

**Application & Performance Warranty Data****Project Information**

Site Location: USA
Project Name: Williams - Clyde Q2110516
Application: Gas Compression
Number of Engines: 1
Operating Hours per Year: 8760

Engine Specifications

Engine Manufacturer: Caterpillar
Model Number: G3516B
Rated Speed: 1,400 RPM
Type of Fuel: Natural Gas
Type of Lube Oil: 0.6 wt% sulfated ash or less
Lube Oil Consumption: < 0.00027 gal/bhp-hr

Engine Cycle Data

Load	Speed	Power	Exhaust Flow	Exhaust Temp.	Fuel Cons.	NO _x	CO	NMHC	NMNEHC	CH ₂ O	PM ₁₀	O ₂	H ₂ O
%		bhp	acfm (cfm)	F	BTU/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	%	%
100	Rated	1380	9107	992	8262	0.5	2.43	0.71	0.48	0.43		9	17

Emission Data (100% Load)

Emission	Raw Engine Emissions						Target Outlet Emissions						Calculated Reduction
	g/bhp-hr	ppmvd @ 15% O ₂	ppmvd	lb/MW-hr	tons/yr	g/kW-hr	g/bhp-hr	ppmvd @ 15% O ₂	ppmvd	lb/MW-hr	tons/yr	g/kW-hr	
NO _x *	0.5	38	77	1.48	6.66	0.671							
CO	2.43	306	616	7.18	32.38	3.259	0.1701	21	43	0.5	2.27	0.228	93%
NMHC**	0.71	156	314	2.1	9.46	0.952							
NMNEHC**	0.48	105	213	1.42	6.4	0.644	0.25	55	111	0.74	3.33	0.335	47.9%
CH ₂ O	0.43	50	102	1.27	5.73	0.577	0.03	4	7	0.09	0.4	0.04	93%

* MW referenced as NO₂ ** MW referenced as CH₄**System Specifications****NCSR System Specifications (SP-ZESO-36x31-14-XH2B1)**

Design Exhaust Flow Rate: 9,107 acfm (cfm)
Design Exhaust Temperature¹: 992°F
Housing Model Number: SP-ZESO-36x31-14-HSG
Element Model Number: ZXS-RE-FULL354XH, ZXS-RE-FULLBLIND
Number of Catalyst Elements: 2
Number of Spare Catalyst Tracks: 1
System Pressure Loss: 8.0 inches of WC (Fresh)
Sound Attenuation: 45-52 dBA insertion loss
Exhaust Temperature Limits: 550 – 1250°F (catalyst inlet); 1350°F (catalyst outlet)



Modular Dehydration Systems Proposal, REV1

FREDERICK LOGAN COMPANY, INC



Typical Regenerator, Contactor, Reverse Flow Coalesce, & Inlet Separator
Provided by Frederick Logan Company, Inc.

FREDERICK LOGAN COMPANY, INC. - 140 COMMONWEALTH DR. - WARRENDALE, PA. 15086
Phone: 724-776-9300 Fax: 724-776-0355 E-mail: Info@FrederickLoganCo.com



September 10, 2013

Williams
Park Place Corporate Center 2
2000 Commerce Drive
Pittsburgh PA 15275

Attention: Mr. Tom Kunkel

Reference: Modular Dehydration Systems Proposal, REV1
Williams Technical Specification ES-2825 REV A.1, RFQ 053013

Attached: Terms and Conditions of Sale

File: 10-0324-1

Dear Mr. Kunkel,

In reference to your request for quote, we are pleased to propose the following equipment for your application:

Modular Dehydration Systems (30 MMSCFD Case)

Process Fluid	Natural Gas
Process Flow	30 MMSCFD Use 40 MMscfd
Min/Max Inlet Gas Temperature	70-120°F
Operating Pressure Range	800-1200 PSIG
Specific Gravity used:	0.65
BTU Range	1000-1350 BTU
Max. Inlet Water Content	121 lbs H2O / MMSCF Max, theoretically saturated
Outlet Water Content	7lbs H2O / MMSCF
Electrical Service Available at Site	Yes, 240VAC/1PH/60Hz (assumed)
Electrical Classification	Class I Div. II



Based upon the design conditions stated on the previous page, we are pleased to offer as follows:

(1) NEW 750M BTU/HR GLYCOL REGENERATOR

Model # FLOCO 750MEE36F14N3PYS

Specifications:

Shell Size	36" OD x 16' Long
Stack Downdraft Protection	Yes
Still Column Size (insulated, removable)	14" OD x 8' Long
Still Column Reflux Loop	Yes
Ceramic Packing Size	1" Saddles
Design Pressure / M.A.W.P.	0 PSIG / 0 PSIG
Corrosion Allowance	N/A
Stripping Gas Assembly with flow meter	Yes
Glycol Flowmeter	No, not needed with Kimray Pumps
Carbon Filter	Yes (1), with 3 valve bypass
Size	12-3/4" OD
Design Pressure	125 PSIG
Design Code	ASME Section VIII, Div. I
Fuel Gas Scrubber	Yes (1)
Size	6" OD x 1'-7 1/4" S/S
Design Pressure	125 PSIG
Design Code	ASME Section VIII, Div. I
Glycol Pump Suction Bag Filter	Yes (1) with 3 valve bypass
Size	6" OD
Glycol Sock Filter	
Size	3-1/2" OD x 20" L
Design Pressure	2000 PSIG
Three Phase Separator	Yes (1), with 3 valve bypass
Size	30" OD x 10' S/S, vertical
Design Pressure	125 PSIG
Design Code	ASME Section VIII, Div. I
High Pressure Glycol Return Filter(s)	Yes (2), with 3 valve bypass, in duplex
Size	3.5" OD x 20" L
Design Pressure	2000 PSIG
Glycol/Glycol Heat Exchanger	Yes (1)
Type	Fin Tube (12 pass) (10 + 2)
Details	2" Sch 80 Fin Tube in 4" Sch 80 Pipe (2"x 4")
Lifting Lugs	Yes (4) on skid
Bath Fluid	Inhibited Triethylene Glycol (99% Lean TEG)



Primer
Paint

Sherwin Williams Macropoxy, B58W610
Sherwin Williams Acrolon 218HS, B65W611

Note: High temp Sherwin Williams paint for the reboiler glycol/glycol HEX.

GLYCOL PUMP(S)

Specifications:

Electric / Energy Exchange	Kimray Energy Exchange
Quantity	(1)
Model	45020-PV
Motor Rating	N/A
Electrical Classification	N/A
Horsepower	N/A
Variable Frequency Drive	N/A

DEHYDRATOR/REGENERATOR CONTROL SYSTEM AND ACCESSORIES

1. One (1) burner assembly with flame arrestor
2. One (1) fuel gas manifold, complete with:
 - a. one (1) Y type strainer with valve
 - b. two (2) Belgas pressure regulators or equal
 - c. two (2) manual isolation valves
 - d. one (1) 0-200 psig pressure gauge with isolation valve
 - e. one (1) 0-30 psig pressure gauges with isolation valve
 - f. one (1) Temperature control valve
 - g. two (2) Safety Block Valves
3. One (1) pilot gas manifold, complete with:
 - a. one (1) 1/4" manual isolation valve
 - b. one (1) 1/4" Belgas pressure regulator or equal
 - c. one (1) 0-30 psig pressure gauge with isolation valve
 - d. two (2) safety block valves
4. One (1) stripping gas assembly complete with pneumatic flow meter
5. One (1) 2" diameter fill port
6. One (1) 1" XH fuel gas preheat coil
7. One (1) 2" drain valve with plug
8. One (1) bath thermometer, 50°F- 550°F, with stainless steel thermowell
9. Two (2) thermocouples for process control
10. One (1) 1/4" Belgas instrument pressure regulator with isolation valve or equal
11. Stainless steel tubing and fittings
12. One (1) thermal relief valve for fuel gas scrubber set @ 125 PSIG



13. One (1) thermal relief valve for the 3phase separator, set @ 125 PSIG
14. One (1) 5/8" sight glass with gage cocks
15. One (1) Profire 2100 BMS
16. One (1) Flameco burner with complete flame arrestor assembly

SHOP ASSEMBLY

Complete fuel gas and instrument gas system will be fully shop assembled and tested prior to shipment. Various items may be disassembled and shipped separately to prevent damage in shipment. Reassembly of these items in the field is to be done by others.

INSULATION

Reboiler shell to be insulated with 1-1/2" thick fiberglass insulation and covered with 0.019" thick embossed aluminum jacketing and banded with 1/2" wide stainless steel bands.

SKID

Approx. 26' Long x 8' Wide, 8" Wide Flange Beam, with continuous drip pan & drain

TESTING

- Firetube welds to be tested with air and soap at 5 psig internal pressure for 10 minutes.
- Assembled unit will be pressured to insure all devices function properly. The main burner will not be ignited during this testing.
- Fuel train to be pressurized at 125 PSIG and leak tested



(1) NEW 30"ID STRUCTURED PACKED CONTACT TOWER

Specifications:

Structured Packing	Structured Packing
Diameter	30" ID
Seam to Seam Length	27'-6"
Design Pressure	1440 PSIG
Design Temperature	-20 DEG F to 120 DEG F
Design Code	ASME Section VIII, Div. I
National Board Registration	Yes
Glycol/Gas Heat Exchanger	Yes, 6" Pipe in 8" Pipe
Manway / Size	Yes (1) Upper, 20" with blind & davit
Hat Tray	Yes, removable
Inlet Integral Separator	Yes
Demister Sections / Quantity / Size	Yes / (2) / 10" Thick
Lifting Lugs / Quantity	Yes / (3)
Turndown	10:1 or more

Connections:

Inlet / Outlet Gas Connections	6" 600 ANSI
Liquid Level Control Quantity / Size	(1) / 2" on sump
LCV connection Quantity / Size	(1) / 1" on sump
Sight Glass Quantity / Size	(2) ¾" on sump
High Level Switch Quantity / Size	No, can be added if requested
Glycol In Quantity / Size	(1), 1"
Glycol Out Quantity / Size	(1), 1"
Upper Manway Quantity / Size	(1), 20" 600 ANSI with blind & davit
Manual Sump Drain Quantity / Size	(1), 1"
Thermal Relief Quantity / Size	(1), 1"
Pressure Gauge Quantity / Size	(1), ½"
Temperature Gauge Quantity / Size	(1), ¾"

Note: Threaded connections for controls, unless specified otherwise

Paint:

Prime Coat	Sherwin Williams Macropoxy, B58W610
Top Coat	Sherwin Williams Acrolon 218HS, B65W611



30" ID CONTACT TOWER CONTROLS AND ACCESSORIES

1. One (1) Thermal relief valve (set: 1440 PSIG @ 120 DEG F)
2. One (1) Sight glasses
3. One (1) pressure gauge
4. One (1) temperature gauge with thermowell
5. One (1) Liquid Level Controller
6. One (1) Automatic Dump Valve

Note: Controls shipped loose for field installation by others. Ball valves, tubing, fittings, pipe are not included.

FREDERICK LOGAN COMPANY, INC.

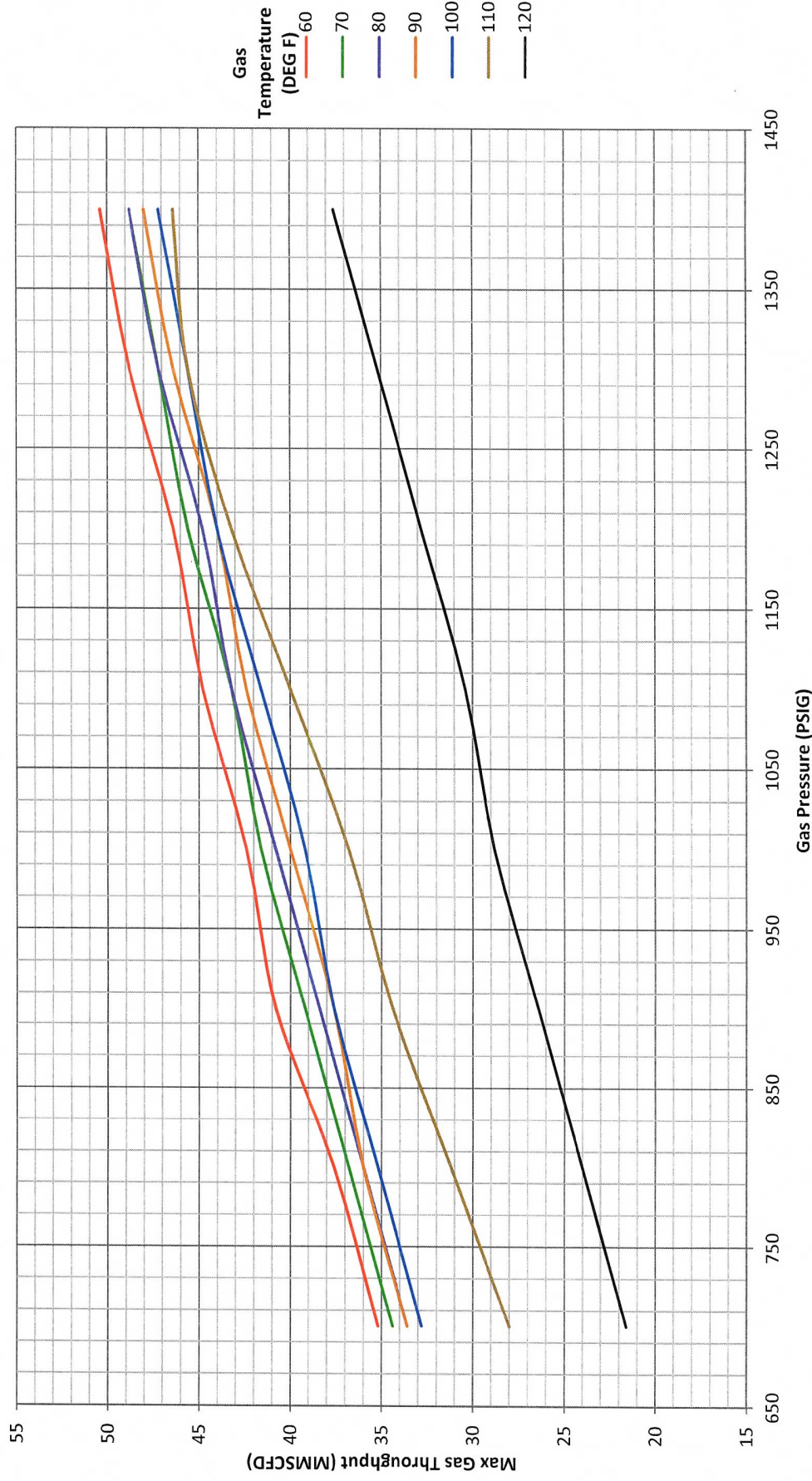
140 COMMONWEALTH DR. WARRENDALE, PA, 15086

PH: 724-776-9300

www.floco.com



Nominal 30MM Modular Separation/Dehydration/Filtration Unit Max Capacity at Pressure/Temperature (0.58 SG)



Note: Maximum gas velocity: 55 FT/SEC

Note: Coalescer Model #: CSA-6F1440V12Q

Contact Model #: SPT-6F1440D8NH

Regenerator Model #: 750M36EP42412N3PYS