

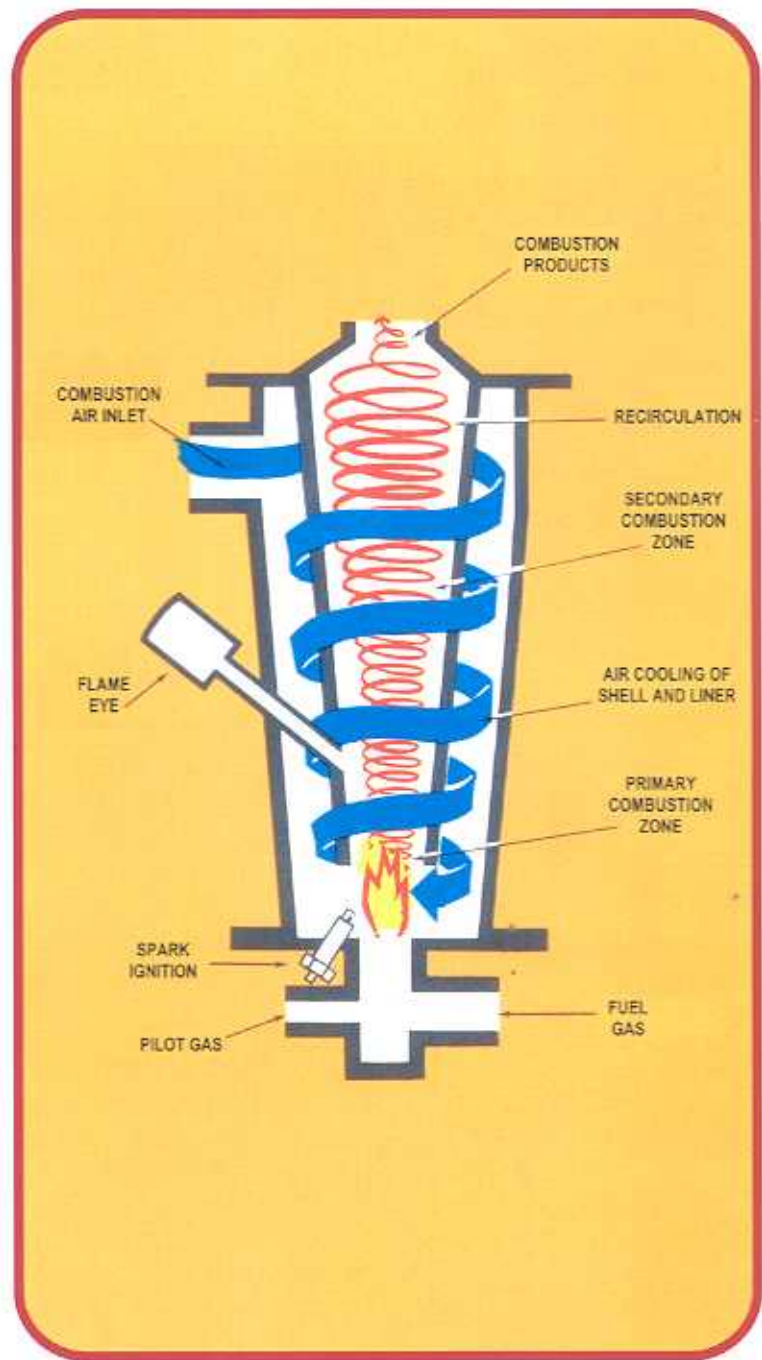
BS & B[®]
**PROCESS
SYSTEMS**

The Uniflux Fuel Reactor

Two major components make up Uniflux the Fuel Reactor and the Heat Exchanger. The Fuel Reactor is the heat supplying element of Uniflux, and accounts for many advantages of the heater.

HOW IT WORKS

The Fuel Reactor receives combustion air tangentially from a blower (20" W.C., discharge or above). From the annulus of the reactor, the air enters the "inner" cone at the back of the reactor with a rotational flow, generating a vortex at the point of fuel injection. This vortex creates a low pressure area at the fuel injection point which allows for use of low pressure fuel (6" W.C. at reactor). Rapid mixing of the fuel and air in the ignition zone is created by the vortex. The design of the reactor causes the combustion process to be carried out under highly turbulent conditions. The combustion process is completed within the reactor with essentially no flame extension and with high temperature vent exhaust gases emitted from the discharge end.



ADVANTAGES

HIGH HEAT RELEASE RATES: About 10,000,000 BTU/Hr/ cu. ft. of combustion volume in firing natural gas.

MINIMUM FLAME EXTENSION: Combustion is essentially completed within the Fuel Reactor with only high temperature inert combustion products emitted. All combustion occurs prior to contact with low temperature areas, preventing flame chilling.

STOICHIOMETRIC COMBUSTION: The reactor is adjustable to stoichiometric fuel-air ratios with complete combustion assured within the reactor. It operates over wide range of turndown with stable combustion.

SAFE OPERATION: The Fuel Reactor is sealed-eliminating flash backs and the need for flame arrestors; it can be completely automated and controlled with optional safeguards and accessories.

COMPACT: With high heat release, the reactor is designed for compactness.

FAST RESPONSE: The Fuel Reactor has instant response to process load changes with its high velocity exhaust gases.

ALL METAL CONSTRUCTION: Cooling effect of inlet combustion air keeps inner and outer cones cool, even when reactor is operating at full capacity. Temperature on outer cone approaches temperature of inlet air. The need for refractories is eliminated.

LOW PRESSURE FUEL: With vortex at the point of fuel injection, low pressure fuels down to 6" W.C. can be effectively burned in the reactor.

The Uniflux Heat Exchanger

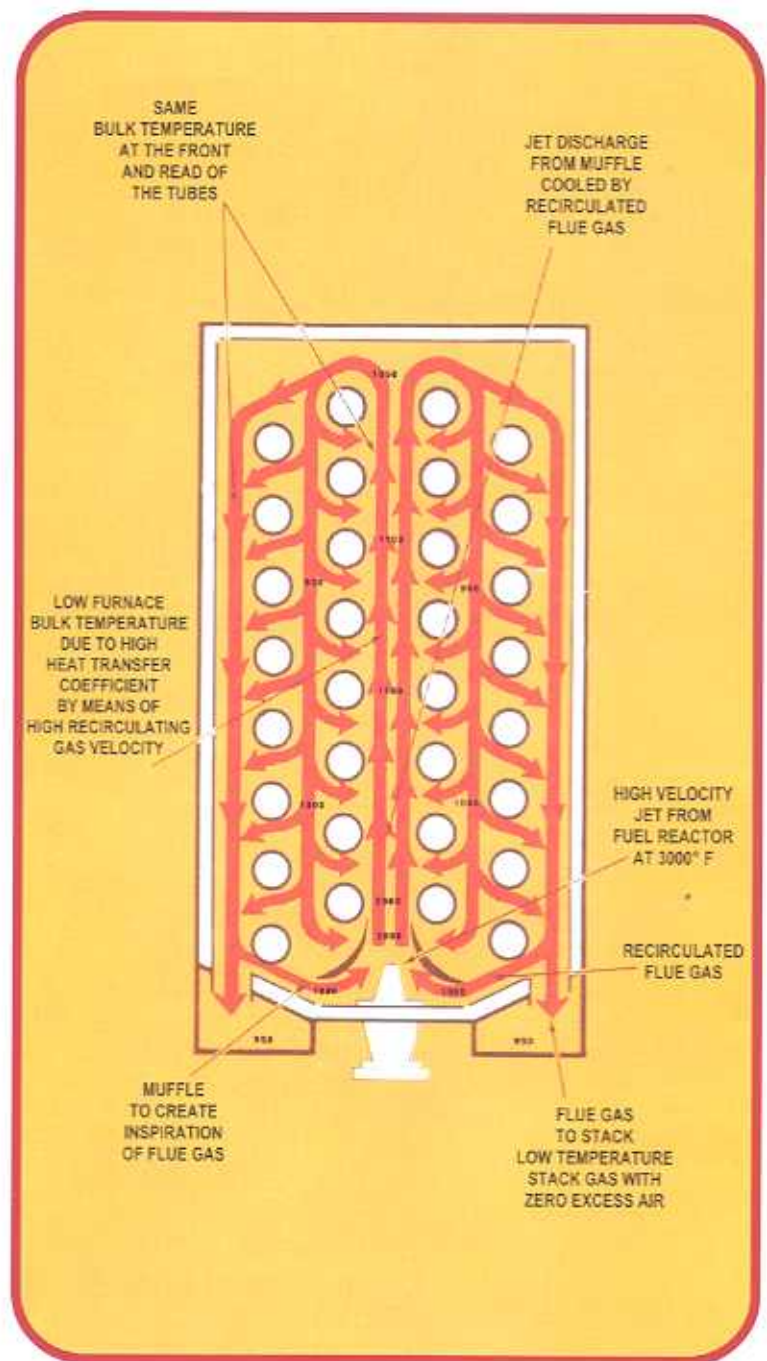
HOW IT WORKS

High velocity, high temperature gases from the Fuel Reactor enter the muffle (or venturi section) of the Heat Exchanger. Process heat transfer tubes are usually located perpendicular to the exhaust jet. The jet passes through the center of the muffle between the inner tubes of the exchanger. The jet is turned 180° at the top of the exchanger and the hot gases flow down the back side of the tubes.

The rapid counterflow of hot inert exhaust gases causes circulation to occur around each tube. This circulation generates a uniform heat flux between the exhaust gases and the process fluid, through the tube walls.

The "jet pump" effect of the discharge gases (discharging at exceedingly high velocities into the muffles) causes fast recirculation of flue gases around the process tubes and into the muffles. The inspiration of the cooler flue gas into the muffles tempers the high temperature exhaust gases and allows **safe, convective** heat transfer.

The flux rate can be chosen for optimum heat transfer conditions. Carbon steel tubes can be used in many Uniflux applications. Uniflux is available with plain or finned tubes in low carbon or alloy steel. Exchangers are available as cabin or cylindrical types. Double wall construction consists of mineral wool insulation sandwiched between a stainless steel inner liner and a carbon steel outer shell. This makes intermittent operation practical and minimizes radiation and convection heat losses.



ADVANTAGES

UNIFORM HEAT FLUX: High circulation of exhaust gases around tubes creates a uniform heat flux. This means lower tube wall temperatures can be used for the same average heat transfer rate as with conventional heaters.

NO FLAME IMPINGEMENT: Complete combustion within Fuel Reactor means no flames within the tube area. Tube walls are safe from flame. Coking of tubes is minimized.

HIGH THERMAL EFFICIENCY: Using Uniflux tube banks alone, efficiencies of 80% are possible. With a convection bank or economizer added, efficiencies of 90% can be attained.

NO REFRACTORIES: Lower muffle temperatures in the Uniflux Heat Exchanger and special insulated double

wall of the exchanger shell eliminate the need for refractories, permitting intermittent operation.

SAFE OPERATION: No flashbacks are possible with the sealed Fuel Reactor. Inert gases in the exchanger cannot support combustion in the case of tube leak or failure.

LIGHT WEIGHT: Uniflux Heat Exchangers weigh two thirds less than conventional refractory lined units.

SKID ASSEMBLED: Delivered complete with skid. Only process piping and electrical connection are required at plant site.



Standard Accessories

COMBUSTION AIR BLOWER

Sized to meet combustion requirements of heater-drive motor included.



FUEL REACTORS

Sized for heat requirements of heater complete with pilot and electric ignition.



FUEL GAS & COMBUSTION AIR PROPORTIONAL CONTROL VALVE

Provides for adjusting fuel-air ratio for manual operation only.



FUEL GAS ACCESSORIES

Includes piping, valves, regulators and strainers required for connecting Fuel Reactor to fuel gas supply.

Optional Accessories / Safety Devices

1. **Automatic proportional temperature control:** Controls outlet temperature of the process fluid. Also available with temperature recorder.
2. **Combustion Safeguard Device:** Provides automatic shutdown in case of flameout by the Fuel Reactor.
3. **Purge Timer:** Purges the heat exchanger of any combustion gases which might have accumulated prior to startup.
4. **Solenoid Pilot Gas Valve:** Opens to start the pilot when purge timer signals its completed operation.
5. **Solenoid Fuel Gas Valve:** Supplies fuel to burner only after pilot is established and proved.
6. **Proportioning Air-Fuel Valve:** Maintains proper fuelair ratio for combustion and automatically adjusts heat release to maintain constant process temperature.
7. **Temperature Safety Shutdown Device:** Senses increase in flue gas temperature and automatically shuts down the fuel reactor in the event of excessive stack temperatures.
8. **Ignition Time Limit Switch:** Shuts in unit if it has not fired on startup in the predetermined 15 or 30 second time limits. Startup sequence including purge must be completed before ignition. This prohibits a dangerous collection of unburned fuel in the heat exchanger.
9. **Combustion Air Pressure Switch:** Shuts unit in when adequate supply of combustion air is not available.

