1443	1665	1861	2047	2205	2362	2497	2640	2886	3116		
21/64	.08460	859	1218	1489	1717	1920	2107	2276	2436	2576	2724	2978	3215		
	.08860	894	1247	1524	1756	1966	2156	2325	2484	2637	2789	3048	3291		
11/32	.09280	942	1336	1633	1884	2107	2311	2474	2635	2784	2931	3192	3424		
	.09500	964	1368	1672	1929	2157	2366	2536	2706	2853	3009	3274	3510		
	.10050	1020	1447	1769	2040	2281	2502	2703	2894	3060	3236	3530	3819		



# Pneumatic Thermostat Elimination



# CMP Standard



## Patton Burner Management System

Unique combination of Flame Ignition,  
Data Acquisition and Control

★ U. S. Patent Pending ★



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 flame, 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 screens.

POD - Pilot on Demand allows the pilot to remain off until it is needed based on pre-set temperature or pressure settings allowing you to save money and fuel gas.



PBMS

### Power

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

### Control

With on board inputs 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, reboiler and flash tank levels, and remote input shutdowns (based on external conditions; example-compressor shutdown). Control examples would be automated valve or drive control to maintain temperature.

12 Volts  
24 Volts  
Uses Solar Power

Modbus

Control  
and  
Logging

Call  
806-  
358-7993

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



# 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



# Emission Abatement Component Overview



Modulating  
Burner Control  
Tie In

Still Overhead Vent

BTEX Coils

Flash Separator

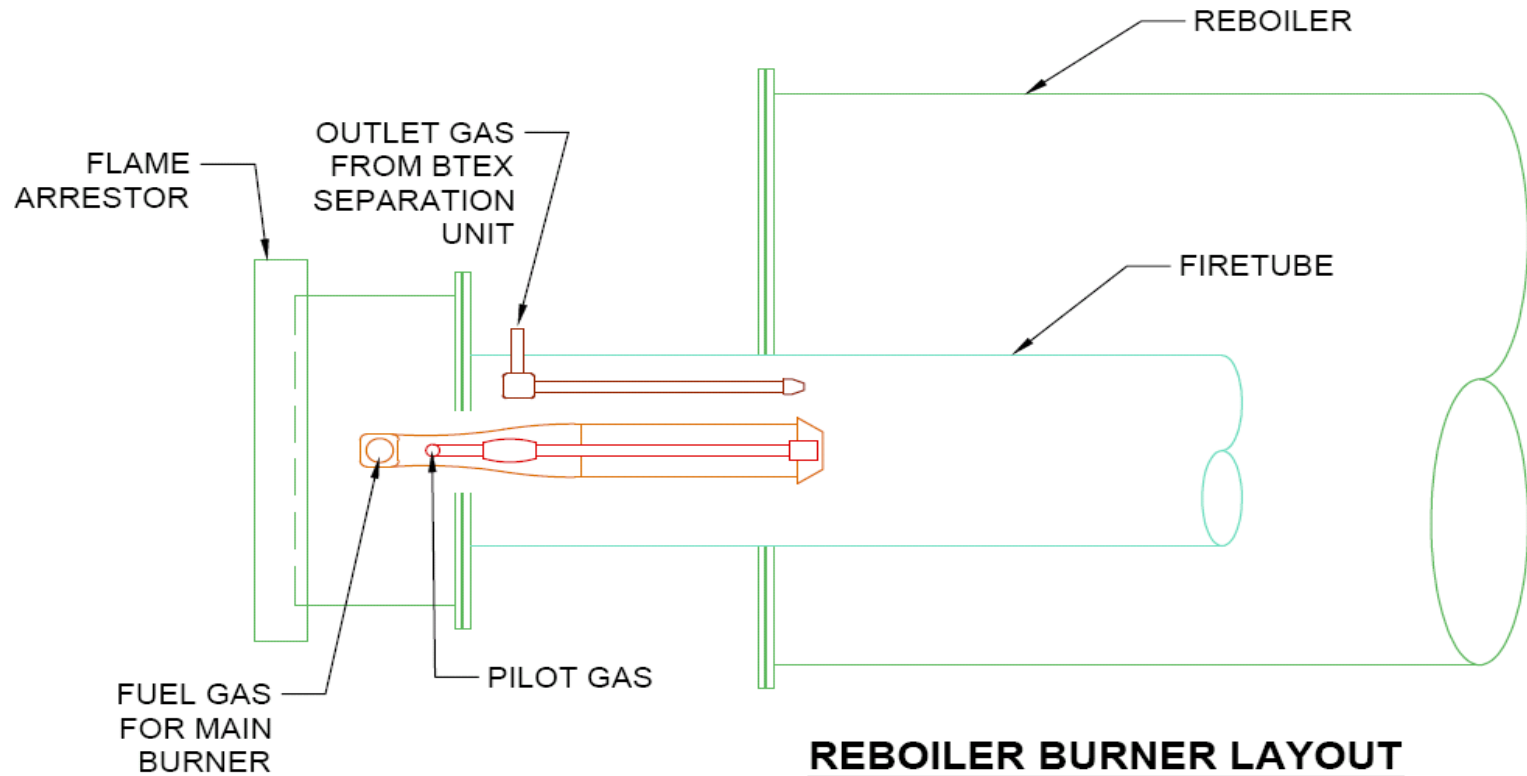
# B-TEX Burner



**BTEX Burner  
mounted below  
and to the side  
of Main Burner**



# Reboiler Burner Layout



**REBOILER BURNER LAYOUT  
SIDE VIEW**

CMP\_OPERATIONS\DRAWING\

No.	Description	AFE	Drawn	Date	REVISIONS								Drawn by	Date	Scale	Location	Chesapeake ENERGY	Drawing File Name:	Set	Rev.
					CM'd	Date	Proj. Eng.	Date	Des. Coord.	Date	Eng. Mang.	Date								



**BURNER LAYOUT**  
Drawing File Name: BURNER\_LAYOUT

# BTEX to Burner Analysis



SHAMROCK GAS ANALYSIS  
1100 South Madden  
Shamrock, Texas 79079  
(806)256-3249

TAKEN AFTER B-TEX  
UNIT ON LINE GOING  
TO BURNER

GAS ANALYSIS REPORT NO: G1499GX/H      DATE: 08-Mar-09

FOR: Chesapeake      SAMPLE IDENTIFICATION  
Attn: Chickasha Area

COMP: Chesapeake  
FIELD: Chickasha Area  
LEASE: Kovar C.F. at BTEX Unit  
STA. #: Not/Rec

---

SAMPLE DATA

DATE: 02-Mar-09      BY: M. Brennan  
PRES: 30 psig      TEMP: 383 Deg. F.      FIELD GRAVITY: Not/Rec  
FLOW: Not/Rec      MCF/D:      DIFF: Not/Rec      IN. Hg      DEW POINT: Not/Rec      LBS H2O  
REMARKS: Temp At Reboiler  
Extended Analysis

CYL #: 9261      LAB #: G1499GX/H

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COMPONENT ANALYSIS

COMPONENTS	MOL PERCENT	GPM @ 14.730 psia
CARBON DIOXIDE (CO2)	3.70	
NITROGEN (N2)	44.73	
METHANE (C1)	7.90	
ETHANE (C2)	10.80	2.887
PROPANE (C3)	14.88	4.098
ISOBUTANE (IC4)	2.75	0.901
N-BUTANE (NC4)	7.55	2.380
ISOPENTANE (IC5)	2.11	0.773
N-PENTANE (NC5)	2.18	0.788
HEXANES PLUS (C6+)	3.39	1.261
TOTALS	100.00	
		ETHANE+ GPM: 13.088
		PROPANE+ GPM: 10.201
		ISO-PENTANE+ GPM: 2.822
MOLECULAR WEIGHT:	37.253	Compressibility Factor (Z): 0.9932
		Specific Gravity @ 60 Deg. F. (real): 1.286
BTU / CU. FT. @ 60 Deg. F.,	14.730	PSIA (REAL): DRY 1320.7
		WET 1297.7

# FLUE GAS ANALYSIS ON HIGH BURNER



SHAMROCK GAS ANALYSIS  
1100 South Madden  
Shamrock, Texas 79079  
(806)256-3249

TAKEN FROM STACK WITH  
TUBING DRAPPED INSIDE  
TO CHECK EMISSIONS

GAS ANALYSIS REPORT NO: G1493GX/H      DATE: 09-Mar-09

FOR: Chesapeake      SAMPLE IDENTIFICATION  
Attn: Chickasha Area

COMP: Chesapeake  
FIELD: Chickasha Area  
LEASE: Kovar C.F. Stack High Burner  
STA. #: Not/Rec

---

SAMPLE DATA

DATE: 02-Mar-09      BY: M. Brennan  
PRES: 30 psig      TEMP: 384 Deg. F.      FIELD GRAVITY: Not/Rec  
FLOW: Not/Rec      MCF/D      DIFF: Not/Rec      IN. Hg      DEW POINT      Not/Rec      LBS H2O  
REMARKS: Extended Analysis

CYL #: 9269      LAB #: G1493GX/H

COMPONENT ANALYSIS		
COMPONENTS	MOL PERCENT	GPM @ 14.730 psia
CARBON DIOXIDE (CO2)	10.12	
NITROGEN (N2 )	89.85	
METHANE (C1 )	0.00	
ETHANE (C2 )	0.00	0.000
PROPANE (C3 )	0.00	0.000
ISOBUTANE (IC4 )	0.00	0.000
N-BUTANE (NC4)	0.01	0.004
ISOPENTANE (IC5 )	0.00	0.000
N-PENTANE (NC5)	0.00	0.000
HEXANES PLUS (C6+)	0.02	0.006
TOTALS	100.00	
		ETHANE+ GPM: 0.010
		PROPANE+ GPM: 0.010
		ISO-PENTANE+ GPM: 0.006
MOLECULAR WEIGHT:	29.646	Compressibility Factor (Z): 0.9995
		Specific Gravity @ 60 Deg. F. (real): 1.024
BTU / CU. FT. @ 60 Deg. F.,	14.730	PSIA (REAL):
		DRY 1.2
		WET 1.2

# FLUE GAS ANALYSIS ON LOW BURNER



SHAMROCK GAS ANALYSIS  
1100 South Madden  
Shamrock, Texas 78079  
(800)265-3249

TAKEN FROM STACK  
WITH TUBING DRAPPED  
INSIDE TO CHECK  
EMISSIONS

GAS ANALYSIS REPORT NO: G1494GX/H

DATE: 08-Mar-09

FOR: Chesapeake  
Attn: Chickasha Area

SAMPLE IDENTIFICATION

COMP: Chesapeake  
FIELD: Chickasha Area  
LEASE: Kovar C.F. Stack Low Burner  
STA. #: Not/Rec

SAMPLE DATA

DATE: 02-Mar-09 BY: M. Brennan  
PRES: 30 psig TEMP: 381 Deg. F. FIELD GRAVITY: Not/Rec  
FLOW: Not/Rec MCF/D DIFF: Not/Rec IN. Hg DEW POINT Not/Rec LBS H2O  
REMARKS: Extended Analysis

CYL #: 9105

LAB #: G1494GX/H

COMPONENT ANALYSIS

COMPONENTS	MOL PERCENT	GPM @ 14,730 psia
CARBON DIOXIDE (CO2)	2.00	
NITROGEN (N2)	97.97	
METHANE (C1)	0.00	
ETHANE (C2)	0.00	0.000
PROPANE (C3)	0.00	0.000
ISOBUTANE (IC4)	0.00	0.000
N-BUTANE (NC4)	0.01	0.003
ISOPENTANE (IC5)	0.00	0.000
N-PENTANE (NC5)	0.00	0.000
HEXANES PLUS (C6+)	0.01	0.005
TOTALS	100.00	

MOLECULAR WEIGHT: 28.344

ETHANE+ GPM: 0.008  
PROPANE+ GPM: 0.008  
ISO-PENTANE+ GPM: 0.005

Compressibility Factor (Z): 0.9997

Specific Gravity @ 60 Deg. F. (real): 0.979

BTU / CU. FT. @ 60 Deg. F., 14.730 PSIA (REAL): DRY 1.0  
WET 1.0



# Contact Information



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CMP – Operations

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