

BIOGAS FLARE HANDOVER PACKAGE Oxley WRP

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Revision:

В

Date:

10 July 2012



OXLEY WRP - BIOGAS FLARE - HANDOVER PACKAGE

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Date	Rev	Details	Sect.	Page	Auth. (Initial)
31 st May 2012	Α	Preliminary Draft	All	All	JB
10 th July 2012	В	For Issue	All	All	RPh

Approval

_	Name	Signature	Date
JHG	Ross Phillips	R. Phillips	10/7/2012
JHG	Mason Grieco	120	10/7/12

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10 July 2012



OXLEY WRP - BIOGAS FLARE - HANDOVER PACKAGE

Contents

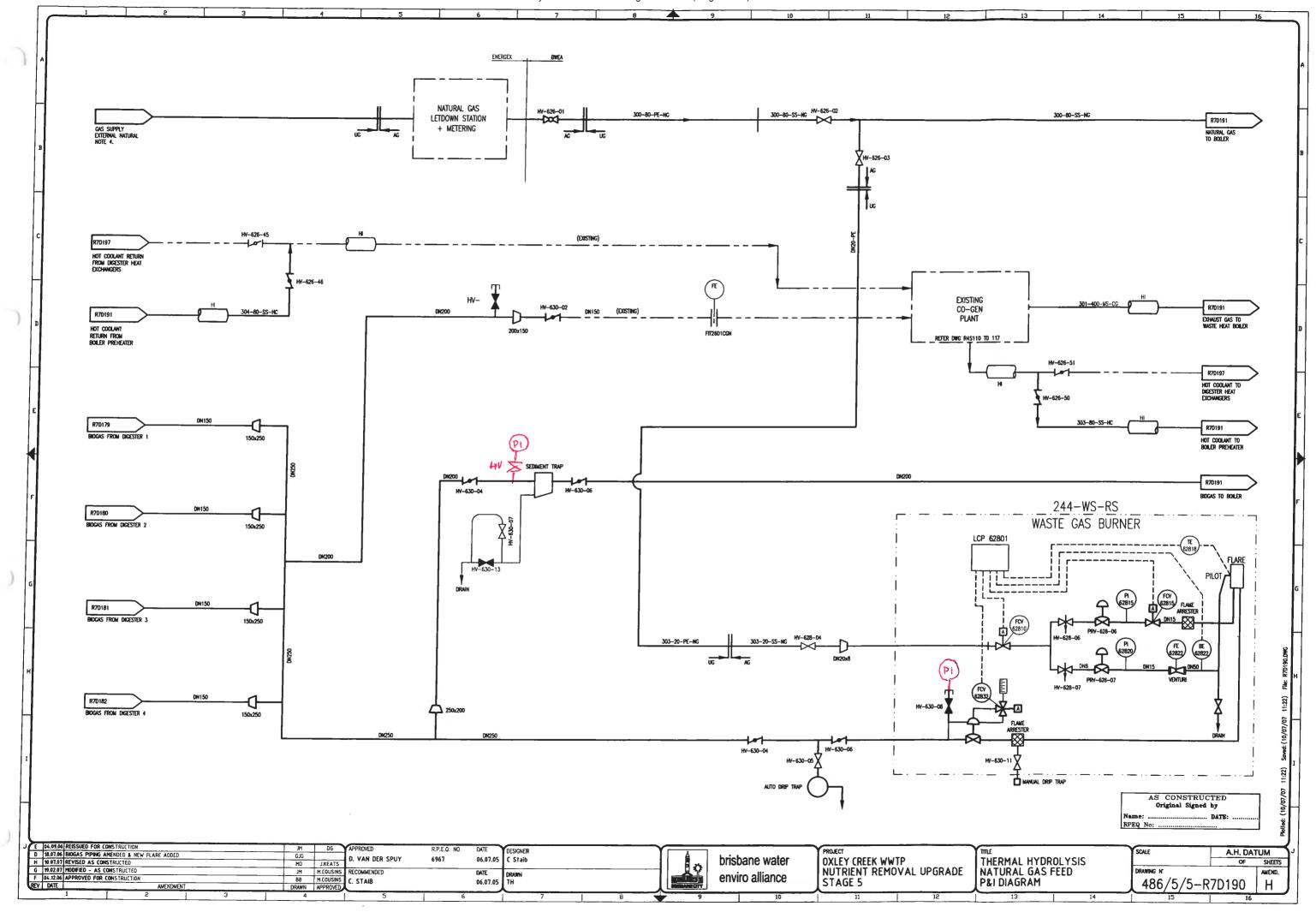
- 1. Design Documents
 - 1.1.P&ID Updated
 - 1.2.Mechanical Drawings
 - 1.3. Electrical Drawings
- 2. Quality Assurance
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 - 2.1.1. Mechanical/Pre-commissioning Checksheets
 - 2.1.2. **Electrical Checksheets**
 - 2.1.3. Gas Line Pressure Test Report
 - 2.1.4. Biogas Line Audit Report
- 3. Operation & Maintenance Manuals
 - 3.1. Varec Biogas 244W Series Waste Gas Burner with Automatic Pilot **Operation System**
 - 3.2. Varec Biogas 244W Product Information

Date: 10 July 2012

3 of 104 Q-Pulse Id: TMS220 08/03/2013

1. Design Documents

1.1. P&ID Updated



1.2. Mechanical Drawings

1. LOCATE UNIT WITHIN 15 FT [4.6 M] OF WASTE GAS BURNER.

- 2. MAXIMUM WORKING PRESSURE: 5 PSIG [34 KPa]
- 3. CONNECT 1/2" NPT CONTROL LINE TO WASTE GAS PIPING (MINIMUM DISTANCE 10 FT [3.0 M] UPSTREAM OF REGULATOR).

BACK PRESSURE REGULATOR REFERENCE DWG: C3149

Α

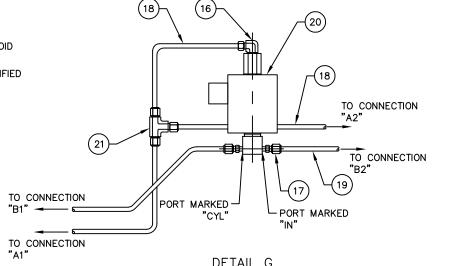
 \angle 1/2" NPT CONTROL

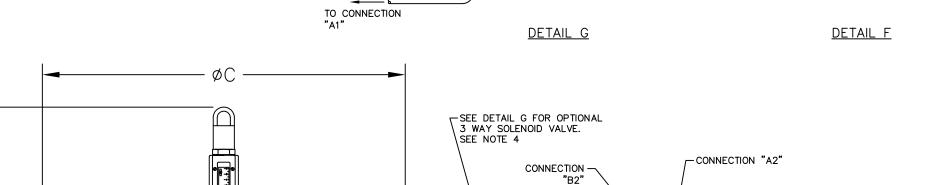
LINE CONNECTION

Q-Pulse Id: TMS220

FLOW

- 4. THE SOLENOID VALVE VOLTAGE DATA IS DEFINED BY THE SOLENOID VALVE OPTION CODE SPECIFIED BY MODEL NO.
- 5. HARDWARE MATERIAL SUPPLIED IN STAINLESS STEEL WHEN SPECIFIED BY MODEL NO.





- CONNECTION

- CONNECTION

SEE NOTE 4

SEE DETAIL F

5010 SERIES

FLAME ARRESTER

REF: DRAWING

NUMBER C1513

	PARTS LIST	
ITEM	DESCRIPTION	MATERIAL
1	REGULATOR	ALUM.
2	HEX HD. CAP SCREW NOTE 5	STEEL
3	GASKET	COMP. NON-ASB
4	HEX NUT NOTE 5	STEEL
5	FLAME ARRESTER	ALUM.
6	BY-PASS VALVE	ALUM./304 SS
7	BY-PASS BRACKET	ALUM.
8	HEX HD. CAP SCREW NOTE 5	ZN PL STEEL
0	HEX HD. CAP SCREW	SS
10	PUSH ROD	304 SS
11	GASKET	RED FIBER
12	FUSE WELL ASSEMBLY	ALUM./304 SS
13	FUSE	260° METAL
14	SPRING, FUSE WELL	304 SS
15	WASHER	304 SS
16	90° TUBING CONNECTOR	ALUM.
17	TUBING CONNECTOR	ALUM.
18	CONTROL TUBE	ALUM.
19	VENT TUBE	ALUM.
20	3-WAY EXPLOSION PROOF SOLENOID VALVE, N.C.	SST.
21	TEE TUBING UNION	ALUM.

SIZE		Α	В	С	D
2"	IN	23 1/4	3 5/8	14 1/2	23 5/16
2	mm	591	92	368	592
3"	IN	26 1/2	4 1/2	20 1/2	26 1/16
3	mm	673	114	521	662
4"	IN	27 1/4	5	20 1/2	31 7/16
4	mm	692	127	521	799
6"	IN	32 7/8	5 5/8	26 1/2	39 7/16
Ь	mm	835	143	673	1002
8"	IN	36 1/4	7 1/4	26 1/2	54 7/16
0	mm	921	184	673	1383
10"	IN	46 1/2	8	36	63 7/8
10	mm	1181	203	914	1622
10"	IN	50 5/8	11	36	67 7/16
12"	mm	1286	279	914	1713

SEE NOTE 4

BYPASS VALVE ASSEMBLY REF: DRAWING NUMBER B7406

CODE	SOLENOID VALVE VOLTAGE
1	N/A (SOLENOID VALVE NOT REQUIRED)
2	110VAC/50 HZ, 120VAC/60 HZ
3	220VAC/50 HZ, 240VAC/60 HZ
4	SPECIAL (AS SPECIFIED IN PURCHASE ORDER)

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CHECKED BY: HJB 87/12/23

APPROVED BY:

VAREC BIOGAS A Division of Westech Industrial Inc.

Toll Free: 1-866-4-BIOGAS Fax: (403)253-6803

CUSTOMER: S/0 NO.:

P.O. NO.: PROJECT:

TAG NO.:

SET PRESSURE: SERIAL#: CATALOG NO.

TITLE:

440 SERIES PRESSURE RELIEF & FLAME TRAP

DWG. NO. C6096 REV. NONE SCALE: SHEET 1 OF 1

7 of 104

www.varec-biogas.com 08/03/2013

-1/2" NPT DRAIN PLUG OR CONNECTOR FOR DRIP TRAP

Oxley Creek STP ST22 Sludge Treatme NOTES:

- 1. ITEMS 1 THROUGH 16 INCLUDED IN BYPASS VALVE ASSEMBLY KIT (BM19974-100).
- 2. ITEMS 1 THROUGH 11 INCLUDED IN BYPASS VALVE ASSEMBLY KIT (BM453-100).
- 3. FOR CONNECTING TUBING, SEE MODEL 440 DRAWING C6096.

ent (Biogas Flare) General REVISIONS									
REV.	ECO	DESCRIPTION	DATE	CHKD	APPD.				
Α	1	ENG. RELEASE	58/12/16		HJB				
В	86200	REVISION PER E.O.	86/11/14		HJB				
O	88037	REDRAWN PER E.O.	87/12/07		RAMP				
D	94139	ADDED PARTS KITS NOTE	94/09/22	JG					
Ε	_	SS HARDWARE ADDED	05/08/10	DAR	CHF				
	REV. A B C	REV. ECO A – B 86200 C 88037 D 94139	REV. ECO DESCRIPTION A - ENG. RELEASE B 86200 REVISION PER E.O. C 88037 REDRAWN PER E.O. D 94139 ADDED PARTS KITS NOTE	REV. ECO DESCRIPTION DATE A — ENG. RELEASE 58/12/16 B 86200 REVISION PER E.O. 86/11/14 C 88037 REDRAWN PER E.O. 87/12/07 D 94139 ADDED PARTS KITS NOTE 94/09/22	REV. ECO DESCRIPTION DATE CHKD A — ENG. RELEASE 58/12/16 B 86200 REVISION PER E.O. 86/11/14 C 88037 REDRAWN PER E.O. 87/12/07 D 94139 ADDED PARTS KITS NOTE 94/09/22 JG				

PARTS LIST

			ITEM	DESCRIPTION	MATERIAL	PART NO.
			1	BODY	ALUM.	VBB408-011
			2	LOWER SEAT	304SS	VBB3060-005
			3	O RING	BUNA N	VBP14-1
			4	VALVE STEM	304SS	VB02-07611-005
			5	O RING	BUNA N	VBP14-15
			6	O RING	BUNA N	VBP14-50
			7	BYPASS VALVE SPRING	304SS	VBB13001-305
			8	GRIP RING	SS	VBP10-36
CONNECT TO	UPPER ¬	CONNECT TO LOWER	9	HEX NUT (2)	304SS	VBP31-1125
DIAPHRAGM HO	DUSING.	DIAPHRAGM HOUSING.	10	ADJUSTING SCREW	SS	VBB05-1079-117
- 1/·	4"NPT \	\- 1/4" NPT	11	STREET ELBOW	316SS	MDMEL-SS04-001
	\	\setminus 1	12	FUSE WELL ASSEMBLY	ALUM./304 SS	VBAA1079
_			13	PUSH ROD	304SS	VBB4341-005
↑	\	(5)	14	FUSE WELL SPRING	304SS	VBP36-305
		(6)	15	FUSE	260°F METAL	VBA1068-061
		(11)	16	WASHER	304SS	VBP31-262
1	3 1/4"-20 MOUNTING					

VENT TO

(16)

ATMOSPHERE

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WHC 88/02/07

CHECKED BY: C. TOKAR 88/02/12

APPROVED BY:

VARE

Toll Free: 1-866-4-BIOGAS Fax: (403)253-6803

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A Division of Westech Industrial Inc.

CUSTOMER: -S/0 NO.:

P.O. NO.:

PROJECT:

TAG NO.: -

REVISED BY: D. RICHER 05/08/10 NOTES: SS HARDWARE ADDED

440 BYPASS VALVE **ASSEMBLY**

B7406 DWG. NO. REV. Ε

Q-Pulse Id: TMS220

HOLES (2)

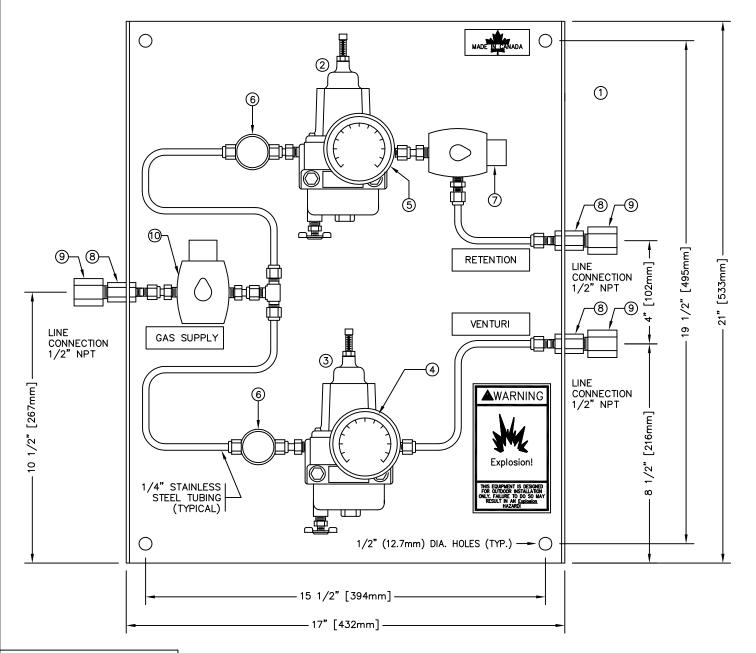
8-1/2" 'NOMINAL'

08/03/2013 www.varec-biogas.com

SCALE: NONE SHEE® of OFD4

NOTE:

- 1. ASSEMBLY MUST BE SECURELY CONNECTED TO PLANT ELECTRICAL GROUND SYSTEM.
- 2. USE WITH NATURAL GAS OR PROPANE AT 10 PSI OR HIGHER ONLY.
- 3. VALVE AND REGULATOR PANEL NOT COMPLETELY ENCLOSED.



ITEM	QTY	DESCRIPTION
1	1	BACKPLATE ONLY: CARBON STEEL
2	1	PRESSURE REGULATOR 0-30 PSI
3	1	PRESSURE REGULATOR 0-60 PSI
4	1	CONTINUOUS PILOT LINE GAUGE 0-30 PSI
5	1	RETENTION LINE GAUGE 0-15 PSI
6	2	NEEDLE VALVE
7	1	RETENTION LINE SOLENOID VALVE, XP, F/O
8	3	1/4" FMPT BULKHEAD CONNECTOR
9	3	1/4" MNPT TO 1/2" FNPT ADAPTOR
10	1	GAS SUPPLY LINE SOLENOID VALVE, XP, F/C

REFERENCE DRAWINGS:

R-804-00-BOM

R-804-00-BOM-SS FOR ALL STAINLESS STEEL

R-804-00-BOM-50 FOR 240V/50Hz

REPLACES 20-07827

REV.	DATE	DESCRIPTION	BY	CHK.	APP.
0	92/12/09	ISSUED FOR CONSTRUCTION			
1	93/07/29	RE-ISSUED FOR CONSTRUCTION			
2	94/06/29	RE-ISSUED FOR CONSTRUCTION			
3	97/04/23	RE-ISSUED FOR CONSTRUCTION	HAS		

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LIENT:	JOB #
xxx	JOB # XXX
TLE: 244WS LOCAL START AUTOMATIC /ALVE AND REGULATOR PANEL, F/C	CLIENT # XXX
-GENERAL LAYOUT	REV.#
wg.#: R-804-00	3

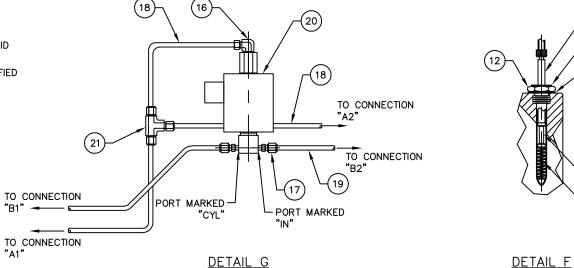
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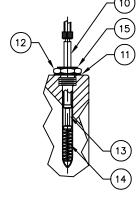
NOTES: 1. LOCATE UNIT WITHIN 15 FT [4.6 M] OF WASTE GAS BURNER. 2. MAXIMUM WORKING PRESSURE: 5 PSIG [34 KPa]

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(MINIMUM DISTANCE 10 FT [3.0 M] UPSTREAM OF REGULATOR). 4. THE SOLENOID VALVE VOLTAGE DATA IS DEFINED BY THE SOLENOID VALVE OPTION CODE SPECIFIED BY MODEL NO.

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7	BY-PASS BRACKET	ALUM.
8	HEX HD. CAP SCREW NOTE 5	ZN PL STEEL
9	HEX HD. CAP SCREW	SS
10	PUSH ROD	304 SS
11	GASKET	RED FIBER
12	FUSE WELL ASSEMBLY	ALUM./304 SS
13	FUSE	260° METAL
14	SPRING, FUSE WELL	304 SS
15	WASHER	304 SS
16	90° TUBING CONNECTOR	ALUM.
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19	VENT TUBE	ALUM.
20	3-WAY EXPLOSION PROOF SOLENOID VALVE, N.C.	SST.
21	TEE TUBING UNION	ALUM.

A III	NE CONNECTION	SEE NOTE 4 CONNECTION "A1" SEE DETAIL F CODE 1 N/A 2 110V/ 3 220V 4 SPEC

SEE NOTE	Ξ 4		
CODE		SOLENOID	VALV

CODE	SOLENOID VALVE VOLTAGE
1	N/A (SOLENOID VALVE NOT REQUIRED)
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SEE NOTE 4

SIZE		Α	В	С	D
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10"	IN	46 1/2	8	36	63 7/8
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12"	IN	50 5/8	11	36	67 7/16
	mm	1286	279	914	1713
	<u> </u>				

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DRAWN BY: C. TOKAR 87/12/08

CHECKED BY: HJB 87/12/23

APPROVED BY:

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CUSTOMER: S/0 NO.:

P.O. NO.: PROJECT:

TAG NO.:

SET PRESSURE: SERIAL#: CATALOG NO.

TITLE:

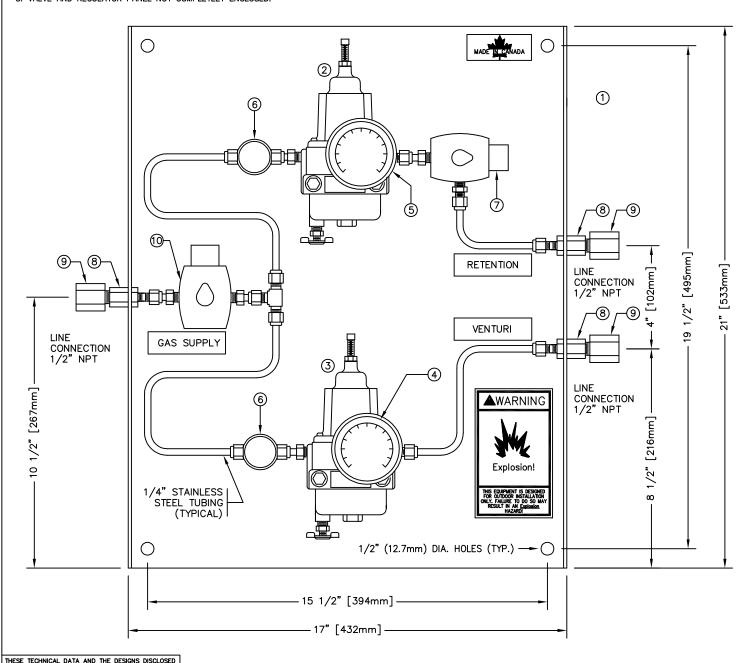
440 SERIES PRESSURE RELIEF & FLAME TRAP

DWG. NO. C6096 REV. NONE SCALE: SHEET 1 OF 1

Q-Pulse Id: TMS220 08/03/2013

NOTE:

- 1. ASSEMBLY MUST BE SECURELY CONNECTED TO PLANT ELECTRICAL GROUND SYSTEM.
- 2. USE WITH NATURAL GAS OR PROPANE AT 10 PSI OR HIGHER ONLY.
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	5	1	RETENTION LINE GAUGE 0-15 PSI
	6	2	NEEDLE VALVE
	7	1	RETENTION LINE SOLENOID VALVE, XP, F/O
	8	3	1/4" FMPT BULKHEAD CONNECTOR
	9	3	1/4" MNPT TO 1/2" FNPT ADAPTOR
	10	1	GAS SUPPLY LINE SOLENOID VALVE, XP, F/C

REFERENCE DRAWINGS:

R-804-00-BOM

R-804-00-BOM-SS FOR ALL STAINLESS STEEL

R-804-00-BOM-50 FOR 240V/50Hz

REPLACES 20-07827

	3	97/04/23	RE-ISSUED FOR CONSTRUCTION	HAS		
	2	94/06/29	RE-ISSUED FOR CONSTRUCTION			
	1	93/07/29	RE-ISSUED FOR CONSTRUCTION			
	0	92/12/09	ISSUED FOR CONSTRUCTION			
ĺ	REV.	DATE	DESCRIPTION	BY	снк.	APP.

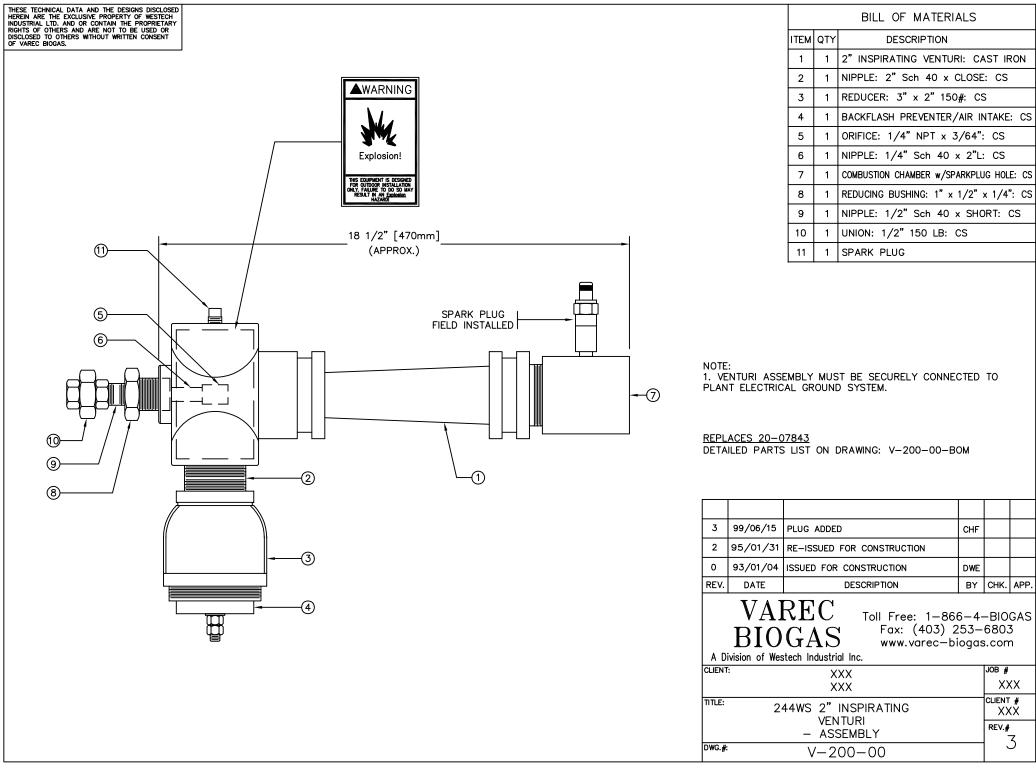
VAREC BIOGAS

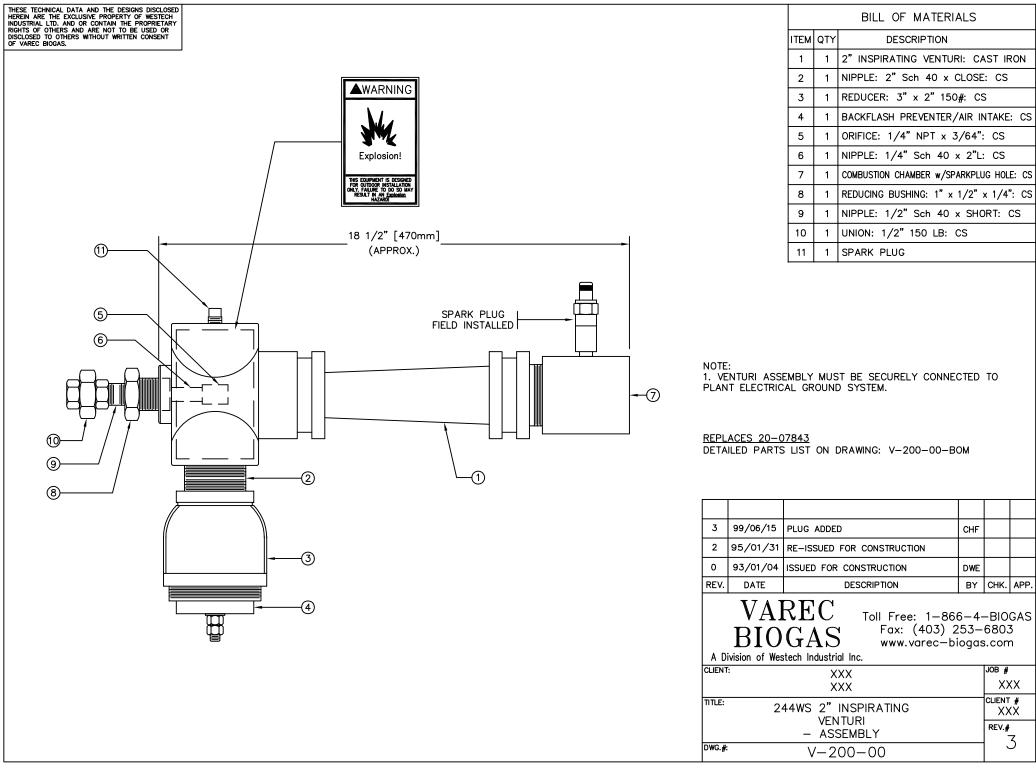
Toll Free: 1-866-4-BIOGAS Fax: (403)253-6803 www.varec-biogas.com

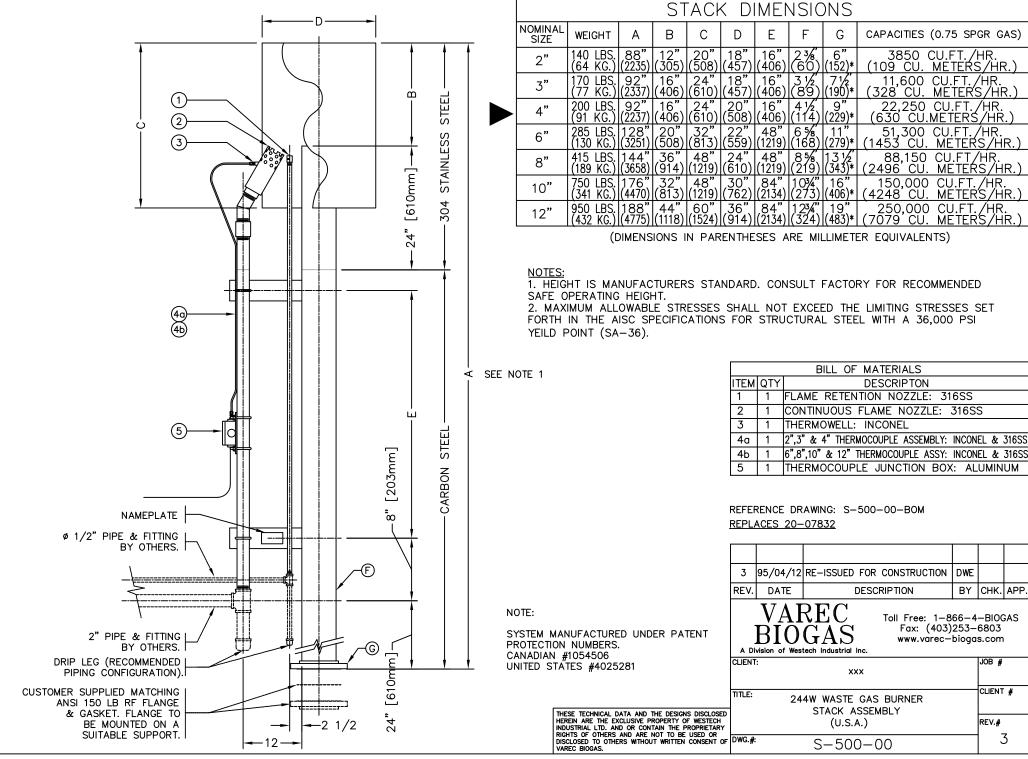
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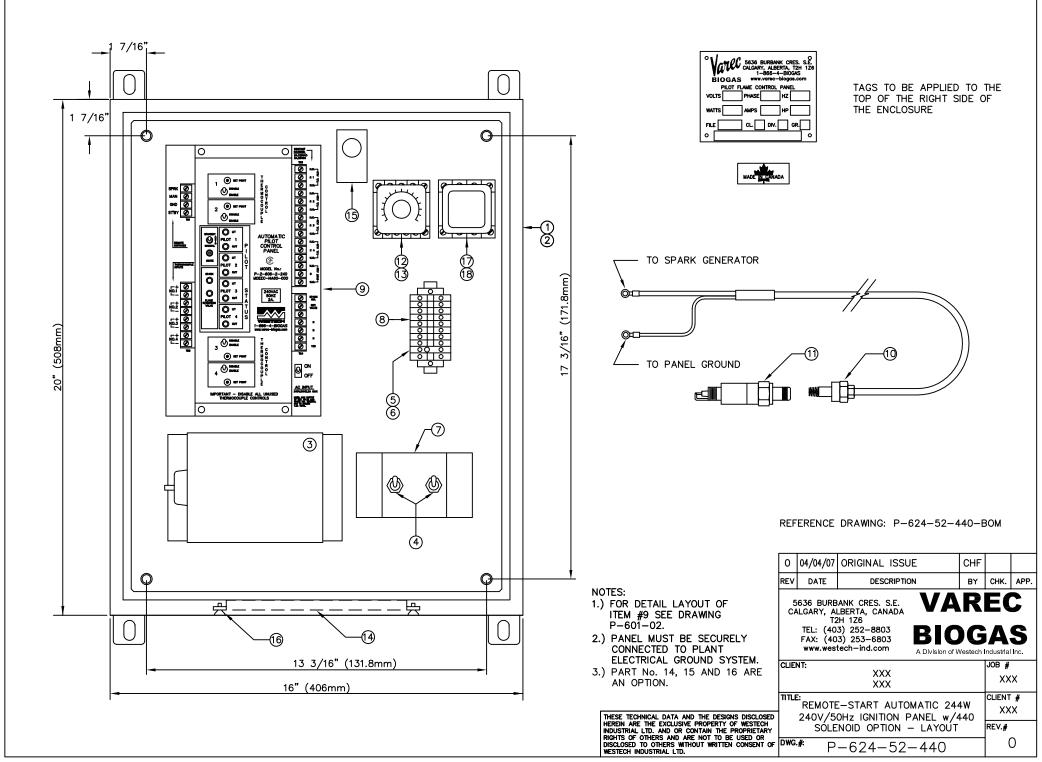
LIENT:	JOB # XXX
xxx	XXX
ITLE: 244WS LOCAL START AUTOMATIC /ALVE AND REGULATOR PANEL, F/C	CLIENT # XXX
-GENERAL LAYOUT	REV.#
wg.#: R-804-00	3

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1.3. Eiectrical Drawings

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Q-Pulse Id: TMS220

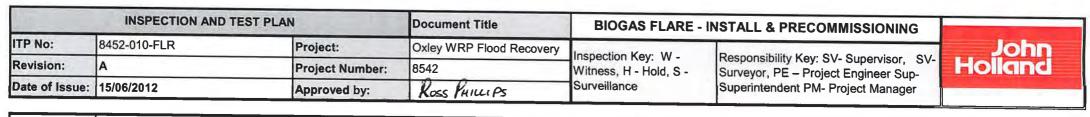
10. REMOTE START SIGNAL INPUT FROM PRESSURE SWITCH OR PLANT PLC FIELD INSTALLED TO TB-5 TERMINALS 8 & 9.

08/03/2013

^{DWG.#}20244-003WS60103-037

2. Quality Assurance

2.1. Inspection & Test Plans



			Verifying			Verify or Te	st by		
Item No.	Activity Details	Reference Procedure	Document of		JHO			QUU	Remarks/Records
		Troocdare	Report incl check sheet number.	Key	Resp.	Sign/Date	Key	Sign/Date	
1.01	Biogas flare mechanical installation complete	NA	Refer to Tyco mechanical installation report	w	PE	R. Helyr 15/6/12			
2.01	Biogas flare electrical installation complete	NA	Refer to Tyco pre- commissioning site acceptance test report	W	PE	30/5/12			
0.01	Biogas flare pre-commissioning complete	NA	Refer to Tyco pre- commissioning site acceptance test report	w	PE	30/5/12			
4.01	Gas line pressure test complete	NA	Refer to Gasworks pressure test report	w	PE	27/4/12			
	Biogas line audit complete	NA	Refer to Gasworks audit report	w	PE	D. Mily 5/6/12			
	Biogas flare system ready for commissioning	NA	NA	Н	PE	R-Helly 15/6/12			

NAME SIGNATURE DATE			NAL APPROVAL FOR CLOSE OUT OF ITP	FIN	
		DATE	SIGNATURE	NAME	
Ross PHILLIPS R. Relly	16/2012	15/6/2012	D. Kelly	Ross PHILLES	JH

2.1.1. Mechanical/Pre-commissioning Checksheets



Introduction

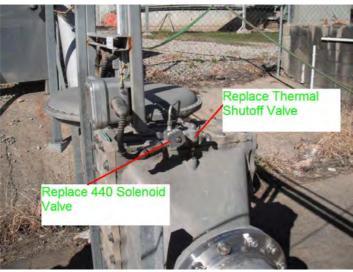
In May 2012 Tyco Flow Control was engaged by John Holland to install, pre-commission and commission all equipment associated with the biogas flare which was purchased under the Oxley WRP Flood Recovery contract. In addition, while on site Tyco was to recondition the 440 diaphragm valve under contract to Queensland Urban Utilities.

This report covers the mechanical works associated with installation of the equipment. Commissioning of the flare is to be performed when biogas is available from the anaerobic digesters.

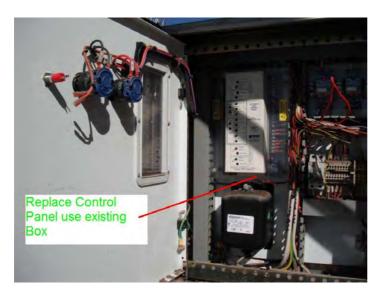
Scope

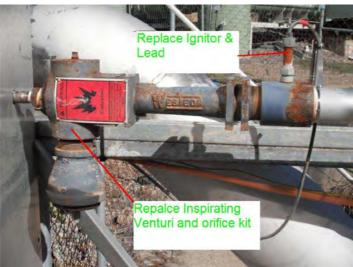
The scope of works is broadly shown in the following photos:

















General Comments

During works what became evident was a lack of regular maintenance to the flare system, particularly the primary safety devices – the flame arrestor thermal shutoff valve's solenoid valve on the 440 valve and the backflash preventer on the inspiriting venturi.

It is Tyco's opinion that the flare would not have been operating efficiently and they suspect that this would have caused problems with the entire biogas system of which the flare is a critical part. When Tyco attend site to commission the new flare system it is their intention to not only train the plant's operators, but also to put forward a maintenance plan to keep the flare operating safely and efficiently. This plan will include a list of spare parts recommended to be kept on site.



Works Performed

The following table details the works performed and any comments specific to those items:

Item	Description	Drawing Number	Comments
1	Varec Biogas 244WS Flare System Model 244WS 0 3 4 2 1 0 R	244W VB10	Installed as per all requirements.
2	New flare stack with thermocouple, pilot nozzle, pilot wiring , junction boxes and gasket	S 500 00	The existing flare stack had a large quantity of scale in the bottom as well as water. The scale we concluded was not from the flood but years of operation and may have reduced the efficiency of the flare.
3	New valve and regulator package for pilot	R 804 00	The valve and regulator package was changed.
4	New inspirating venturi for pilot c/w new ignitor and high tension lead	v 200 00	The existing inspirating venturi was significantly corroded and was not operating correctly. This item works as a backflash preventer as well and hence the system would not have been operating safely.
5	New electronic controller fitted into existing control cubicle	P624 52 440	The standard Varec Controller was modified to match the wiring modifications performed on the existing controller.
6	New solenoid valve on Varec 440 valve	440 2 12	The solenoid valve was changed over however, due to modifications and a lack of maintenance, we feel that this would not have been operating correctly.
7	New flame arrester insert for Varec 440 valve with gasket	440 2 12	The existing flame arrester insert was beyond cleaning or repair. It was fused together by the biogas solids and had to be "forced" out of the housing. The condition of the insert was not due to the flood but instead to a lack of maintenance. An arrester in this condition will not function correctly and will also provide a major pressure loss and flow restriction.
8	New thermal shutoff relief valve fitted to Varec 440 valve	440 bypass valve	The thermal shutoff valve was jammed in position and some of the piping had been disconnected. The unit could not have operated as designed in this condition. This presents a major problem as the thermal shutoff valve and flame arrestor together act as the primary safety item for the flare system and in this condition would not have been operating correctly.

2.1.2. Electrical Checksheets





Process Automation

Oxley Creek STP GAS Flare Maintenance

Pre-Commission Site Acceptance Test

Revision 1.01

25 May 2012

This document and attachments contain confidential information and is to be treated as Commercial-In-Confidence, Copying or disclosure to a third party is prohibited without prior consent in writing from Tyco Flow Control

Order Number:

1 6





Process Automation

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tycoFlow Control

Process Automation

REVISION HISTORY

Description	By	Chk	Approved	Date
Initial document	SH	RR	RR	
Adjusted document	几	SH	VV	28 Apr 12
	Initial document	Initial document SH	Initial document SH RR	Initial document SH RR RR



Flow Control

Process Automation

1 REFRENCES

Varec BIOGAS 244WS Series IOM Rev C March 2011

2 DEFINITIONS

The following terms, abbreviations and acronyms are used:

- FAT Factory Acceptance Test.
- · Pre-FAT Internal test in preparation for FAT.
- SAT Site Acceptance Test.
- MCB Miniature Circuit Breaker.

3 Purpose

The purpose of this document is to provide a test procedure used to ensure all hardware is tested adequately and the results are documented. Full functional tests shall be carried out during commissioning.

4 Scope

This document applies to the Oxley Park STP GAS Flare Site Acceptance Test.

5 Strategy

The SAT test will be carried out upon completion of Flare upgrade work. The SAT test will be witnessed by Customer representative.

6 Documentation

Results of testing shall be recorded in this document by ticking each successfully tested sequence step as required. At the completion of each test a sign off area is provided. Any testing errors, notes, or observations that require further investigation shall be annotated on the log file sheets. A cross reference needs to be made between the test and the log file sheet entry.

Any tests may be signed off as untested or additional tests may be performed with agreement of all parties, and documented on the additional test sheets.





Process Automation

7 Procedures:

All test procedures are contained within the appendices. A general overview of the tests which may be performed under each test section is given below.

7.1 Hardware test

Where appropriate this will include but is not limited to:

Visual and instrument test

7.2 Flare electronic Controller Functional Test

Where appropriate this will include but is not limited to:

- · Interlocks.
- Indication leds.

(Tests to be performed with reference to relevant documentation).

7.3 Additional Tests

This will include:

Any agreed tests not elsewhere documented.

(Tests to be performed with reference to relevant documentation).

7.4 Outstanding Issue Log Sheets

- Failed tests.
- Required changes to configuration.
- · General comments for consideration.

7.5 Conclusion

When all tests have been performed all parties are required to sign the Acceptance Signoff Sheet.





Flow Control

Process Automation

8. Flare Visual check

Project Number	•	System: Bio Gas Flare	
Cabinet ID: Assembler:	Burner Control Cabinet Jeff Leevers	Unit/Area: Oxley Creek	
Date:	27 Apr 2012		

INSPECTION ITEMS

	DESCRIPTION	INITIALS	DATE (dd- mmm-yy)
1	MCB's, fuses, switches labeled		111
2	Warning labels applied		
3	Wiring labeled		-
4	Discrimination between cabinet protective devices and supply cabinet protective device	11	30/5/12
5	All external holes in cabinet blanked off or accounted for on install	37	30/5/12
6	Adequate ventilation for install environment	11	30/5/16
7	Main isolator and Emergency Stop button operates adequately	1	30/3/10
8	All cable sizes correctly rated	17/	30/5/10
9	LV and ELV segregated	1	30/3//
10	All devices tightly fastened	1	30/5//3
11	Point-point wiring check carried out as per drawings	71	30/3/12
12	Drawing equipment schedule updated	00	30/5/12
13	Updated set of drawings provided with cabinet (sleeved or laminated)		
14			
15			





Flow Control

Process Automation

9. Electrical Testing

TEST METERS USED:

Туре	S/N	Cal Due Date
Fluke 789 continuity meter/volt meter	101824	07/07/12
Kyoritsu insulation tester	0116568	10/09/12

EARTH CONTINUITY TEST RESULTS (Ω):

E bar to panel	0.2Ω
E bar to panel internal door	0.2Ω
E bar to panel external door	0.3Ω
E bar to Solenoid panel	0.2Ω
E bar to piping	0.3Ω

FIELD CABLE TEST RESULTS:

CABLE	DEVICE	TEST	VALUE
FCV 62832	Solenoid 440	Insulation	∞MΩ
	Valve P/N EAB314G121	Earth Continuity	0.3Ω
	Solenoid P/N EA8003G1	Phase-Neutral Continuity	357Ω
		Earth Screen Continuity	0.2Ω
		Voltage Polarity	N/A
	Junction Box	Earth Continuity	0.3Ω



TycoFlow Control

Process Automation

TE-62818	Thermocouple	Earth Continuity	0.4Ω
	Type K	Pos-Neg Continuity	23Ω
		Ambient Voltage	3mV
		Meter Temperature Reading	26°C
BE-62822	High Tension Lead	Insulation	∞MΩ
		Earth Continuity (screen)	0.3Ω
		Conductor Continuity	4.5Ω
FCV 62815	Retention Solenoid	Insulation	∞MΩ
	Valve P/N EAB320A200	Earth Continuity	0.2Ω
	Solenoid P/N EA8003G2	Phase-Neutral Continuity	299Ω
		Earth Screen Continuity	0.4Ω
		Voltage Polarity	2470
FCV 62810	Gas Supply Solenoid	Insulation	ωMΩ
	Valve P/N EAB320A201	Earth Continuity	0.2Ω
	Solenoid P/N EA8003G2	Phase-Neutral Continuity	302Ω
		Earth Screen Continuity	0.3Ω
		Voltage Polarity	2471



Flow Control

Process Automation

CABINET POLARITY TEST RESULTS (V):

Φ to N	Φ to G	N to G
247V	247V	OV

10. Functional Test

		Procedure	Results	
1	Switch on the Main Isolator	 Close all Gas isolating Valves Switch off the following switches RSSS Main power toggle switch Electronic Controller switch Check for 240Vac at the terminals 2& 2A on TB 5 	240VAC	3
2	Switch ON the Electronic controller	 Switch on the Power toggle switch Switch on the toggle switch on the electronic controller Put 3 position selector switch into Manual mode 	Pilot 1 Red Led ON	ď
3	Switch ON RSSS switch	Switch on the RSSS toggle switch	Pilot 1 Red Led ON Flame retention Valve Led On Flame retention solenoid energised	d

				Oxley Creek STP ST22 Sludge Treatme	ent (Biogas Flare) General			
PROFI PROCESS FIELD BUS BUS Competence Centre		Oxley Creek STP GAS Flare Maintenance Pre-Commission Site Acceptance Test				Flow Control Process Automation		
4	Measure ther	mocouple m\	V	Measure mV across t of thermocouple	the terminals	3	mV	9
		Instruct		perform unstructured testing.				
1	tem			Procedure	Check	Comment		
2								
3								
4								
5								
6								
7								
8								
0								
	12. O	utstand	sel gnit	ue Log				
tem			110.00		Rectificat	ion	ls a m	
No	Test Reference	Name	Date	Description	Name	Date	Witness Signature	Date



12

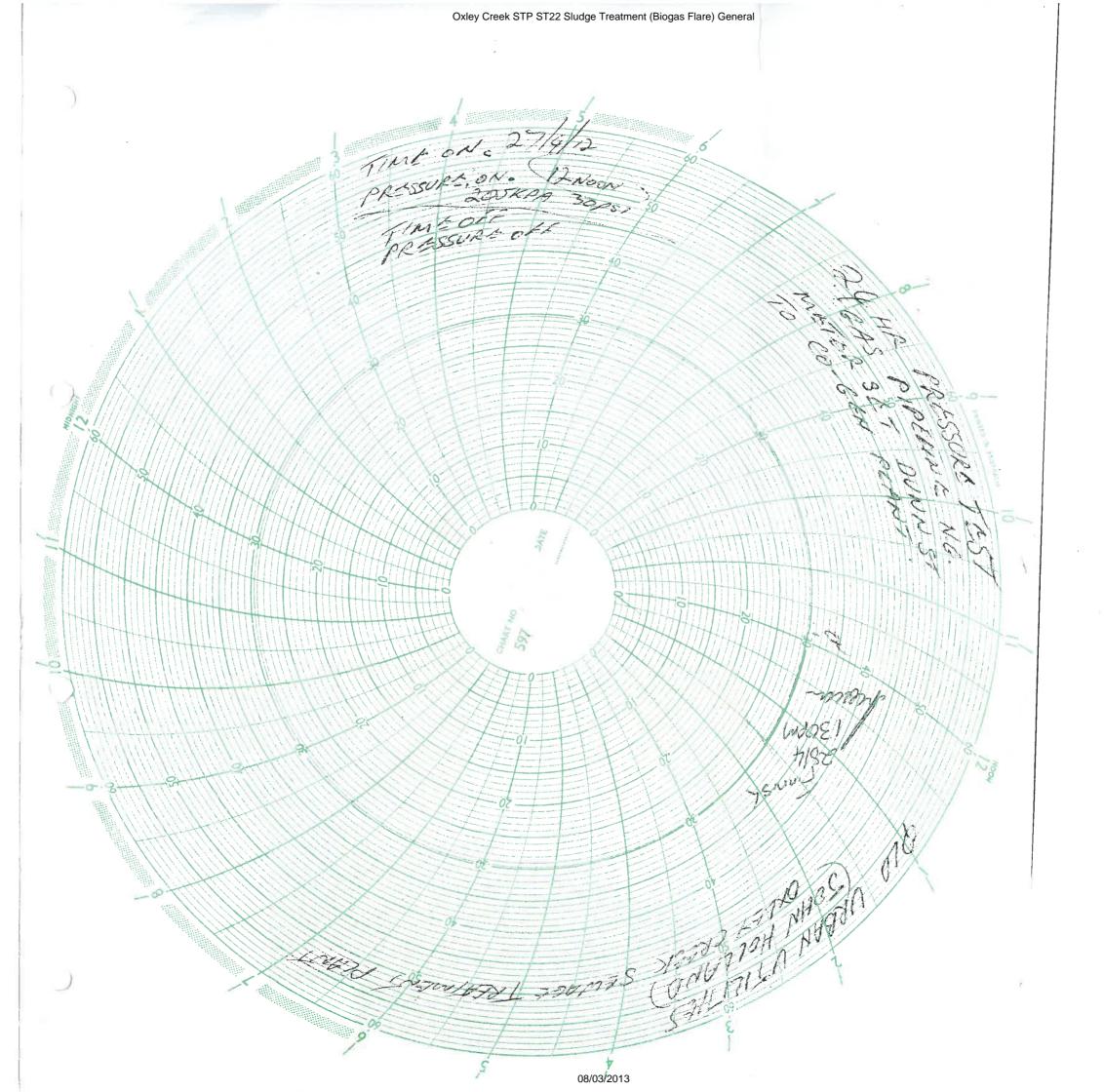
Oxley Creek STP GAS Flare Maintenance Pre-Commission Site Acceptance Test



Process Automation

1;	3. Acceptance S	Sign-off		
INSPECTIO TPA Rep.:	N PERFORMED BY:	sign:	date: 30/5/12	
Test witness	sed by:			
Rep.:	print:	sign:	date:	
Test ACCEP	PTED BY:	Fully	CONDITIONALY:	
	o.: print: N. DUPROE HBELS TO 13E ADDED. EL	sign: Decom	date: <u>30/5/12</u>	
				_

2.1.3. Gas Line Pressure Test Report





708507

Gas System Compliance Certificate

Section 734 (3) Petroleum and Gas (Production and Safety) Act 2004

Owner operator			Please print	clearly and use BLOCK LETTERS
Name of owner/operator of gas system				
Brisbane City Co	,			25
Donald Son Rol	Osley Crack	- (Rock	(ea)	,
	n of gas system (if mobile e.g. cara			
	-			
Details of gas system install	led and installation	work done	•	If insufficient space attach list
Gas device type: Type A Type	B (pro	ovide details)		
F type: Natural gas LP				
Gas supplier (if known):	PA.			
Appliance type (modify as required)	Make/model (e.g. Rheem 87102		ias Device Appro e.g. AGA1234 o	oval number r Type B Certificate 00123)
Cooker:				
Water heater:				
Other:				
Other:				
on multi-stage systems) Cocco Gas work (detail gas work undertaken)	Sketch	es No (if desired provide of device and pipe		No. work undertaken including
Prosecre test 110mm 300 live From Make to Boilar House Risa tested with Nitrogan 24ths (seechant les Passed,	a Station			
Licensed/authorised installe	er			
I hereby certify that the gas system listed above, a Petroleum and Gas (Production and Safety) Act 20		the safety requiren	nents and other	relevant provisions of the
Name of licensed/authorised person	Please print clearly	Licence/authori	sation no.	Phone number
Kent Vickens		A088	4	ex18883959
Address of licensed/authorised person				
21 Coolcrest St	DaisyHill			
: yture	Date			_
Auth	30/4/12.		be used for a ga n vehicles or ves	s system that supplies fuel ssels

Department of Employment, Economic Development and Innovation, Approved Form Number PGA734 — Version Number 4, Form FDU1423 (05/10)

White - Owner Green - Network operator Pink - Book copy

© State of Queensland

2.1.4. Biogas Line Audit Report



GASWORKS INDUSTRIAL PTY LTD

PO BOX 716, Morningside Qld 4170

KENT VICKERS: 0418 883 999 Office (07) 3909 9943 Fax (07) 3399 5100

Email: desleyc@gasworks.com.au

ABN: 14 310 406 932

5th June 2012

QUEENSLAND URBAN UTILITIES

Oxley Creek Sewerage Treatment Plant John Holland Work Site Upgrade of Biogas line

Audit of Biogas Line: A. Maloney, C. Cook - Gasworks Industrial Pty Ltd

<u>Digester 1:</u> (4 compressors)

- Stainless steel pipe work in good condition Yes
- 4 new compressors being installed.
- Compressors- inlet low pressure lockout installed. Outlet High pressure lockout installed and high gas temperature lock out installed.
- Electrical components etc. look to be in good condition.
- Relief valve on outlet 25mm brass (Gerhard Gotze). Reliefs to inlet recycle to Digester set 150 kpa.
- Compressor set 80-100 kpa.
- ** The Relief Valve is new and looks to be good quality and suitable for the task.
- ** Labeling required on pipe work Biogas direction of flow and working pressure.

Digester 2: (4 compressors)

Stainless steel pipe work in good condition - Yes

- 4 new compressors being installed.
- Compressors- inlet low pressure lockout installed. Outlet High pressure lockout installed and high gas temperature lock out installed.
- Electrical components etc. look to be in good condition.
- Relief valve on outlet 25mm brass (Gerhard Gotze). Reliefs to inlet similar to a bypass valve.
 Recycle to Digester set 150 kpa.
- Compressor set 80-100 kpa.
- ** Relief Valve is new and looks to be good quality and suitable for the task.
- ** Labeling required on pipe work Biogas direction of flow and working pressure.

NOTE: 1-25mm gal mal socket and plug fitted at sediment trap drain point. (Upgrade not complete)

GASWORKS INDUSTRIAL PTY LTD

PO BOX 716, Morningside Qld 4170

KENT VICKERS: 0418 883 999 Office (07) 3909 9943 Fax (07) 3399 5100

Email: desleyc@gasworks.com.au

ABN: 14 310 406 932

-2-

Digester 3: 3 compressors to be installed.

Work on upgrade of Bio Gas lines and compressor renewals have not been started.

Welded spiral wound stainless steel pipe -

- 3" pipe goes the full circumference of the digester tank.
- 4" Pipe goes vertical up 6 metres. There is in some places of the spiral pipe at compressor rooms etc. where this pipe has been replaced. Visual inspection shows pin holes in this pipe (Spiral wound) in various places. This pipe MUST BE replaced.

It was mentioned that if welded spiral wound pipe is to be replaced. It would be done in the same manner as Digester 1 & 2 pipe work would only need to be connected between the 3 compressors.

Digester 4: 3 compressors, upgrade has not started.

Welded spiral wound stainless steel pipe -

- 3" pipe goes the full circumference of the digester tank.
- 4" Pipe goes vertical up 6 metres. There is in some places of the spiral pipe at compressor rooms etc. where this pipe has been replaced. Visual inspection shows pin holes in this pipe (Spiral wound) in various places. This pipe MUST BE replaced.

Welded 3" spiral wound stainless steel pipe has pinholes and holes in it at various places a lot more than Digester 3. This pipe <u>MUST BE</u> replaced.

Biogas overhead pipe work:

It is recommended for all of the Biogas lines that extra labels with directional arrow and working pressure be installed.

Biogas line to/at generator:

It was mentioned that the generator upgrade may be 12 months or more before refurbishment/upgrade is to be started.

- 1. Recommend a "flange spade" be installed at inlet butterfly valve that is locked off and tagged.
- 2. There is a large water knockout pot made of Polyethylene on the inlet supply to the generator. There is no other polyethylene pipe or fittings anywhere else on the Biogas line.

During the upgrade of the generator plant etc. it is recommended that the knock out pot be:

- 1. Removed
- 2. Smaller version of a water knockout pot be made in stainless steel as it is mentioned in the <u>Gas Codes</u> that the Polyethylene not be used above ground.

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KENT VICKERS: 0418 883 999 Office (07) 3909 9943 Fax (07) 3399 5100

Email: desleyc@gasworks.com.au

ABN: 14 310 406 932

-3-

Flare Burner:

The upgrade/replacement is of good workmanship. Only recommendation is that the pilot line regulators have two downwards facing vent screen elbow installed to stop water and insect ingress into the breather vent (diaphragm area).

Boiler gas supply:

Biogas line upgrade is in progress. Natural gas line connection has been completed.

- 1. The gate entrance to this area needs to be pinned when left hand gate open. Pin the left hand gate so as it does not swing across and block access to the Emergency Manual shut off/isolation valve to boiler. The alternative to this would be to relocate the emergency isolation valve to a more accessible location
- 2. Long grass and temporary fencing also needs to be removed to improve access.
- 3. Signage and labeling is okay.

All hot water systems on site are electric or heat pump – Yes.

Pressure test:

Recommend a pressure test be done on the main line of the Biogas Network.

- 1. Lock A air pressure test to 1.4 times MAOP of the biogas line, between valves and do a 4 hour minimum drop test.
- 2. Using Air a 24 hour pressure test at 1.4 times the working pressure.

Note: Confirm the decommissioned bio gas lines – line is already open or has been opened to the atmosphere during the shutdown. There is no gas in the Network? The line has been dead a long time.

Summary:

- Condemn all welded spiral wound stainless steel Biogas pipe work.
- * Recommend pressure test on Biogas line.
- Labeling of all of Biogas lines to be completed upgraded.
- Spade off line to generator.
- Pin opening position of gates to Co-gen area or relocate Emergency Isolation valve.
- Fit screens in pilot regulator vents on flare valve train.

3. Operation & Maintenance Manuals

3.1. Varec Biogas 244W Series Waste Gas Burner with Automatic Pilot Operation System



VAREC BIOGAS 244W Series

244WS Option
Waste Gas Burner With
Automatic Pilot Ignition System

INSTRUCTION, OPERATION AND MAINTENANCE MANUAL

June 1, 2005

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244WS Waste Gas Burner with Automatic Ignition System

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Q-Pulse Id: TMS220

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244WS Waste Gas Burner with Automatic Ignition System

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Section 1 - GENERAL INFORMATION

1.1 DISCLAIMER OF WARRANTIES

The contract between Varec Biogas and our customer states Varec Biogas' entire obligation. The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship between Varec Biogas and our customer. There are no express or implied warranties set out in this instruction manual. The only warranties that apply are those in the existing contract between Varec Biogas and our customer.

The Varec Biogas244W Waste Gas Burners, subsequently referred to as 244WS, have not been tested by Varec Biogas under all possible operational conditions, and Varec Biogas does not have all the data relative to your application. The Waste Gas Burner supplied is designed to burn continuously biogas of a 0.8 specific gravity at approximately 60°F (15°C). Flow rates and temperatures in excess of the specified maximum as provided in this manual may affect overall performance of the burner, and is not covered under manufacturer's warranty. The warranty only applies if the waste gas burner is operated within the burner's inherent design parameters.

Varec Biogas warrants that the waste gas burner will burn efficiently the hydrocarbons in the waste gas stream for the process conditions specified. Varec Biogas does not provide any performance guarantee. All installed component warranties are passed on and are not underwritten by Varec Biogas.

The information in this instruction manual is not all-inclusive. This document has not taken into account all unique situations that may exist. Consequently, you should review this manual in view of your application. If you have any further questions, please contact Varec Biogas for assistance.

1.2 LIMITATIONS OF SELLER'S LIABILITY

If it is determined that this instruction manual created some new warranties, Varec Biogas' liability shall be limited to repair or replacement under the standard warranty clause. In no case shall Varec Biogas' liability exceed that stated as Limitations of Remedy in the contract between Varec Biogas and our customer.

1.3 SAFETY PRECAUTIONS

READ AND UNDERSTAND THIS INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR PERFORMING MAINTENANCE ON VAREC BIOGAS 244WS WASTE GAS BURNER.

FOLLOW ALL PRECAUTIONS AND WARNINGS NOTED HEREIN WHEN INSTALLING, OPERATING OR PERFORMING MAINTENANCE ON THIS EQUIPMENT.

Safety Precaution Definitions:

CAUTION

Damage to equipment may result if this precaution is disregarded.

WARNING

Direct injury to personnel or damage to equipment that can cause injury to personnel may result if this precaution is not followed.

1.4 DESCRIPTION

OPTION

This manual describes the installation, operation and maintenance of the Varec Biogas 244WS Series of waste gas burners. The manual differentiates between the following options:

LOCAL START	Local Start, automatic ignition mode
REMOTE START	Remote Start, automatic ignition mode
VENTURI	Venturi Driven Pilot (Above 10 psig)
BLOWER	Blower Driven Pilot (Below 10 psig)

DESCRIPTION

* NOTE

Every step in this manual shall apply to the unit purchased unless otherwise specified for a particular option.

- The Varec Biogas 244WS Series Waste Gas Burner incorporates a patented automatic pilot ignition system to consistently burn biogas of low BTU values. Pilot gas is mixed with air drawn-in by either:
 - a. An inspirating venturi; or

b. A blower.

Air and pilot gas are mixed to the proper air/gas ratio, resulting in a stoichiometric non-smoking continuous pilot flame.

- 2. The pilot system can be operated in:
 - a. **"LOCAL START" mode** The pilot flame is monitored by a thermocouple and automatic unattended re-ignition is provided should the pilot flame fail; or
 - b. "REMOTE START" mode Pilot fuel is conserved because intermittent pilot operation is controlled by the plant biogas pressure or other parameters.
- 3. The system consists of the following:
 - a. Burner assembly
 - b. Control panel
 - c. VENTURI DRIVEN PILOT
 - Valve and Regulator Panel
 - ii. Inspirating venturi assembly

Or a:

BLOWER DRIVEN PILOT

- i. Blower Regulator Panel.
- d. A pressure switch or dry contacts are provided for the "REMOTE START" feature.

1.5 DEFINITIONS

- "Remote Start Time Delay Relay" is an adjustable time delay relay located between a biogas manifold pressure switch and the electronic control module. The purpose of the relay is to eliminate nuisance switching and false ignition starts.
- "AUTO" position of the three-position switch on the controller allows for an automatic ignition and re-ignition with appropriate control and alarm functions
- "Remote Start Simulator Switch" (RSSS) is a manual switch wired in parallel with a remote switching source like a pressure switch in the biogas manifold. Its purpose is to bypass the remote pressure switch during commissioning of the system.
- "Remote Start" system refers to a pilot system which can be turned on and off by a remote source like a biogas manifold pressure switch or a plant signal prompting contact closure on the burner controller. This system when switched

- on from the remote source will also re-light automatically if required while the system is in the "ON" position.
- **"BLOWER"** driven pilot system utilizes a blower to mix and move the combustible pilot gas/air mixture into the pilot nozzle when the pilot gas supply pressure is below 10 psig (70 kPa) but greater than 6 inches WC (150mm WC), which is too low for standard venturi operation.
- "Controller Three-Position Switch" is located on the controller. It sets the controller to "Stand-by", "Auto", "Manual" modes.
- "Flame Retention Gas Supply" is an intermittent gas supply controlled by the flame retention nozzle solenoid valve and is required for the ignition sequence.
- **"MANUAL"** switch position on the controller allows the operator to ignite the pilot manually, and to allow the pilot system to operate in a lit mode with the re-ignition feature disabled.
- **"Manual local start"** system operation refers to a pilot system, which is locally turned on and off. The continuous pilot will re-light automatically if required while the system is in the "ON" position and the three-position selector switch is switched to the "AUTO" position.
- "Regulator Panel Gas Supply" is the main gas supply for both the continuous and retention nozzles. When this solenoid valve is closed all pilot operation is terminated.

*NOTE

If this solenoid valve is supplied in a fail-open mode (venturi option only), the continuous pilot on a venturi system will continue to stay lit during a power failure operation.

"Stand By" switch position on the controller allows the controller to be placed in a stand-by mode with live electronics while isolating the thermocouple inputs and alarms. The controller can be switched between "AUTO" and "STAND-BY" from a remote source allowing "Remote Start".

*NOTE

This is different from the "**ST'BY**" contact found on TB1 of the controller. This allows the automatic unattended re-ignition in case; (a) the pressure falls below the pressure switch setting or there is no contact change-over in the control panel; and (b) the pilot is lost.

"VENTURI" driven pilot system utilizes a venturi to mix and move the combustible pilot gas into the pilot nozzle for applications when the pilot gas supply pressure is above 10 psig.

1.6 SPECIFICATION

1.6.1 Burner

The burner assembly mounts on a mating flange (supplied by others) and is self-supporting. The assembly includes:

- a. Burner
- b. Continuous pilot nozzle complete with thermowell and thermocouple
- c. Flame retention nozzle
- d. Burner shroud.

Refer to the 244WS Waste Gas Burner Stack Assembly drawing provided in Section 9 of this manual.

1.6.2 Burning Capacity

For gas having specific gravity 0.8 with 0.5" W.C. pressure drop between inlet flange and burner tip.

BURNER SIZE	FT ³ /HR. MAXIMUM FLOWS	M³/HR. MAXIMUM FLOWS
2"	3,850	109
3"	11,600	328
4"	22,250	630
6"	51,300	1,453
8"	88,150	2,496
10"	150,000	4,245
12"	250,000	7,075

1.6.3 Combusted Gas

Biogas, primarily methane of low BTU content. Minimum inlet pressure 0.5" W.C. (12 mm).

1.6.4 Pilot Gas

VENTURI	BLOWER
Propane	
Natural Gas	Natural Gas
Minimum pressure of 10 PSIG	Minimum pressure of 6" W.C.
(70 kPa)	(150mm WC)
Maximum pressure of 35 PSIG	Maximum pressure of 10 PSIG
(245 kPa)	(70 kPa)

1.6.5 Physical Dimensions

a. Burner

BURNER SIZE	OVERALL HEIGHT	WEIGHT
2"	88" (2.24 m)	140 lb. (64 kg)
3"	92" (2.34 m)	170 lb. (77 kg)
4"	92" (2.34 m)	200 lb. (91 kg)
6"	128" (3.25 m)	285 lb. (130 kg)
8"	144" (3.66 m)	415 lb. (189 kg)
10"	176" (4.47 m)	750 lb. (341 kg)
12"	188" (4.78 m)	950 lb. (432 kg)

b. Electronic Control Panel

The control panel consists of the electronic controller, spark generator, power switch, thermocouple temperature indicator and terminal blocks housed in a suitable enclosure.

*NOTE

Remote start option electronic control panel includes an RSSS switch and a time delay relay.

Dimensions 20" high (508 mm) 16" wide (406 mm) 6" deep (152 mm)

Weight: 36 lbs. (16 kg)

c. Valve and Regulator with Inspirating Venturi

c.1 Venturi Regulator Panel

The regulator panel consists of isolation valves, gas flow regulators and solenoid valves for both the venturi and flame retention nozzles.

*NOTE

The standard valve and regulator panel is provided in a steel panel and is not enclosed.

Dimensions

21" high (533 mm) 17" wide (432 mm) 6" deep (152 mm) Weight: 35 lbs. (16 kg)

c.2 Inspirating Venturi Assembly

The inspirating venturi assembly consists of a venturi, backflash preventer, combustion chamber and spark plug.

Dimensions

19" long (483 mm) 13" high (330 mm) including spark plug 6" deep (152 mm) Weight: 30 lbs. (14 kg)

d. Blower and Regulator Panel

The blower and regulator panel consists of:

- (a) Isolation valves
- (b) A regulator for setting gas flow rates to the mixing chamber and the flame retention nozzle
- (c) A solenoid valve to cut-off gas flow to the continuous flame nozzle.

Dimensions

42" high (1067 mm) 36" wide (914 mm) 10" deep (254 mm) Weight 170 lb. (77 kg)

*NOTE

The blower panel (general purpose or explosion-proof motor) is provided in a steel enclosure rated NEMA 3R, weatherproof.

e. Remote Spark Generator (Optional)

A Remote Spark Generator can be used if control panel cannot be installed within 10 feet from the venturi.

i. Enclosure

NEMA 4, steel construction (standard)

NEMA 4X, Corrosion Resistant, Stainless Steel (Optional)

NEMA 7 Explosion proof, aluminum construction with o-ring for some outdoor weather protection (Optional)

ii. Dimensions

11-1/2" high (292 mm) 8" wide (203 mm)

iii. Weight

13 lbs (6 Kg)

1.6.6 Connections

a. Burner Stack

ANSI 150 lb. RF flange Continuous Flame Nozzle - 2" FNPT Flame Retention Nozzle - 1/2" FNPT

b. Venturi

Venturi Inlet – 1/2" FNPT Venturi Outlet – 2" FNPT

c. Venturi Valve Regulator Panel

Panel Inlet - 1/2" NPT
Panel to Continuous Flame Nozzle - 1/2" FNPT
Panel to Flame Retention Nozzle - 1/2" FNPT

d. Blower Regulator Panel

Panel Inlet - 1/2" NPT screwed Panel to Continuous Flame Nozzle - 2" FNPT Panel to Flame Retention Nozzle - 1/2" FNPT

e. Remote Spark Generator (Optional)

Conduit Connection - 1/2"

f. Distance

- 1. From Venturi to Continuous Flame Nozzle between 25(7 m) to 100 feet (30 m).
- 2. From Blower Panel to Continuous Flame Nozzle not more than 35 feet (10 m).
- 3. From control panel to venturi 10 feet (3 m).

*NOTE

A Remote Spark Generator can be used if control panel cannot be installed within 10 feet from the venturi.

1.6.7 Elevation

The unit may be used at elevations up to 3,500 feet (1,000 meters). For higher elevations, up to 8000 feet (2,440 meters), consult factory.

1.6.8 Materials of Construction

a. Burner Stack and Pilot Gas Piping

Upper 24" in 304 Stainless Steel (standard)¹, remainder in mild steel².

*NOTE

- 1. Also available in 316 SS.
- 2. Complete stack and piping can be supplied in all 304 SS or all 316 SS construction.

Refer to the burner stack drawing for reference of the Varec Biogas supplied pilot gas piping.

b. Nozzles

Stainless Steel

c. Thermocouple Assembly

- a. Thermocouple Type K, 316 stainless steel
- b. Thermowell Inconel

*NOTE

Refer to Section 9 of this manual for further information on components' materials of construction.

1.6.9 Electrical

a. Control Panel Enclosure

NEMA 4, weatherproof, standard

NEMA 4X, corrosion resistant, 316 SS construction (optional)

NEMA 7, explosion proof, aluminum construction (optional)

b. Electronics

CSA approved components

c. Power Consumption

VENTURI SYSTEM	BLOWER SYSTEM
0.7 amps @ 120 VAC, 60 Hz.	7.1 amps @ 120 VAC, 60 Hz.
0.35 amps @ 240 VAC, 50 Hz.	3.6 amps @ 240 VAC, 50 Hz

d. Ambient Temperature Rating

- Minus 40° F to plus 150° F (-40° C to + 65° C)

e. Electronic Controller Operating Modes

- "MANUAL", "AUTOMATIC", "STAND-BY"

f. Flame Monitoring

- Thermocouple with individual set point adjustments, pilot lights and alarm relay.

g. Remote Alarm Contacts

- i. One set SPDT dry contacts for pilot on/off status
- ii. One set SPDT dry contacts for pilot flame failure status
- iii. Contact rating 120 VAC @ 2 amps, 240 VAC @ 1 amp

h. Thermocouple Alarm Response – Pilot On/Off Indication

Immediate upon cooling of thermocouple below set point

i. System Alarm Response – Pilot Flame Failure Indication

 Number of attempts to re-ignite before system alarm activates - 1 to 8 attempts.

*NOTE

Factory set at 8 attempts unless otherwise specified (selectable timing by dip switch operation). See dip switch chart, Section 8.

j. High Tension Lead

10 feet long (3m). For greater lengths consult Factory

WARNING

The high voltage lead carries an extremely high voltage, maximum 15,000 V peak.

k. Spark Duration

- 0.5 seconds

I. Re-ignition attempts

Every 30 seconds. (Selectable timing by dip switch operation).

*NOTE

Factory set at 30 seconds. See dip switch chart, Section 8.

m. Pilot Lights

 Provided as standard on controller for: spark on, flame retention valve open, pilot lit and pilot out.

*NOTE

The indicating lights are not field replaceable. A new controller may be purchased or the controller must be returned to the factory for service.

1.6.10 Blower Motor

Capacity: 1/2 HP, 1 phase

Rating: 6.4 amps, 120 VAC or 3.2 amps, 240 VAC

Enclosure: general purpose (standard), explosion proof (optional)

Blower housing

material: cast aluminum

1.6.11 Remote Start/Stop Signal (Optional)

Available when remote start option is supplied with the waste gas burner. N.O. dry contact closure, standard 120 VAC or 240 VAC input signal, optional

1.6.12 Remote Start Time Delay Relay (Optional)

Available when remote start option is supplied with the waste gas burner.

Range: Adjustable from 10 seconds to 300 seconds

Function: Prevents system from frequent "ON"/"OFF" cycles

(nuisance switching) during pressure fluctuations at

remote pressure switch.

1.6.13 Remote Start/Stop Pressure Switch (Optional)

Available when remote start option is supplied with the waste gas burner.

Range: 4" to 20" (100 mm to 500 mm) W.C.

Pressure

Connection: 1/8" NPT

Switch Rating: 15 amps @ 125 VAC or 7 amps @ 240 VAC Enclosure: Explosion proof, Class 1, Div. 1, Groups C & D

Deadband: 0.5" (13 mm) W.C.

Conduit Connection: 1/2" NPT

Temperature Range: -40° to $+140^{\circ}$ F (-40° to $+60^{\circ}$ C)

1.6.14 Electronic Enclosure Heater and Thermostat (Optional)

Rating: 100 watts, 120 VAC or 240 VAC

Adjustable Range: 50° to 13°F (10° to 150°C)

SECTION 2 - INSTALLATION

2.1 BURNER STACK

The waste gas burner should be mounted vertically on a matching 150-lb. R.F. flange. Matching flange and gasket are to be provided by others.

CAUTION

Insulation is recommended for the exposed portion of the waste gas manifold including the vertical manifold into the burner in cold weather conditions.

2.2 PILOT GAS SUPPLY

2.2.1 Venturi Driven Pilot

- (a) Remove all packing from venturi and backflash preventer.
- (b) The venturi mounting height should be such that it will ensure that debris, snow, etc. will not plug the backflash preventer inlet.
- (c) If the venturi is installed horizontally, ensure that the spark plug is not located at the bottom of the combustion chamber, and that the backflash preventer is mounted vertically in the down position.
- (d) No additional support is required for the venturi when connected to the 2" NPT piping.
- (e) See the venturi assembly drawing and the typical lay-out drawing for more information. Refer to Section 9 of this manual.
- (f) Go to Step 2.2.3 below.

2.2.2 Blower Driven Pilot

- (a) Mount blower and regulator panel on a flat vibration free surface.
- (b) See blower panel drawing for more details. Refer to Section 9 of this manual.
- (c) Go to Step 2.2.3 below.

2.2.3 Pilot Gas Piping

a. Install 2" piping between the burner and the venturi, or between the burner and the blower/regulator panel depending on which option is supplied. There should not be any bends or elbows in the piping within 4 feet of the venturi or blower exit.

CAUTION

This 2" line should never be buried underground as this will cause condensation in the line and ultimate system failure.

b. Horizontal piping between the **venturi** or the **blower panel** and the continuous flame nozzle connection at the stack (supplied by others) should slope towards the **venturi** at a rate of 1/4" (0.64 cm) per foot with a provision for condensate drain. Piping should be installed in the most direct path and with minimal bends or elbows.

CAUTION

The 2" piping must have a constant slope so that condensed water from the air/gas pilot mixture will not collect in low spots and create a pressure drop to the pilot gas supply.

WARNING

This equipment is designed for outdoor installation only. Failure to do so may result in an explosion hazard.

- c. Install 1/2" piping between the flame retention nozzle piping, and the **venturi valve and regulator panel** or the **blower panel**.
- d. Connect pilot gas source to the venturi valve and regulator panel or the blower panel. Refer to Paragraph 1.6.4 for maximum pilot gas supply pressure.

2.3 PRESSURE SWITCH (OPTIONAL)

- Mount the pressure switch in the biogas manifold in a vibration-free location with its own lockable isolation valve (valve supplied by others).
- b. Refer to the typical installation drawing provided in Section 9 of this manual for recommended location of the pressure switch. Location must be upstream of the main biogas pressure relief valve.

c. Wire the switch for normally open, N.O., and connect the plant process pressure connection to the high-pressure side of the switch. Set the switch to the appropriate set point as determined by the plant process requirements.

2.4 ELECTRICAL

- 2.4.1 Mount controller enclosure on a flat vibration-free surface. See the Control Panel Layout Drawing for mounting dimensions. Refer to Section 9 of this manual.
- 2.4.2 Install a suitable power supply to the control panel following all applicable safety regulations and codes.
- 2.4.3 Set the spark plug gap between 1/4" (6 mm) and 3/8" (10 mm). Ensure the following:
 - VENTURI DRIVEN PILOT Install the spark plug into the venturi assembly. Refer to Section 9.1 for correct location. Attach the high voltage lead.
 - 2. **BLOWER DRIVEN PILOT** Install the spark plug into the air/mixing chamber of the blower/regulator package. Refer to Section 9.2 for correct location. Attach the high voltage lead.
- 2.4.4 Make all electrical connections in accordance with drawings.
- 2.4.5 The unit is now ready for commissioning and start-up.

WARNING

The electrical installation must be in accordance with all applicable safety regulations and area classification codes

SECTION 3 - OPERATION

3.1 THEORY OF OPERATION

The unique feature of this system is the patented principle of ignition where gas and air are mixed and ignited in a combustion chamber located a safe distance from the burner stack. The result is a flame front that travels from the combustion chamber through the pilot gas line to the pilot nozzle, and ultimately results in a pilot flame with an ideal gas-to-air burning ratio. The pilot burns a true stoichiometric nonsmoking flame at all times, regardless of the biogas flow or BTU content.

The "REMOTE-START" feature is accomplished by using a remote pressure switch or through a contact change-over in the control panel. The pilot gas is consumed only when the system pressure rises to the point where biogas will be relieved to the burner for flaring, thus conserving pilot fuel. Nuisance switching is eliminated by a time delay relay. The established continuous pilot heats the pilot thermocouple above its set point in the controller. The individual pilot alarm contact switches to indicate that the continuous pilot is lit and up to temperature.

3.2 OPERATING SEQUENCE

3.2.1 Local Auto-Start Operation

- a. The power switches are turned on in the control panel.
- b. The electronic controller is manually switched to "AUTO".
- c. The RSSS switch should be switched to the "ON" position.
- d. The pilot gas supply solenoid opens.
- e. The flame retention solenoid valve:
 - VENTURI PACKAGE located in the valve and regulator panel opens and delivers pilot gas to the flame retention nozzle.
 - ii. **BLOWER PACKAGE** –located in the blower/regulator panel opens and delivers pilot gas to the flame retention nozzle.
- f. The system alarm is reset to a non-alarm state.

- g. The continuous flame nozzle receives a constant air/gas supply from:
 - i. The inspirating venturi; or
 - ii. The air/gas mixing chamber in the **blower panel**.
- h. The system will purge for "spark interval set time" minutes.
- i. The controller energizes the spark plug:
 - Spark plug ignites the air/gas mixture in the inspirating venturi.
 - ii. Spark plug will ignite the air/gas mixture in the **blower** panel.
- j. This generates a flame front, which exits the continuous flame nozzle and ignites the gas from the flame retention nozzle.
- k. The combustible air/gas mixture will purge the spent gas in the continuous flame nozzle piping. This mixture is then re-ignited from the flame retention nozzle.
- I. The thermocouple inside the continuous flame nozzle heats up. When it exceeds its temperature set point, it signals the controller to change the red LED to green and close the flame retention solenoid valve, extinguishing the flame retention nozzle.
- m. The controller timer stops cycling and ignition stops.
- n. Any alarms will clear.
- o. The pilot will remain lit.
- p. If the thermocouple cools below its set point, the controller will switch to alarm status and re-ignition will be attempted.
- q. The thermocouple alarm relay will switch contacts signaling "Pilot Off".
- r. The LED indicator will switch to "Pilot Off" (red).
- s. A system alarm will come on indicating a pilot flame failure if the thermocouple does not heat up to its setting after the controller has gone through the preset re-ignition cycle attempts. The unit would have to be manually reset.

3.2.2 Remote Auto-Start Operation

*NOTE

Refer to the applicable wiring diagram provided in Section 9 of this manual.

- a. The power switches are turned on in the control panel.
- b. The Remote Start Simulator Switch (RSSS) is turned to "OFF" and the three-position selector switch should be in the "AUTO" position.
- c. Either a plant signal, or a pressure switch installed on the main gas line, initiates start-up sequence on the controller through the remote start contacts.
- d. Referring to the wiring diagram provided in Section 9 of this manual, the timing relay opens the controller circuit between terminal GRD and "ST'BY" on TB1 enabling the controller to activate automatic unattended re-ignition.
- e. Terminal 7 on TB5 is powered, and opens either of the following:
 - VENTURI PACKAGE The "Regulator Panel Gas Supply" solenoid valve on the valve and regulator panel.
 - ii. **BLOWER PACKAGE** The "Regulator Panel Gas Supply" solenoid valve on the blower panel.
- f. The flame retention solenoid valve:
 - i. **VENTURI PACKAGE** located in the valve and regulator panel opens, and delivers pilot gas/air mixture to the flame retention nozzle.
 - ii. **BLOWER PACKAGE** –located in the blower panel opens, and delivers pilot gas/air mixture to the flame retention nozzle.

*NOTE BLOWER PACKAGE ONLY - Terminal 13 on TB5 is powered, starting the blower motor.

- g. The system alarm is reset to a non-alarm state.
- h. The continuous flame nozzle then receives a constant air/gas supply from:
 - i. **VENTURI PACKAGE** The inspirating venturi. The pilot gas is delivered from the valve and regulator panel.
 - ii. **BLOWER PACKAGE** The air/gas mixing chamber in the blower panel.
- i. The system will purge for "spark interval set time" minutes.
- j. The controller energizes the spark plug:

- Spark plug ignites the air/gas mixture in the inspirating venturi.
- ii. Spark plug will ignite the air/gas mixture in the blower/regulator panel.
- k. This generates a flame front, which exits the continuous flame nozzle, and ignites the gas from the flame retention nozzle.
- I. The fresh combustible air/gas mixture purges the spent gas in the continuous flame nozzle piping. This mixture is then re-ignited from the flame retention nozzle.
- m. The thermocouple inside the continuous flame nozzle heats up.
 When it exceeds its temperature set point, it signals the controller to change the red LED to green and close the flame retention solenoid valve, extinguishing the flame retention nozzle.
- n. The controller timer stops cycling and ignition stops.
- o. Any alarms will clear.
- p. If the thermocouple cools below its set point, the controller will switch to alarm status and re-ignition will be attempted if the plant or pressure switch permissive is still present.
- q. The thermocouple alarm relay will switch contacts signaling "Pilot Off" indication.
- r. The LED indicator light will switch to "Pilot Off" (red).
- s. A system alarm will come on indicating a pilot flame failure if the thermocouple does not heat up to the specified setting on the controller. Pilot flame failure will require manual re-set if the controller has gone through the pre-set re-ignition cycle attempts.

t. REMOTE START OPERATION

- 1. The "Remote Start" time delay relay will delay switching until it times out and its contacts change thus providing a delayed burner shutdown time and prevents nuisance switching.
- The burner and the pilot will remain lit as long as there is no contact change-over in the panel via a plant or through a pressure switch permissive.
- 3. The controller mode then changes from continuous operation in automatic to standby operating mode.
- 4. When the biogas manifold pressure falls below the setting of the pressure switch, or the plant sends a signal to the control panel, the contacts change.

- The "Remote Start" timing relay will delay switching until it times out and its contacts change thus providing a delayed burner operating time.
- 6. The controller mode then changes from continuous operation in automatic mode to standby mode.
- 7. The "Regulator Panel Gas Supply" solenoid valve will close, extinguishing the pilot.
 - a. **VENTURI PACKAGE** The "Regulator Panel Gas Supply" solenoid valve is on the valve and regulator panel.
 - b. **BLOWER PACKAGE** The "Regulator Panel Gas Supply" solenoid valve is on the blower panel.

*NOTE
BLOWER PACKAGE ONLY - The blower motor will stop.

- 8. Once the thermocouple cools below its set point, the LED pilot light will switch from green to red.
- 9. The thermocouple alarm relay will switch contacts.
- 10. The system alarm relay will not activate because it is made inactive in the standby mode.
- 11. Total system will remain in standby mode until there is a "REMOTE –START" contact change in the controller and signals the burner to operate again.

SECTION 4 -START-UP AND COMMISIONING

4.1 INSPECTION AND START-UP

A. Local Start-Automatic Operation

A.1 Venturi-Driven Pilot

- 1. Ensure power and gas are off.
- Check the backflash preventer on the venturi for freedom of operation by pulling down on the shaft protruding from the device. Only spring resistance should be felt and the diaphragm will click as it bottoms out against the sealing disc.
- 3. Adjust the shaft for ³/₄" (20mm) or more travel. Lock into position.
- 4. Referring to the wiring diagram provided in Section 9 of this manual, select the "MANUAL" position on the three-position selector switch. Disable all thermocouple controls except for No. 1 used for the continuous pilot. Set this switch to the "ENABLE" position. Ensure that the thermocouple wires are connected to No. 1 thermocouple control. Note the following:

Red – (negative), Yellow + (positive).

- 5. Turn on main power switch in ignition panel. Turn on controller power switch.
- 6. The thermocouple status red LED will come on for the enabled thermocouple.
- 7. The flame retention valve red LED will come on. The flame retention solenoid valve will energize-open.
- 8. Unit is now ready for commissioning.

A.2 Blower-Driven Pilot

- 1. Ensure power and gas are off.
- 2. Blower power switch should be in the "Off" position.
- Check to see that the blower inlet air ports are fully open. If not, release the circular washer, and rotate it to align the washer holes over the blower holes for full air flow.

*NOTE

An additional 10A fuse is added to the terminal block 5 for a Blower-Driven Pilot.

4. Referring to the wiring diagram provided in Section 9 of this manual, select the "MANUAL" position on the three-position selector switch. Disable all thermocouple controls except for No. 1 used for the continuous pilot. Set this switch to the "ENABLE" position. Ensure that the thermocouple wires are connected to No. 1 thermocouple control. Note the following:

Red – (negative), Yellow + (positive).

- 5. Turn on main power switch in ignition panel. Turn on controller power switch.
- 6. The thermocouple status red LED will come on for the enabled thermocouple.
- 7. The flame retention valve red LED will come on. The flame retention solenoid valve will energize-open.
- 8. Unit is now ready for commissioning.

B. Remote Start – Automatic Operation

B.1 Venturi-Driven Pilot

- 1. Ensure power and gas are off. Set the Remote Start Similator Switch (RSSS) in the "OFF" position.
- Check the backflash preventer on the venturi for freedom of operation by pulling down on the shaft protruding from the device. Only spring resistance should be felt and the diaphragm will click as it bottoms out against the sealing disc.
- 3. Adjust the shaft for ³/₄" (20mm) or more travel. Lock into position.
- 4. Referring to the wiring diagram provided in Section 9 of this manual, select the "MANUAL" position on the three-position selector switch. Disable all thermocouple controls except for No. 1 used for the continuous pilot. Set this switch to the "ENABLE" position. Ensure that the thermocouple wires are connected to No. 1 thermocouple control. Note the following:

Red – (negative), Yellow + (positive).

- 5. Turn on main power switch in ignition panel. Turn on controller power switch.
- 6. The thermocouple status red LED will come on for the enabled thermocouple.
- 7. The flame retention valve red LED will come on. The flame retention solenoid valve will energize-open.
- 8. Set the "Remote Start" time delay relay to the mid-range.
- 9. Turn the RSS Switch to the "ON" position. This simulates a relieving (flaring) condition.
- 10. The Remote Start time delay relay is energized.
- 11. The unit is now ready for commissioning.

CAUTION

If the Remote-Start pressure switch is installed, the main header pressure must be below the set point or the pressure switch should be temporarily disconnected.

B.2 Blower-Driven Pilot

- 1. Ensure power and gas are off. Set the Remote Start Similator Switch (RSSS) in the "OFF" position.
- 2. Blower power switch should be in the "Off" position.
- Check to see that the blower inlet air ports are half way open. If not, release the circular washer, and rotate it to align the washer holes over the blower holes for air flow.

*NOTE

An additional 10A fuse is added to the terminal block 5 for a Blower-Driven Pilot.

4. Referring to the wiring diagram provided in Section 9 of this manual, select the "MANUAL" position on the three-position selector switch. Disable all thermocouple controls except for No. 1 used for the continuous pilot. Set this switch to the "ENABLE" position. Ensure that the thermocouple wires are connected to No. 1 thermocouple control. Note the following:

Red – (negative), Yellow + (positive).

5. Turn on main power switch in ignition panel. Turn on controller power switch.

- 6. The thermocouple status red LED will come on for the enabled thermocouple.
- 7. The flame retention valve red LED will come on. The flame retention solenoid valve will energize-open.
- 8. Set the "Remote Start" time delay relay to the mid-range.
- 9. Turn the RSS Switch to the "ON" position. This simulates a relieving (flaring) condition.
- 10. The Remote Start time delay relay is energized.
- 11. The unit is now ready for commissioning.

CAUTION

If the Remote-Start pressure switch is installed, the main header pressure must be below the set point or the pressure switch should be temporarily disconnected.

4.2 COMMISSIONING

A. Local Start – Automatic Operation

A.1 Venturi-Driven Pilot

- 1. Open the isolation valves to the two regulators on the valve and regulator panel.
- 2. Set the venturi gas line regulator to 7 psig (48 kPa).
- 3. Set the flame retention gas regulator to 3 psig (21 kPa).
- 4. Check that the three-position selector switch is in the "MANUAL" position.
- 5. The flame retention line solenoid valve will open.
- 6. Allow system to purge for 30 seconds.
- 7. Push the "IGNITE" button on the controller momentarily. The following should occur:
 - a. Ignition should occur at the venturi exit.
 - b. The flame front will travel up the continuous flame line to the burner. The momentary appearance and "pop" of the flame front as it reaches the continuous flame nozzle will ignite the gas from the flame retention nozzle. The reigniting effect of the continuous flame nozzle will occur within seconds and may not be visible in daylight.
 - c. The flame retention nozzle will maintain a flame in the burner until the continuous flame nozzle has been purged of spent gas in less than 10 seconds.
 - d. The flame retention nozzle will then light the continuous flame nozzle.

8. **IF IGNITION DOES NOT OCCUR**, check the following:

- a. Momentarily depress the "IGNITE" button on the controller, which will cause ignition of the mixture. Listen and determine if:
 - The ignition is "soft" or "mellow", the mixture is very rich (a high proportion of gas to air).

- The ignition is "sharp" or "violent", mixture is close to stoichiometric ratio or lean (low proportion of gas to air).
- b. Desired mixture should be "slightly rich". Adjustments should be made at the venturi gas supply regulator.

To enrich the mixture, increase the pressure.

To make the mixture leaner, decrease the pressure.

- c. Carry out ignitions starting with low pressure and moving up to the highest pressure available or allowed (35 psig or 245 kPa).
- d. Repeat Steps a. and b. until the ignition is most robust, then increase the pressure slightly until the ignition becomes softer. Use the backflash preventer bolt to adjust air intake. The most efficient method is achieved by adjusting the venturi gas regulator. Changing the orifice inside the venturi in another adjustment option. Consult the factory for details.
- e. Allow the system to purge for 30 seconds, then manually ignite. Note the time taken for the flame front to reach the continuous nozzle and ignite the flame retention nozzle.

CAUTION

Once the igniter has been fired and a flame front is traveling up the 2" piping, do not re-ignite, as the shock wave from the second ignition will overtake the first flame front and extinguish it. The ignition system cannot operate properly if more than one flame front is traveling to the continuous flame nozzle at the same time.

- f. Allow fifteen minutes burning of the continuous flame nozzle to stabilize the temperature. The slightly rich mixture when burning continuously, will reveal a flame burning deep in the nozzle to approximately 18" (457mm) above the nozzle tip as seen at night.
- g. Turn the respective thermocouple set point adjustment screw on the controller clockwise until the respective red LED comes on indicating a "PILOT OFF" alarm condition. Turn the adjustment screw slowly counter-

clockwise until the red LED goes out, and the green LED comes on. Continue to turn the potentiometer counter-clockwise for two more full turns.

CAUTION

If the monitor set point is set too close to the operating temperature, adverse weather conditions such as extreme cold and high wind could trip the controller even though the pilot is lit and an erroneous alarm and needless re-ignition cycles could occur.

- 9. Once the thermocouple LED has changed to green signaling "PILOT ON" Indication, move the three-position selector switch on the controller to the "AUTO" position.
- 10. When the thermocouple is hot and above the controller thermocouple set point, the following will occur:
 - a. The continuous flame nozzle continues to burn.
 - b. The thermocouple status LED stays green for "PILOT ON" Indication.
 - c. The flame retention valve red LED goes out.
 - d. The flame retention solenoid valve closes.
 - e. A yellow flame disappears from the burner and instead a blue luminous flame is sighted.
 - e. No ignition cycle takes place.
 - f. Neither the thermocouple alarm nor the system alarm is activated.
- 11. The 3-position switch should now be left in "AUTO" position. In this position, no operator function is required for automatic re-ignition. Re-ignition attempt cycle is based on the dip switch setting on the controller. Refer to Section 8 of this manual for more information.
- 12. If the above sequence executes correctly and the pilot remains lit satisfactorily, the system is now tuned and commissioned.

A.2 Blower-Driven Pilot

 A manometer check is required at the pilot air/gas mixing chamber. Refer to the Blower Panel drawing provided in Section 9 of this manual. Turn the blower and all gas valves off:

- (a) Main gas supply
- (b) Continuous Pilot
- (c) Flame retention isolation valves

Attach a manometer to the test report on the bottom of the air/gas mixing chamber. Turn on the blower and read the pressure.

WARNING

The reading must be a minimum of ½" (12 mm) W.C. vacuum. If this minimum vacuum is not present, the gas will be unable to flow into the air/gas mixing chamber. Look for obstructions in the piping between blower system and the burner.

- Open the gas supply isolation valve to the fully-open position. This will allow gas through the solenoid valve to the regulator.
- 3. Set the regulator to 8 inches (125mm) WC.

*NOTE

The flame retention line and continuous flame line isolation valves must be closed.

4. Open the continuous flame line isolation valve to the fully-open position.

*NOTE

The gauge pressure will drop substantially to approximately 3 inches (76mm) WC.

- 5. Open the flame retention line isolation valve to only one halfturn, or sufficient to see some small deflection in the pressure gauge. Wait for one minute for the system to purge.
- 6. Push the "IGNITE" button on the controller momentarily. The following should occur:
 - a. Ignition should occur at the air/gas mixing chamber exit.
 - b. The flame front will travel up the continuous flame line to the burner. The momentary appearance and "pop" of the flame front as it reaches the continuous flame nozzle will ignite the gas from the flame retention nozzle. The re-igniting effect of the continuous flame

- nozzle will occur within seconds and may not be visible in daylight.
- c. The flame retention nozzle will maintain a flame in the burner until the continuous flame nozzle has been purged of spent gas in less than 10 seconds.
- d. The flame retention nozzle will then light the continuous flame nozzle.

7. **IF IGNITION DOES NOT OCCUR**, check the following:

- a. Momentarily depress the "IGNITE" button on the controller, which will cause ignition of the mixture. Listen and determine if:
 - The ignition is "soft" or "mellow", the mixture is very rich (a high proportion of gas to air).
 - The ignition is "sharp" or "violent", mixture is close to stoichiometric ratio or lean (low proportion of gas to air).
- b. Desired mixture should be "slightly rich". Open the flame retention isolation valve further than ½ turn to a maximum of one turn. Repeat step 8 above.
- c. Check for proper fuel/air mixture. Adjust the regulator first in the higher direction and then in the lower direction in increments of 1 inch (25 mm) WC.
- d. Repeat Steps a. and b. above and Step 11 until the ignition is most robust

*NOTE

- A "soft" or "mellow" ignition indicates the mixture is very rich because of a high proportion of gas to air.
- ✓ A "sharp" or "fast" ignition indicates the mixture is close to the rich mixture ratio.
- e. Allow the system to purge for 30 seconds, then manually ignite. Note the time taken for the flame front to reach the continuous nozzle and ignite the flame retention nozzle.

CAUTION

Once the igniter has been fired and a flame front is traveling up the 2" piping, do not re-ignite, as the shock wave from the second ignition will overtake the first flame front and extinguish it. The ignition system cannot operate properly if more than one flame front is traveling to the continuous flame nozzle at the same time.

- f. Allow fifteen minutes burning of the continuous flame nozzle to stabilize the temperature. The slightly rich mixture when burning continuously, will reveal a flame burning deep in the nozzle to approximately 18" (457mm) above the nozzle tip as seen at night.
- g. Turn the respective thermocouple set point adjustment screw on the controller clockwise until the respective red LED comes on indicating a "PILOT OFF" alarm condition. Turn the adjustment screw slowly counterclockwise until the red LED goes out, and the green LED comes on. Continue to turn the potentiometer counter-clockwise for two more full turns.

CAUTION

If the monitor set point is set too close to the operating temperature, adverse weather conditions such as extreme cold and high wind could trip the controller even though the pilot is lit and an erroneous alarm and needless re-ignition cycles could occur.

- 8. Once the thermocouple LED has changed to green signaling "PILOT ON" Indication, move the three-position selector switch on the controller to the "AUTO" position.
- 9. When the thermocouple is hot and above the controller thermocouple set point, the following will occur:
 - a. The continuous flame nozzle continues to burn.
 - The thermocouple status LED stays green for "PILOT ON" Indication.
 - c. The flame retention valve red LED goes out.
 - d. The flame retention solenoid valve closes.

- e. A yellow flame disappears from the burner and instead a blue luminous flame is sighted.
- f. No ignition cycle takes place.
- g. Neither the thermocouple alarm nor the system alarm is activated.
- 10. The 3-position switch should now be left in "AUTO" position. In this position, no operator function is required for automatic re-ignition. Re-ignition attempt cycle is based on the dip switch setting on the controller. Refer to Section 8 of this manual for more information.
- 11. If the above sequence executes correctly and the pilot remains lit satisfactorily, the system is now tuned and commissioned.

B. Remote Start – Automatic Operation

B.1 Venturi-Driven Pilot

- 1. Open the isolation valves to the two regulators on the valve and regulator panel.
- 2. Set the venturi gas line regulator to 7 psig (48 kPa).
- 3. Set the flame retention gas regulator to 3 psig (21 kPa).
- Check that the three-position selector switch is in the "MANUAL" position and the RSS Switch is in the "ON" Position.
- 5. The ignition retention line solenoid valve will open.
- Allow system to purge for 30 seconds.
- 7. Push the "IGNITE" button on the controller momentarily. The following should occur:
 - Ignition should occur at the venturi exit.
 - b. The flame front will travel up the continuous flame line to the burner. The momentary appearance and "pop" of the flame front as it reaches the continuous flame nozzle will ignite the gas from the flame retention nozzle. The reigniting effect of the continuous flame nozzle will occur within seconds and may not be visible in daylight.

- c. The flame retention nozzle will maintain a flame in the burner until the continuous flame nozzle has been purged of spent gas in less than 10 seconds.
- d. The flame retention nozzle will then light the continuous flame nozzle.

8. **IF IGNITION DOES NOT OCCUR**, check the following:

- a. Momentarily depress the "IGNITE" button on the controller, which will cause ignition of the mixture. Listen and determine if:
 - ✓ The ignition is "soft" or "mellow", the mixture is very rich (a high proportion of gas to air).
 - The ignition is "sharp" or "violent", mixture is close to stoichiometric ratio or lean (low proportion of gas to air).
- b. Desired mixture should be "slightly rich". Adjustments should be made at the venturi gas supply regulator.
 - To enrich the mixture, increase the pressure.
 - To make the mixture leaner, decrease the pressure.
- c. Carry out ignitions starting with low pressure and moving up to the highest pressure available or allowed (35 psig or 245 kPa).
- d. Repeat Steps a. and b. until the ignition is most robust, then increase the pressure slightly until the ignition becomes softer. Use the backflash preventer bolt to adjust air intake. The most efficient method is achieved by adjusting the venturi gas regulator. Changing the orifice inside the venturi in another adjustment option. Consult the factory for details.
- e. Allow the system to purge for 30 seconds, then manually ignite. Note the time taken for the flame front to reach the continuous nozzle and ignite the flame retention nozzle.

CAUTION

Once the igniter has been fired and a flame front is traveling up the 2" piping, do not re-ignite, as the shock wave from the second ignition will overtake the first flame front and extinguish it. The ignition system cannot operate properly if more than one flame front is traveling to the continuous flame nozzle at the same time.

- f. Allow fifteen minutes burning of the continuous flame nozzle to stabilize the temperature. The slightly rich mixture when burning continuously, will reveal a flame burning deep in the nozzle to approximately 18" (457mm) above the nozzle tip as seen at night.
- g. Turn the respective thermocouple set point adjustment screw on the controller clockwise until the respective red LED comes on indicating a "PILOT OFF" alarm condition. Turn the adjustment screw slowly counterclockwise until the red LED goes out, and the green LED comes on. Continue to turn the potentiometer counter-clockwise for two more full turns.

CAUTION

If the monitor set point is set too close to the operating temperature, adverse weather conditions such as extreme cold and high wind could trip the controller even though the pilot is lit and an erroneous alarm and needless re-ignition cycles could occur.

- 9. The thermocouple LED should turn to green signaling "PILOT ON" indication.
- 10. Set the RSS Switch to "OFF".
- 11. The time delay relay times out and the controller will close the gas supply solenoid valve, thus extinguishing the pilot.
- 12. When the pilot cools below the thermocouple set point, the LED changes from green "PILOT ON" to red "PILOT OFF" and the thermocouple alarm relay switch sends a start signal to initiate re-ignition cycle.

- 13. The 3-position switch should now be left in "AUTO" position. In this position:
 - a. The burner is on a "STANDBY" mode. The burner will initiate start-up and shutdown sequence through either a plant or pressure switch permissive.
 - b. No operator function is required for automatic re-ignition. In the event of the flame going out, the controller will reignite the pilot if the "Remote Start" contacts are closed.
 - c. Re-ignition attempt cycle is based on the dip switch setting on the controller. Refer to Section 8 of this manual for more information.
- 14. If the above sequence executes correctly and the pilot remains lit satisfactorily, the system is now tuned and commissioned.

B.2 Blower-Driven Pilot

- A manometer check is required at the pilot air/gas mixing chamber. Refer to the Blower Panel drawing provided in Section 9 of this manual. Turn the blower and all gas valves off:
 - (a) Main gas supply
 - (b) Continuous Pilot
 - (c) Flame retention isolation valves

Attach a manometer to the test report on the bottom of the air/gas mixing chamber. Turn on the blower and read the pressure.

- 2. Open the gas supply isolation valve to the fully-open position. This will allow gas through the solenoid valve to the regulator.
- 3. Set the regulator to 8 inches (125mm) WC.

*NOTE

The flame retention line and continuous flame line isolation valves must be closed.

4. Open the continuous flame line isolation valve to the fully-open position.

*NOTE

The gauge pressure will drop substantially to approximately 3 inches (76mm) WC.

- 5. Open the flame retention line isolation valve to only one halfturn, or sufficient to see some small deflection in the pressure gauge. Wait for one minute for the system to purge.
- Check that the three-position selector switch is in the "MANUAL" position and the RSS Switch is in the "ON" position.
- 7. The flame retention line solenoid valve will open.
- 8. Allow system to purge for 30 seconds.
- 9. Push the "IGNITE" button on the controller momentarily. The following should occur:
 - a. Ignition should occur in the air/gas mixing chamber.
 - b. The flame front will travel up the continuous flame line to the burner. The momentary appearance and "pop" of the flame front as it reaches the continuous flame nozzle will ignite the gas from the flame retention nozzle. The reigniting effect of the continuous flame nozzle will occur within seconds and may not be visible in daylight.
 - c. The flame retention nozzle will maintain a flame in the burner until the continuous flame nozzle has been purged of spent gas in less than 20 seconds.
 - d. The flame retention nozzle will then light the continuous flame nozzle.

10. **IF IGNITION DOES NOT OCCUR**, check the following:

- a. Momentarily depress the "IGNITE" button on the controller, which will cause ignition of the mixture. Listen and determine if:
 - The ignition is "soft" or "mellow", the mixture is very rich (a high proportion of gas to air).
 - The ignition is "sharp" or "violent", mixture is close to stoichiometric ratio or lean (low proportion of gas to air).

- b. Desired mixture should be "slightly rich". Open the flame retention isolation valve further than ½ turn to a maximum of one turn. Repeat step 8 above.
- c. Check for proper fuel/air mixture. Adjust the regulator first in the higher direction and then in the lower direction in increments of 1 inch (25 mm) WC.
- d. Repeat Steps a. and b. above and Step 11 until the ignition is most robust

*NOTE

- ✓ A "soft" or "mellow" ignition indicates the mixture is very rich because of a high proportion of gas to air.
- ✓ A "sharp" or "fast" ignition indicates the mixture is close to the rich mixture ratio.
- e. Allow the system to purge for 30 seconds, then manually ignite. Note the time taken for the flame front to reach the continuous nozzle and ignite the flame retention nozzle.

CAUTION

Once the igniter has been fired and a flame front is traveling up the 2" piping, do not re-ignite, as the shock wave from the second ignition will overtake the first flame front and extinguish it. The ignition system cannot operate properly if more than one flame front is traveling to the continuous flame nozzle at the same time.

- f. Allow fifteen minutes burning of the continuous flame nozzle to stabilize the temperature. The slightly rich mixture when burning continuously, will reveal a flame burning deep in the nozzle to approximately 18" (457mm) above the nozzle tip as seen at night.
- g. Turn the respective thermocouple set point adjustment screw on the controller clockwise until the respective red LED comes on indicating a "PILOT OFF" alarm condition. Turn the adjustment screw slowly counterclockwise until the red LED goes out, and the green LED comes on. Continue to turn the potentiometer counter-clockwise for two more full turns.

CAUTION

If the monitor set point is set too close to the operating temperature, adverse weather conditions such as extreme cold and high wind could trip the controller even though the pilot is lit and an erroneous alarm and needless re-ignition cycles could occur.

- 11. The thermocouple LED should turn to green signaling "PILOT ON" indication.
- 12. Set the RSS Switch to "OFF".
- 13. The time delay relay times out and the controller will close the gas supply solenoid valve, thus extinguishing the pilot.
- 14. When the pilot cools below the thermocouple set point, the LED changes from green "PILOT ON" to red "PILOT OFF" and the thermocouple alarm relay switch sends a start signal to initiate re-ignition cycle.
- 15. The 3-position switch should now be left in "AUTO" position. In this position:
 - a. The burner is on a "STANDBY" mode. The burner will initiate start-up and shutdown sequence through either a plant or pressure switch permissive.
 - b. No operator function is required for automatic re-ignition. In the event of the flame going out, the controller will re-ignite the pilot if the "Remote Start" contacts are closed.
 - c. Re-ignition attempt cycle is based on the dip switch setting on the controller. Refer to Section 8 of this manual for more information.
- 16. If the above sequence executes correctly and the pilot remains lit satisfactorily, the system is now tuned and commissioned

SECTION 5 - Maintenance

The controller on this system is maintenance-free. The routine maintenance on remaining equipment is as follows:

Annually

- 1. Clean spark plug and check for proper gap.
- 2. Check high-tension wiring for damage or loose connections.
- 3. Check thermocouple operation.
- 4. Clean orifice on venturi models.
- 5. Bleed off regulators using installed petcock.
- 6. Ensure back flash preventer moves freely and is clear.
- 7. Inspect electrical connections for corrosion.

SECTION 6 - Troubleshooting

The following is intended for guidance in troubleshooting on the ignition system. Only qualified personnel should carry out troubleshooting.

	SYMPTOM	POSSIBLE CAUSE				
1.	Pilot will not light	Insufficient pilot gas supply				
		Plugged regulator				
		Faulty Spark plug				
		Incorrect air/gas mixture				
2.	Ignition system cycling in	Open circuit on thermocouple				
	automatic	Thermocouple set point too close to operating temperature				
		Controller failure				
3.	Flame retention nozzle will	Plugged regulator				
	not light	Faulty or plugged solenoid valve				
		Open circuit to solenoid valve				
		Plugged line to nozzle				
		Pilot gas supply pressure too high				
4.	Pressure switch not	Faulty electrical connection				
	functioning	Plugged sensing line or closed valve				
		Pressure switch failure				

WARNING

The controller is not field repairable and should be returned to Varec Biogas for repair.

SECTION 7 - Replacement Parts

When ordering replacement parts specify Varec Biogas Model Number. Identify replacement parts by description and part number where possible.

7.1 VENTURI-DRIVEN PILOT

For pilot gas pressures above 10 PSIG of either Natural Gas or Propane.

VAREC BIOGAS Part	Part Description
Number	·
P011-05-065	Flame Retention Nozzle
P011-05-066	Continuous Flame Nozzle Assembly
P011-05-067	Thermowell
P011-05-295	Thermocouple, 2", 3", 4"
P011-05-068	Thermocouple, 6", 8", 10", 12"
P011-05-072	Hi-Tension Lead with Connector (10 Ft)
P011-05-073	Spark Plug
P011-05-220	Relay- Timing for Auto Start
P011-05-118	Electronic Controller- 115 VAC
P011-05-119	Enclosure Heater and Thermostat Kit
P011-05-316	Enclosure Heater Only
P011-05-093	Spark Generator
P011-05-194	Pressure Switch, NEMA 7 (CL 1, DIV 1, GR C/D)
P011-05-074	2" Inspirating Venturi
P011-05-110	Backflash Preventer
P011-05-107	Orifice Kit (includes 3/64", 2/64", 4/64",5/64" orifice plus nipples)
P011-05-252	Regulator- 0-60 psi for Continuous Flame Line
P011-05-097	Regulator- 0-30 psi for Flame Retention Line
P011-05-100	Gauge- 0-30 psi for Continuous Flame Line
P011-05-098	Gauge- 0-15 psi for Flame Retention Line
P011-05-329	Solenoid Valve- Continuous flame line
P011-05-101	Solenoid Valve- Flame Retention Line
P011-05-099	1/4" Needle Valve

7.2 BLOWER-DRIVEN PILOT

For pilot gas pressures below 10 PSIG (70 kPa) but greater than 8" WC (203mm WC) either Natural Gas Or Propane. Biogas not allowed.

VAREC BIOGAS Part	Part Description
Number	·
P011-05-065	Flame Retention Nozzle
P011-05-066	Continuous Flame Nozzle Assembly
P011-05-067	Thermowell
P011-05-295	Thermocouple, 2", 3", 4"
P011-05-068	Thermocouple, 6", 8", 10", 12"
P011-05-072	Hi-Tension Lead with Connector (10 Ft)
P011-05-073	Spark Plug
P011-05-220	Relay- Timing for Auto Start
P011-05-118	Electronic Controller- 115 VAC
P011-05-119	Enclosure Heater and Thermostat Kit
P011-05-316	Enclosure Heater Only
P011-05-093	Spark Generator
P011-05-260	Regulator- 5.5-8.5 IN WC for Gas Supply
P011-05-324	Gauge- 0-10 IN WC for Gas Supply
P011-05-162	Solenoid Valve- Gas Supply Line, General Purpose
P011-05-333	Solenoid Valve- Gas Supply Line, Explosion Proof
P011-05-332	Solenoid Valve- Flame Retention Line, General Purpose
P011-05-323	Solenoid Valve- Flame Retention Line, Explosion Proof
P011-05-263	3/4" Needle Valve
P011-05-266	Bower Motor, General Purpose
P011-05-165	Bower Motor, Explosion Proof
P011-05-267	Blower Motor Switch, General Purpose
P011-05-331	Blower Motor Switch, Explosion Proof
P011-05-163	Mixer Blower
P011-05-111	2" Combustion Chamber
P011-05-264	2" Air/Gas Mixing Chamber
P011-05-194	Pressure Switch, NEMA 7 (CL 1, DIV 1, GR C/D)

SECTION 8 - Reference Tables and Charts

8.1 CONTROLLER FUNCTION TABLE

Switch Setting	Thermocouple Pilot Lights	Individual T/C Alarms	System Alarm	Flame Ret. Valve Open	Pilot Re- Ignite After Failure
STANDBY	Active	Active	Inactive	No	No
AUTO	Active	Active	Active	On Ignition	Automatically
MANUAL	Active	Active	Inactive	Yes	Manually

8.2 CONTROL PANEL DIP SWITCH SETTINGS

	Interval E			•	System Alarm Delay Cycles					
	•		Swit	,		(Right Dip Switch)				
(Loca	ated Unde	er 7	<u> Therm</u>	ocouple #2)	(Lo	ocated U	<u>nde</u>	r Spai	rk Button)	
0.5	Minute	=	#2	Switch On	1	Cycle	=	#4	Switch On	
1.0	Minute	=	#4	Switch On	2	Cycle	=	#7	Switch On	
1.5	Minute	II	#7	Switch On	3	Cycle	=	#9	Switch On	
2.0	Minute	=	#9	Switch On	4	Cycle	=	#1	Switch On	
2.5	Minute	П	#1	Switch On	5	Cycle	=	#5	Switch On	
3.0	Minute	П	#5	Switch On	6	Cycle	=	#6	Switch On	
3.5	Minute	П	#6	Switch On	7	Cycle	=	#8	Switch On	
4.0 Minute = #8 Switch On		8	Cycle	=	#10	Switch On				
4.5	Minute	II	#10	Switch On						
NOTE	E: All oth	er	switc	hes must be l	left in	the "OF	F" p	ositio	on.	

SECTION 9 - Reference Drawings

9.1 VENTURI-DRIVEN PILOT

For pilot gas pressures above 10 PSIG of either Natural Gas or Propane.

DRAWING NUMBERS VAREC BIOGAS	Description
20-07833	244WS Waste Gas Burner /Ignition Typical Installation – Venturi System, Remote Start
20-11590	244WS Waste Gas Burner /Ignition Typical Installation – Venturi System, Local Start
S-500-00	244WS Waste Gas Burner Stack Assembly
20-11559	Valve and Regulator Package: Local Start- Venturi System, 120 VAC
R-804-00	Valve and Regulator Package: Remote Auto- Start- Venturi System, 120 VAC
20-07843	Inspirating Venturi Assembly
20-11561	Control Panel Layout: Local Auto-Start, Venturi System, 120 VAC
20-07831	Control Panel Layout: Remote Auto-Start, Venturi System, 120 VAC
20-11560	Electrical Connection Diagram, Local Auto- Start, Venturi System, 120 VAC
P-605-01	Electrical Connection Diagram, Remote Auto- Start, Venturi System, 120 VAC

9.2 BLOWER-DRIVEN PILOT

For pilot gas pressures below 10 PSIG (70 kPa) but greater than 8" WC (203mm WC) either Natural Gas or Propane. Biogas not allowed.

DRAWING NUMBERS Varec Biogas	Description
20-07184	244WS Waste Gas Burner /Ignition Typical Installation – Blower Panel System
20-07832	244WS Waste Gas Burner Stack Assembly
20-08073	Blower Package: Local and Remote Auto- Start, General Purpose Motor, 120 VAC
20-08349	Blower Package: Local and Remote Auto- Start, Explosion-Proof Motor, 120 VAC
20-08521	Control Panel Layout: Remote Auto-Start, Blower Panel, 120 VAC
20-08523	Electrical Connection Diagram, Local Auto- Start, Blower Panel System, 120 VAC
20-07181	Electrical Connection Diagram, Remote Auto- Start, Blower Panel System, 120 VAC

9.3 SUPPLEMENTAL DRAWINGS

DRAWING NUMBERS Varec Biogas	Description
20-11563	Cover Layout: Explosion Proof Ignition Panel, Remote Auto-Start, 120VAC
20-11564	Control Panel Layout: Explosion Proof Ignition Panel, Remote Auto-Start, 120 VAC
20-11565	Wiring Diagram: Explosion Proof Ignition Panel, Remote Auto-Start, 120 VAC
20-11580	Remote Spark Generator: Local or Remote Start, 120VAC

*NOTE

The drawings supplied above are for 120 VAC/60 Hz power supply. For a 240 VAC/60Hz Power Supply Burner System, a transformer is installed on the panel for the power conversion. All components remain the same.

SECTION TEN

Component Data Sheets

3.2. Varec Biogas 244W Product Information

Waste Gas Burner & Ignition System

The Varec Biogas 244W Series Waste Gas Burner is a highly reliable flare and ignition system ideal for use in burning excess biogas.

INTRODUCTION

The Varec Biogas 244W Series Waste Gas Burner is a highly reliable flare and ignition system. It is developed from systems used extensively in the petroleum industry. The pilot has proven reliability, even in the extremes of climate. The 244W Series is ideal for use in burning excess biogas.

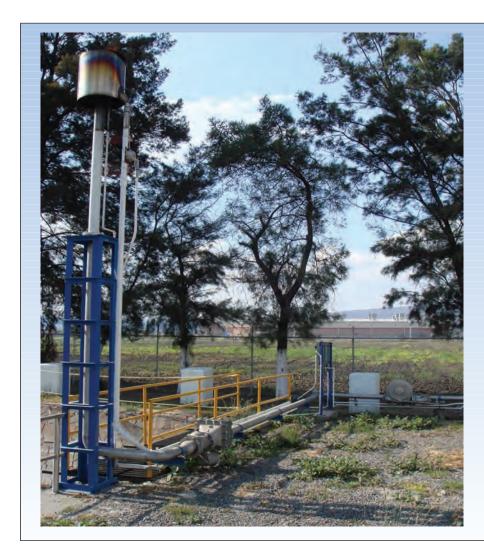
APPLICATION

Excess biogas must be disposed of safely. The gas is flared to avoid an odor nuisance or an explosion hazard. Biogas is generated through the anaerobic digestion of organic solids. It is produced in municipal or industrial anaerobic digesters, lagoons, and municipal landfills. Biogas is typically a highly-moist mixture of gases. It consists of approximately 55 to 70% methane, 25 to 35% carbon dioxide and trace amounts of nitrogen, hydrogen sulfide, and water vapor. The biogas often has a fluctuating flow and BTU value. The 244W Series is designed to operate reliably at low and high flow rates, and is not affected by changes in the biogas BTU value.

OPERATION

The Varec Biogas 244WS Series Burner is a state-of-the-art, candle-stick flare. The burner utilizes a patented pilot ignition system. Pilot gas and air are mixed and ignited at ground level, remote from the burner stack. This controlled method results in a stable pilot flame with an ideal gas-to-air ratio. The pilot burns a true stoichiometric, non-smoking flame. It is not affected by changes in the biogas flow rate or BTU content.

The electronics package controls automatic pilot ignition and monitoring. During the ignition cycle, pilot gas is directed to the flame retention nozzle. Pilot gas is also directed to the venturi



where air is inspirated. The air/gas mixture is ignited at the venturi outlet. The ignition generates a flame front which travels through the continuous flame line and exits the continuous flame nozzle at the burner tip. Gas flowing in the flame retention nozzle is ignited by this flame front.

A thermocouple is installed in the continuous flame nozzle. When it reaches its temperature setting, the controller shuts off the flame retention pilot to conserve fuel. The pilot in the larger continuous flame nozzle continuously burns to ensure efficient combustion of the biogas, and elimination of irritating odor.

The continuous flame nozzle ignites the waste gas as it is relieved through the burner. Should this pilot go out, an alarm is energized and the controller cycles to re-light the pilot. If unsuccessful after several attempts, a second alarm is activated. The system continues to cycle for re-ignition until an operator changes the controller mode.

DESIGN FEATURES

The A44WS, 244WG and 244WL Series design includes features that provide reliable and efficient operation. The design provides flow capacities nearly twice that of conventional "pilot-ring" burners.



Waste Gas Burner & Ignition System

DESIGN FEATURES cont...

The flare can withstand windloading of 150 mph (242 km/h) and windspeeds of 110 mph (180 km/h). Baffles, downdraft preventers, vortex vanes, and secondary stacks are not required. The design also allows the use of smaller diameter burners, thus contributing to cost-efficiency. The inclined pilot nozzle provides a long profile flame that penetrates the waste gas as it passes through. This feature ensures the biogas is ignited at near zero flows.

Installation is simplified. The burner allows high turndown ratios, therefore there is no need to manifold several burners together. Pre-cast concrete supports are not necessary. The burner includes an integral ANSI 150 RF flange. The contractor just has to provide a matching flange and pipe supports. These features keep installation costs to a minimum.

The 244WS, 244WG and 244WL pilot ignition systems include a solid state controller. The controller

sequences the major components that operate the pilot ignition valve and regulator panel.

The 244WS venturi-driven pilot system burns at higher temperature when fueled by propane or natural gas. Refer to our availalable Low Pressure Pilot Gas Ignition systems \Dreve{A} \D

These nozzles are designed to withstand the elevated pilot temperature and H₂S environment. A heavily protected thermocouple permits pilot flame monitoring. The thermocouple provides an extremely reliable pilot signal.

Contacts are provided as standard for remote pilot indication and system alarm. Manual, automatic, or standby ignition modes are switch selectable.

Complete remote control is easily

achieved. Low cost signal wiring (by others) may be connected to the control switch and manual ignition button.

The Varec Biogas 244WS is designed to operate satisfactorily in very cold climates. The large venturi design allows the ignition components to be mounted up to 100 feet (30 m) away from the burner. The control package may also be mounted at this distance without suffering any performance loss. The venturi includes a backflash preventer for safety. An anti-clog orifice is supplied which eliminates the need for pilot filters.

The Varec Biogas Model 244WS is designed with operator safety in mind. All hi-tension leads and sparking devices are located a safe distance from the flame. Typical adjustments and maintenance are performed at ground level, away from the heat of combustion. Ignition components are also located remote from the burner, which provides optimum service.

Low Pressure Pilot Gas:

Blower Package

A blower package is available when the pilot gas supply is less than 10 psig (70 kPa) and as low as 8" W.C. (2 kPa) pressure.

The burner stack and control panel design is the same as the standard 244WS with a venturi.

This option can also handle the same burner flow capacities. Local or "Remote-Start" features are still available. You retain the advantage of having the theory of operation using flamefront technology.

A blower panel replaces the venturi and valve + regulator panel and utilizes a blower to premix air and gas. The blower comes with an air/gas mixing chamber to achieve proper air-gas mixture and is ignited at the chamber exit. It also includes the pilot gas solenoid valves, regulators and gauges required to control pilot gas. See the Sample Specification Product Data Sheet for more information.

244WG Series

Low Pressure Pilot Ignition System

The Varec Biogas 244WG option is specifically designed to burn biogas efficiently with the use of low pressure biogas for pilot fuel (4" ≤ pilot gas pressure ≤ 14" WC) without the requirement of blower-assisted fuel or air.

The Burner comes with two inspirating venturis to help pre-mix air and pilot gas and ensure pilot reliability and efficient combustion of biogas even with the low volume biogas pilot fuel. The control panel and pilot gas control components are mounted on a plate, either fabricated in steel or 304SS. It is installed a maximum of 10 feet horizontal distance from the waste gas burner. The pilot gas piping from the venturis to the waste gas burner connection must be a straight pipe - no pipe bends allowed. This will ensure that the stoichiometric gas can travel to the burner tip.

The 244WG also utilizes flamefront technology like the 244WS option and follows the same operation scheme.

244WL Series

Low Pressure Pilot Ignition System

The 244WL ignition system utilizes the same flame from technology as the industry standard for our Model 244W Waste Gas Burners. The pilot gas control components panel can be mounted up to 70 ft. (seventy feet) from the burner stack. It can utilize biogas, natural gas or propane at pressures as low as 4" WC.

The 244WL ignition system no longer requires a straight pilot gas piping run from the pilot gas control components panel to the burner stack. 45 degrees elbows are allowed providing for greater flexibility during design and installation.

The "L" ignition system comes equipped with a blower to pre-mix air with the pilot gas to achieve the proper air-gas mixture required for combustion. This pre-mixing of the pilot gas and air insures that the pilot stays lit under virtually all flow and weather conditions.

Included with the pilot gas control components are a set of mixing chambers. The sparkplug is located at the end of the 2" mixing chamber. A flame front travels

Waste Gas Burner & Ignition System

244WL Series....cont...

Low Pressure Pilot Ignition System

on the 2" pilot gas line and as it exits the burner stack, the 1/2" retention line is there to capture the flame front.

The angled design of the pilot gas piping has been field tested to achieve the proper air-gas mixture needed for optimum combustion of the waste gas.

All serviceable items are located remotely from the burner stack which protects all electrical components from the heat of combustion. More importantly, Operators are protected from radiant heat effects from the waste gas burner when it is in operation.

OPTIONAL FEATURES

"Remote - Start"

If biogas will be flared intermittently, an option to conserve pilot fuel is available through our "Remote-Start" pilot ignition option. It includes a pilot-gas supply solenoid valve, which opens when pilot ignition is required and remains open while the gas is flaring. The solenoid may be specified to: (a) fail open which will continue to deliver pilot fuel during a power failure and keep the burner operational in an emergency condition, or (b) fail close, which is used when a blower is available to deliver the biogas to the burner or with the biogas pilot ignition system.

The "call for ignition" signal may be provided by a pressure switch, flow-switch, or through a contact change-over

Heater & Thermostat

For ambient temperatures below -20°F (-29°C), a heater and thermostat is recommended. Both are installed in the electronic panel to ensure proper operation of the controller.

Flashback Protection

It is recommended that suitable flame flashback protection be installed in fuel gas lines supplying any of the 244W burner systems. Please refer to 5200 Series Product Data Sheet for information.

Remote Spark Generator

The hi-tension lead wire supplied with the unit is a maximum 10 feet (3 m) in length. In cases where the control panel that houses the transformer cannot be located within 10 feet of the spark plug location, a remote generator can be specified.

The transformer is supplied in either a NEMA 4, 4X or 4 & 7 enclosure and located within 10 feet of the spark plug. This allows an operator to have the control panel installed further away from the burner for improved burner monitoring.

SPECIFICATIONS

Sizes

2", 3", 4", 6", 8", 10" and 12"

Connections

Burner Stack

ANSI 150 RF Flange

Controller

Power Supply Input:

115/120 VAC, 60Hz, Standard

220/240 VAC, 50Hz, Option

I nad-

0.7 Amps at 115 VAC

Ambient Temperature Rating:

-20°F to +150°F (-29° C to +65°C), Standard

Remote Alarm Contacts

SPDT (NC, NO and Common) contacts

Contact Rating:

2 amps at 115 or 240 VAC

Function:

Pilot Out and System Alarm

Materials

Burner

Stainless Steel shroud and upper 24" of stack; remainder mild steel, standard.

All 304SS or 316SS (Optional)

Pilot Nozzles

316 SS

Thermocouple

316 SS

Controller Enclosure¹

NEMA 4, steel construction, Standard

NEMA 4X, 316 SS construction, Optional

NEMA 7, aluminum construction with o'ring or steel, Optional

Notes

1. UL Approval on NEMA 4/4X Control

High Pressure Pilot Gas Supply

Natural Gas or Propane

Minimum supply pressure: 10 PSIG (70 kPa)

Maximum supply pressure: 100 PSIG (700 kPa)

Recomended Pipe Length from Venturi to continious flame nozzle:

Minimum distance: 15 feet (5m)

Maximum distance: 100 feet (30m)

Low Pressure Pilot Gas Supply

When available pilot gas pressure is less than 10 PSIG (70 kPa) and greater than 4" WC.

Blower Package

Natural Gas or Propane

Minimum Supply Pressure: 6" - 8" WC

General purpose motor, Standard

Explosion proof motor, Optional

Recommended Pipe Length from blower package to continuous flame nozzle:

Maximum distance: 33 feet (10m)

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Waste Gas Burner & Ignition System

Recomended Pipe Length from Venturi continuous flame

Varec Biogas does not supply the pilot gas piping

between the valve & regulator panel to the

Composed primarily methane (50-55%) and CO₂

Maximum distance:70 feet (21m)

combustion stack.

Biogas

(40 - 45%).

Gas to be Flared

Minimum inlet pressure

450 bend allowed on pilot gas piping .

SPECIFICATIONS

244WG Biogas Pilot Ignition System

Dry Biogas Pilot of 500 BTU/ft3 minimum

Biogas or Natural Gas Supply Pressure

Supply Pressure:

4" WC min. to 14" WC max.

Recommended Pipe Length from Venturis to waste gas burner (244WG):

Maximum distance: 10 feet (3m)

Only one 900 bend allowed on pilot gas piping, maximum.

244WL Biogas Pilot Ignition System

Dry Biogas Pilot of 500 BTU/ft3 minimum

Biogas, Natural Gas or Propane

Supply Pressure:

4" WC min. to 0.75 psi max.

Pilot Gas Piping Connections

- 1. Pilot Fuel Supply 1" NPT
- 2. Valve & Regulator Panel Connections.
 - a. Continuous Line 2" NPT
 - b. Flame Retention Line 1/2" NPT

Dimensions, inches and pounds [millimeters and kilograms]

Size Code	2	3	4	6	8	0	1	4"WC (1 kPa)
Nominal Pipe Size	2 [50]	3 [80]	4 [100]	6 [150]	8 [200]	10 [250]	12 [300]	Optional Features
i ipo oizo	88	92	92	128	144	176	188	Auto-Start signal (specify with)
Α	[2235]	[2337]	[2337]	[3251]	[3658]	[4470]	[4775]	Dry contact, Standard
В	20	24	24	32	48	48	60	115 VAC input signal, Optional
5	[508]	[610]	[610]	[813]	[1219]	[1219]	[1524]	Explosion proof pressure switch
С	15 [381	18 [457]	20 [508]	22 [559]	24 [610]	30 [762]	36 [914]	Operating range: 4"- 20" (100mm - 500 mm) WC
	[00]	[.0.]	[000]	[000]	[0.0]	[. 02]	[0]	Deadband: Approxiamately 0.5" (13mm) WC
Weight	150	175	200	300	425	750	950	←-C- →
(Burner)	[68]	[79]	[91]	[136]	[193]	[341]	[432]	MIDEL 244W
					6. ALL CON	DUIT AND FIE	ELD WIRING BY OTHE	WASTE GAS BURNER ASSEMBLY
					25' (7.6)	M) AND 100' (VENTURI MA)) CONTROL PANEL BE 30M) FROM PILOT NO: KIMUM 10 FEET (3M) F	
					ABOVE (ER TO BE MIN OF 24' ISTALLED SO THAT IT S SHOWN.	
		← CONTROL					DEL 440) TO BE MOU _AME SOURCE.	D VITHIN THE REPORT OF THE PROPERTY OF THE PRO
	_/	PANEL (ELE	ECTRONICS)				URNISHED BY OTHERS	### A
		/	/ PACKAGE	I REGULATOR			D UNDER PATENT PR TES #4025281, CANAI	TION HINCTION ROY —
POWER SUP		<u> </u>	HI-TENSI				TYPE K THERMOOD INPUT (BY DITHE (1/2' CONDUIT REI	CHECK (REFERENCE)
ZNBAFA FIN	NE NE O		- 1/2" PIPE				1/2" PIPE	
						•		
	. 7		J '\		SSEMBLY WITH E	BACKFLASH	2° PIPE SLOPE TOWARD V	RI
	BACKFLA PREVENT	ZH L		PRE VENT	ER OUTDOORS)		(D□ N□T BURY	MIDEL 440 PRESSURE RELIEF AND
	FREVENT	EK [WASTE GA PRESSUR SWITC NEMA	E		10' (3M) — MIN	-	FLAME TRAP ASSEMBLY (REFERENCE)
				4			===	CUSTOMER SUPPLIE
				9		_ —		FLANGE & GASKET
			> -					ON SUITABLE SUPPO
		WASTE GA	72 A2		TURNISHED		∠_ z	GRADE DRIP TRAP (REFERENCE)

- 1. The appropriate height of the flare must be calculated to ensure occupational safety. Consult factory for assistance.
- 2. Stack dimensions are the same for all the options available with the 244W (244WS or 244WG).

Waste Gas Burner & Ignition System

SPECIFICATIONS

Burning Capacity, FT3/HR [M3/HR] - Maximum Flows

Flow stated for biogas with specific gravity 0.8 with 4" WC inlet pressure at flange connection and .05" WC pressure drop at 60°F (15°C) between the inlet flange and burner tip. Consult factory for flare sizing based on meeting 40 CFR Part 60.18 and Water Environment Federation, Manual of Practice (MOP) No. 8.

Size Code	02	03	04	06	08	0	01
SIZE	2"	3"	4"	6"	8"	10"	12"
FT ³ /HR	3,850	11,600	22,250	51,300	88,150	150,000	250,000
M ³ /HR	[109]	[328]	[630]	[1,453]	[2,496]	[4,245]	[7,075]

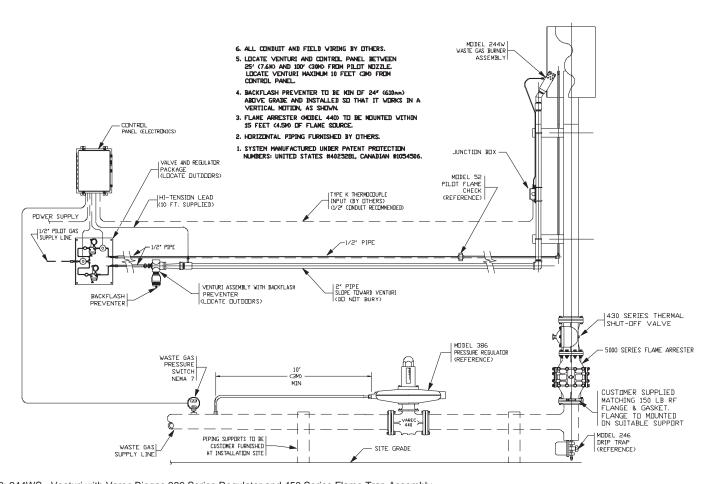


Figure 02: 244WS - Venturi with Varec Biogas 386 Series Regulator and 450 Series Flame Trap Assembly

The 450 Flame Trap Assembly is not designed to support burner weight. Alternate support may be required and is recommended.



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SPECIFICATIONS

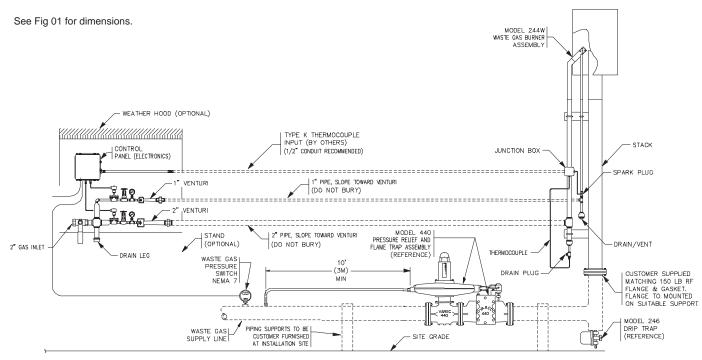
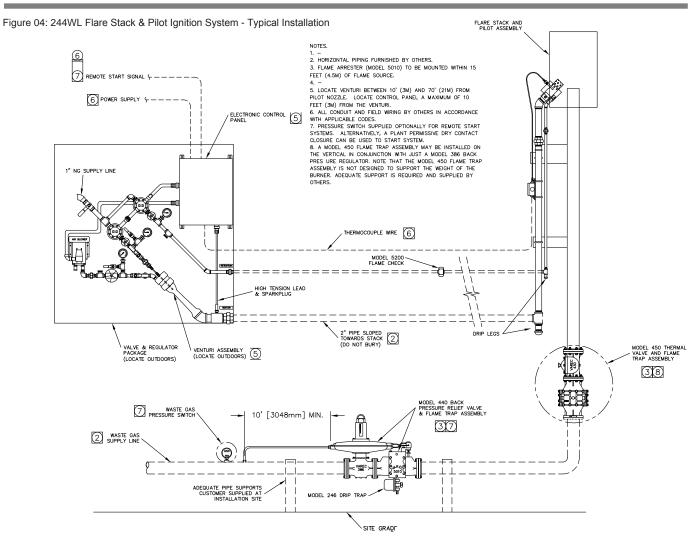


Figure 03: 244WG - Venturi with Varec Biogas 440 Series Flame Trap Assembly



Waste Gas Burner & Ignition System

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244W

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ORDERING INFORMATION Model Description 244W Waste Gas Burner & Ignition System Code Flame Monitoring G Low Pressure Pilot Ignition System (pilot gas is 14" WC > x > 4" WC)1 L Low Pressure Pilot Ignition System (pilot gas is 0.75 PSIG > x > 4" WC) Code Size 2 2" 3" 3 4 4" 6 6" 8 8" 0 10" 12" Power Supply (must select one) Code 115 - 120 VAC 60Hz, (Standard) 2 220 - 240 VAC 60Hz 3 220 - 240 VAC 50Hz Code Electronic Enclosure Rating (must select one) 4 NEMA 4, Weatherproof (standard) 7 NEMA 7, Explosion-proof (optional) 9 NEMA 4X, Stainless Steel (optional) Code Remote - Start Option (must select one) None-Manual Start Dry Contact - NEMA 7 Pressure switch included 2 Dry Contact - Pressure switch not required Pilot Solenoid (Used only with Remote - Start option) 0 No Auto-Start option required Pilot solenoid shall fail open (not available with blower package) 1 2 Pilot solenoid shall fail closed Code Blower Package Option (must select one) Indicate when specifying: * Standard venturi-driven system (pilot gas is 10 psig or greater), or * "G" & "L" Pilot Ignition System. Blower package - general purpose Blower package - explosion proof Code Available Options (may select more than one) 0 None required (Standard) 1 Heater and thermostat mounted within electronic enclosure panel Specify if full feature or Basic/Standard 2 Remote Spark Generator NEMA 4 panel on sales order. 3 Remote Spark Generator NEMA 7 2. Only available option with the 244WG & 244WL 4 Natural Gas for Pilot Gas (244WG/B/GIY Š Uption) XXX /XXX ÁÁÚ¦[]æ)^EŠÚÕÁ;¦ÁÚã[dÁÕæ ÁQÁGI!YÕÁBÁGI!YŠÁU]dã;}D Option can be used for 244WS, 244WL and 6 244WG systems. Reference drawing No. 244WG or 244WL Mounting Stand & Weatherhood (Steel and galvanized weatherhood P-614-00. Construction)2 4. Always include this option when specifying 7 244WG or 244WL Mounting Stand & Weatherhood (304 Stainless Steel Construction)² a three-way solenoid valve with the model 8 Auxiliary Weatherhood and Mounting Stand (Steel with galvanized weatherhood 386/440. Auxiliary Weatherhood and Mounting Stand (304 SS construction)3 Relay for use with Model 386/4404 Code Burner Stack, Shroud and Pilot Gas Piping Material Leave blank when specifying standard of Upper 24" of stack, shroud and pilot gas piping in 304 SS, remainder mild steel.

Example: 4" Model 244WS Waste Gas Burner and Pilot Ignition System, 115/120 VAC, 60 Hz, NEMA 4X Enclosure, NEMA 7 Pressure Switch included, pilot solenoid to fail open, pilot gas is 10 psig or higher, heater and thermostat mounted within electronic enclosure panel, Stack, shroud & piping material all 304

S4

S6

0

All 304 SS

All 316 SS

S4

Example

1

BGH5 @05 H±CB'D< CHC

