

The Varec Biogas 244E Series Enclosed Burner Systems are designed to burn biogas with guaranteed destruction removal efficiency (>99%) over a wide range of operating parameters.

## INTRODUCTION

The Varec Biogas 244E Enclosed Burner Systems are designed to burn biogas efficiently and safely over a wide range of operating parameters. With no visible flame, the 244E systems use an innovative stack design to naturally induce the proper amount of combustion air which guarantees high destruction removal efficiency.

The design of the 244E allows for complete combustion of the digester gas or landfill gas. The unique stack design takes advantage of the natural draft properties of the combustion process to draw in the correct amount of air necessary to provide complete combustion. This is all done without the need for motorized dampers and complicated control systems. Independent tests have shown Destruction Removal Efficiencies (DRE) in excess of 99% and low NOX and CO emissions.

The 244E enclosed burner system is not a time and temperature based flare. Its design is constructed to allow combustion air to be naturally inspired and obtain the proper air-gas mixture, thus achieving the optimum operating temperature necessary for complete combustion to occur. The 244E's innovative combustion stack design eliminates the need for refractory lining and insulation to protect the chamber of high temperatures since cooling air is naturally induced in the stack section openings. This also eliminates the need for heat shields and structures.

The 244E Enclosed Burner System is cost effective and its design makes for easy and reliable operation and maintenance.

## OPERATING PRINCIPLE

Biogas is introduced via venturi nozzle burners to the combustion chamber zones. Gas is introduced into the main burner zone, and secondary burner zones are opened when the gas flow rate and pressure increases.



Air is naturally introduced from the stack base and the gaps between each stack section. The design allows for a natural introduction of air into the combustion process. The required amount of air is induced with the increase in heat release rate resulting in higher combustion efficiency. The heat generated in the combustion process draws in air that allows natural cooling of the chamber to take effect.

## DESIGN FEATURES

- No visible flame

- Infinite turn down ratio - The design allows biogas combustion without limiting the gas flow range.
- No motorized or manual dampers required to bring in combustion air.
- Destruction Removal Efficiencies (DRE) in excess of 99%. Low NOX and CO emissions.
- No refractory lining or insulation required.
- Smaller footprint.
- Utilizes the same efficient and reliable 244W flamefront technology or pilot ignition.

# Varec Biogas 244E Series (US Patent # 6,012,917 and 6,146,131)

Enclosed Burner and Automatic Pilot Ignition System

## SPECIFICATIONS

The 244E utilizes the same state-of-the-art, pilot ignition system as the 244W. Pilot gas and air are mixed and ignited at ground level, remote from the combustion stack assembly. This controlled method results in a stable pilot flame with an ideal gas-to-air ratio. It is not affected by changes in the biogas flow rate or BTU content.

The unit includes an electronics package that controls pilot gas supply, ignition and monitoring. During the ignition cycle, pilot gas is diverted through the dual pilot lines. One line is referred to as the Continuous Flame line

and another smaller pilot line is referred to as the flame or ignition retention line.

Air is inspirated through venturi(s) installed in either one or both pilot lines. This stoichiometric air/gas mixture is ignited remote from the combustion stack and generates a flame front that travels to the pilot nozzle tip. The secondary pilot fuel line assists in ensuring that the flame front is not purged, and a pilot flame is established.

The pilot flame continuously burns to ensure efficient combustion of the biogas. Pilot gas only continuously flows

through the continuous line when there is a demand to combust biogas. Otherwise, the controls will permit burner operation in a standby mode. No pilot gas is consumed when there is no demand to combust biogas.

The ignition system provides for automatic re-ignition in case the pilot is lost. If unsuccessful after a time duration, then an alarm is activated signaling PILOT FLAME FAILURE.

### Burner Inlet Sizes

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

### Burner Capacity

Please consult the factory for proper sizing of the 244E. Specify maximum waste gas flow rate, gas composition, inlet gas pressure and specific gravity.

### Combusted Gas

#### Biogas

Primarily methane of low BTU content.

#### Minimum inlet pressure

4"WC (100 mm H<sub>2</sub>O) at flare inlet manifold.

### "S" Pilot Ignition System

#### High Pressure Pilot Gas

Natural Gas or Propane

Minimum supply pressure: 10 PSIG (70 kPa)

Maximum supply pressure: 100 PSIG (700 kPa)

Recommended Pipe Length from Venturi to continuous flame nozzle:

Minimum distance: 15 feet (5m)

Maximum distance: 100 feet (30m)

#### Low Pressure Pilot Gas

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

#### Blower Package

Specify when piping lay-out dictates that the control panel cannot be installed 10 feet horizontal distance from the stack.

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)

### "G" Pilot Ignition System

#### Biogas Pilot Ignition System

Dry Biogas Pilot of 500 BTU/ft<sup>3</sup> 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 (Biogas Pilot Ignition System):

Maximum distance: 10 feet (3m) horizontal distance to the stack

Only one 90° bend allowed on pilot gas piping, maximum.

### "L" Pilot Ignition System

#### Biogas Pilot Ignition System

Dry Biogas Pilot of 500 BTU/ft<sup>3</sup> minimum

Biogas, Natural Gas or Propane

Supply Pressure: 4" WC min. to 20" WC max.

Recommended Pipe Length from Venturis to continuous flame nozzle:

Maximum distance: 70 feet (21m)

45° bend allowed on pilot gas piping

### Control System

The standard control panel and temperature recorder (optional) is provided with relay logic and is also available with a programmable logic controller (PLC). The PLC can be provided with HMI touch screen controls which provide the same inputs and outputs as our relay logic panel. Please consult the factory for additional information on our PLC-based control panel.

### Materials

#### Combustion Stack Assembly

304 SS chambers with 11Ga#2B wall thickness.

#### Stack Burner Base & Pedestal and Inlet Manifold

Carbon steel with a 3-4 mil P-Series TGIC Polyester topcoat powder coating for corrosion resistance. The burner base & pedestal is designed to secure the stack firmly to the foundation and will be provided with bolt holes for support.

All 304 or 316 SS is an available option.

#### Combustion Stack Pilot Gas Piping

The pilot gas piping provided with the combustion stack assembly is supplied in 316 SS.

#### Pilot Gas Nozzles

Continuous Pilot Flame Nozzle: 316 SS

Flame Retention ("S & L ignition System"): 316 SS

Ignition ("G ignition system"): 316 SS

#### Thermocouple Assembly

Thermocouple is installed in the continuous pilot flame nozzle and is supplied in inconel, Standard.

A secondary thermocouple can be installed at the combustion stack assembly and temperature recorder exit to monitor stack exit temperature, Optional.

### Connections

#### Combustion Stack Assembly

The combustion stack assembly mounts on the burner base and is self supporting. Lugs are provided on the stack for attachment of guy wires where necessary for additional support.

Waste biogas standard connection is an ANSI 150 RF Flange. ANSI 150# FF or DIN Flanges available upon request.

The assembly Includes:

Main combustion stack, Burner manifold, Continuous pilot nozzle, thermocouple, and flame or ignition retention nozzle.

#### Stack Pilot Gas Connection

"S" and "L" Ignition System

Continuous Pilot Nozzle - 2" NPT  
Flame Retention Nozzle - 1/2" NPT

"G" Pilot Ignition System

Continuous Pilot Nozzle - 2" NPT  
Ignition Line - 1" NPT

#### Pilot Gas Supply Connection

"S" Pilot Ignition System

Pilot Fuel Supply - 1/2" NPT

Valve & Regulator Panel Connections - Varec Biogas does not supply the pilot gas piping between the valve and regulator panel to the combustion stack.

Continuous Line -

Venturi Inlet: 1/2" NPT

Venturi Outlet: 2" NPT

Flame Retention Line - 1/2" NPT

"G" Pilot Ignition System

Pilot Fuel Supply - 2" NPT

Valve & Regulator Panel Connections - Varec Biogas does not supply the pilot gas piping between the valve and regulator panel to the combustion stack.

Continuous Line - 2" NPT

Flame Retention Line - 1" NPT

"L" Pilot Ignition System

Pilot Fuel Supply - 1" NPT

Valve & Regulator Panel Connections - Varec Biogas does not supply the pilot gas piping between the valve and regulator panel to the combustion stack.

Continuous Line - 2" NPT

Flame Retention Line - 1/2" NPT

### Electrical

#### Enclosure

NEMA 4, weatherproof (standard)

NEMA 4X, corrosion resistant,  
316 Stainless Steel (Optional)

NEMA 7, explosion proof, aluminum (Optional)

#### Power Consumption

10 amps @ 120VAC or 5amps @ 240VAC (50/60 Hz)

#### Ambient Temperature Rating

-40°F to +131°F (-40°C to +55°C)

#### Electronic Controller Operating Modes

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

#### Flame Monitoring

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

#### Remote Alarm Contacts

One set SPDT dry contacts for pilot on/off status.  
One set SPDT dry contacts for pilot flame failure

Contact rating:

Max 2 amps @ 120VAC OR 240VAC (50/60Hz).

#### Pilot On/Off Alarm Response

Immediate upon cooling of thermocouple below set point.

### Available Options

#### Remote Start/Stop Signal Input

Option provided when remote automatic pilot ignition is required.

Contact connections are provided for available plant signal.

N.O. dry contact closure (standard)

120 VAC or 240 VAC input signal (optional)

#### Remote Start Time Delay Relay

Included when remote start option is supplied.

Factory Set:

Setting Mode D, Unit Mins

Range:

0-30, factory set 4 minutes

Function:

Prevents system from frequent "ON"/"OFF" cycles (nuisance switching) during pressure fluctuations at remote pressure switch.

### Available Options

#### Remote Start Pressure Switch

Option provided when remote automatic pilot ignition is specified and a method of starting and shut-ting the burner is required through main gas line pressure.

Range: 4" to 20" (10mm to 500mm)  
WC

Pressure Connection: 1/8" NPT

Switch Rating: 15 amps @12VAC 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: -0° to +140°F  
(-40°C to +60°C)

Approvals: CSA, FM and UL

#### Control Panel Enclosure

#### Heater & Thermostat

This is recommended for outdoor panel installations that have cold weather conditions.

Rating: 125 watts, 120VAC or  
240VAC

#### Remote Spark Generator

The hi-tension lead wire supplied with the unit is a maximum 10 feet (3m) in length. In cases where the control panel that houses the transformer cannot be located within 10 feet (3m) 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 (3m) of the spark plug. This allows an operator to have the control panel installed further away from the burner for improved burner monitoring.

#### Flashback Protection

It is recommended that suitable flame flashback protection be installed in fuel gas lines supplying any of the 244E Burner systems. Please refer to 5200 Series Product data sheet for information.

# Varec Biogas 244E Series (US Patent # 6,012,917 and 6,146,131)

Enclosed Burner and Automatic Pilot Ignition System

## ORDERING INFORMATION

<b>Model</b>	<b>Product Description</b>
244E	Waste Gas Burner & Ignition System, Enclosed with no visible flame
<b>Code</b>	<b>Pilot Ignition System</b>
S	Standard
G	Low Pressure Pilot Ignition System (pilot gas is 15" WC > X > 4" WC)
L	Low Pressure Pilot Ignition System (pilot gas is 0.75 psig > X > 4" WC)
<b>Code</b>	<b>Maximum Flow Capacities</b>
	<b>SCFH</b> <b>m3/hr</b>
A	
B	
C	<b>PLEASE CONSULT FACTORY</b>
D	<b>FOR SIZING</b>
E	
F	
	<b>Inlet Manifold<sup>2</sup></b>
	3" (75 mm)
	3" (75 mm)
	4" (100 mm)
	6" (150 mm)
	10" (250 mm)
	12" (300 mm)
<b>Code</b>	<b>Power Requirements (Must select one)</b>
1	115/120 VAC, 60 Hz (standard)
2	220/240 VAC 60 Hz
3	220/240 VAC 50 Hz
<b>Code</b>	<b>Electronic Enclosure Rating (Must Select One)</b>
4	NEMA 4, Weatherproof (standard)
7	NEMA 7, Explosion-proof (optional)
9	NEMA 4X, Stainless Steel (optional)
<b>Code</b>	<b>Remote-Start Option (Must select one)</b>
0	None-Local Start
1	Dry Contact - NEMA 7 Pressure switch included
2	Dry Contact - Pressure switch not required
<b>Code</b>	<b>Pilot Solenoid (Used only with Auto-Start option) (Must select one)</b>
0	No Auto-Start option required
1	Pilot solenoid shall fail open-(not avail. with blower package)
2	Pilot solenoid shall fail closed
<b>Code</b>	<b>Blower Package Option (only with 244WS system)</b>
0	Indicate when specifying when: Standard venturi-driven system (pilot gas 10 psig or greater) or "G" & "L" Pilot Ignition System
1	Blower-driven system <sup>5</sup>
<b>Code</b>	<b>Options (may select more than one)</b>
0	None required (standard)
1	Heater and thermostat mounted within electronic enclosure panel
2	Remote Spark Generator NEMA 4
3	Remote Spark Generator NEMA 7
4	Low pressure Natural Gas for Pilot Gas (244WG & 244WL option)
5	Propane/LPG for Pilot Gas ( 244WS or 244WL option)
6	244WG or 244WL Mounting Stand & Weatherhood (Steel and galvanized weatherhood Construction) <sup>1</sup>
7	244WG or 244WL Mounting Stand & Weatherhood (304 Stainless Steel Construction) <sup>1</sup>
8	Auxiliary Weatherhood and Mounting Stand (Steel with galvanized weatherhood construction) <sup>2</sup>
9	Auxiliary Weatherhood and Mounting Stand (304 SS construction) <sup>2</sup>
R	Relay for use with Model 386/440
A	Anchor Bolt Calculations
C	CSA Approval (Min. Stack Height, FF Flange, CSA Inspection)
W	Left Exit Panel (right exit - standard)
P	Step down pilot gas pressure regulator Max 10 psig regulated to 12" WC <sup>6</sup>
I	Standard Insulation cladding on burner manifold
<b>Code</b>	<b>Standard Combustion Stack, burner base and pedestal:<sup>4</sup></b>
	1. The flare stack - 11 GA#2B thickness, 304 stainless combustion chamber. Combustion stack piping will be 1-1/4" 304 SS SCH 40, all other stack materials to be 304SS.
	2. Burner base, pedestal and waste gas inlet manifold - Carbon steel with a 3-4 mil P-Series TGIC Polyester topcoat powder coating for corrosion resistance.
	3. 347 Stainless steel venturi nozzle burners and elbows.
	4. 304 SS stainless steel pilot gas piping with 316 SS Continuous Pilot and Retention nozzles
S4	All 304 SS
S6	All 316 SS

**Notes:**

1. Available option with the 244EG and 244EL.
2. Option can be used for 244ES,244EG and 244EL systems.
3. Always include this option when specifying a three-way solenoid valve with the Model 386/440.
4. Add an S4 or S6 at the end of the PN to signify choice of either all 304 SS or all 316 SS burner stack, shroud and pilot gas piping.
5. The blower driven system come standard with Explosion proof motor and switch.
6. Include a step down pressure regulator if the available pilot gas supply pressure is greater than 15" WC.