TwinBed II Regenerative Burners operate as a conventional regenerative high velocity burner when the furnace temperature is below 1450°F (788°C). Above 1450°F, fuel is switched to strategically placed nozzles adjacent to the burner tunnel port. Low NOx Injection of fuel (LNI) into the furnace chamber allows the combustion products to be sucked back into the air and fuel streams, reducing the rate and temperature of the combustion reaction, thus significantly suppressing the formation of NOx. This “in-furnace” direct NOx control method maintains the highest potential efficiency. There is no efficiency loss as with flue gas recirculation (FGR) that is frequently used to reduce NOx emission from regenerative burners.

**TYPICAL APPLICATIONS**
- Aluminum melter
- Glass melter
- Steel forge furnace
- Steel reheat furnace
- Heat treat furnace
- Retort furnace

**ACTUAL PERFORMANCE DATA**

<table>
<thead>
<tr>
<th>Furnace temp. °F</th>
<th>Air preheat temp. °F (average)</th>
<th>Waste Gas Temp. °F at 90% bed extraction</th>
<th>TwinBed II combustion efficiency % (average)</th>
<th>Combustion efficiency % (cold air)</th>
<th>Fuel savings over cold air operation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1470</td>
<td>1220</td>
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<td>2280</td>
<td>460</td>
<td>74</td>
<td>23</td>
<td>69</td>
</tr>
</tbody>
</table>

**LOW NOx EMISSIONS**

TwinBed II uses low NOx technology developed by Tokyo Gas Co. Ltd. of Japan. North American is the exclusive worldwide licensee for this technology with regenerative burners. To minimize NOx formation, two different air-fuel mixing techniques are used depending on furnace temperature.

**CONVENTIONAL VS. TWINBED II NOx LEVELS**

Conventional regenerative burner NOx levels vs. TwinBed II

TwinBed II is operated as a conventional regenerative high velocity burner when furnace temperature is below 1450°F (788°C). Above 1450°F fuel is switched to strategically placed nozzles adjacent to the burner tunnel port. Low NOx Injection of fuel (LNI) into the furnace chamber allows inspiration of combustion products into the air and fuel streams, reducing the rate and temperature of the combustion reaction, thus significantly suppressing the formation of NOx. This “in-furnace” direct NOx control method maintains the highest potential efficiency. There is no efficiency loss as with flue gas recirculation (FGR) that is frequently used to reduce NOx emission from regenerative burners.
Gas injectors reduce NOx emissions.

FGR involves adding furnace exhaust gas to the combustion air where the inert constituents reduce the rate and temperature of the combustion reaction. If added after the combustion air flows through the regenerator, FGR can reduce system thermal efficiency up to 15%. If added prior to the regenerator system, efficiency can be maintained, but larger regenerators are required to accept the additional volume. Other regenerative burners use up to 50% FGR.

A very practical advantage of TB-II low NOx technology is the simplicity of construction of the burner and tile. Burners that use air staging to reduce NOx require internal refractory baffles that the TB-II design eliminates.

**CONTROLS**

TwinBed II operates with the same controls (air/fuel ratio, furnace pressure, and flame detection) used with conventional burners.

Air/fuel ratio is typically controlled with differential pressures from an orifice plate in the combustion air line and a flow-based fuel rate control system--either regulator or electronic.

Typically, about 80% of the furnace gases are exhausted through the regenerators. The remaining 20% passes through a pressure controlled furnace flue.

Exhaust flow through the regenerators is controlled by the temperature of the exhaust gases leaving the regenerator. If temperature is too low, the exhaust flow through the regenerator is increased. Furnace pressure is controlled with the flue damper. Logic links from the furnace pressure control to the burner exhaust system prevent excessive pull through the burners which would result in negative furnace pressure.

Each burner’s flame supervision uses ultraviolet flame detectors on both the pilot and main flames connected to a single flame relay. By switching detector signals when burners alternate firing, the flame relays monitor the main flame of the firing burner and the pilot flame of the exhausting burner.

**CONSTRUCTION FEATURES**

TwinBed II has enhanced rugged construction. Burner and regenerator are separate modules. Angled transitions are available to change burner firing angles relative to regenerator. Burner and regenerator can be rotated for ease of installation. Other improvements include nozzle-mix pilot with flanged mounting.

TwinBed II is insensitive to furnace operating environments that can quickly destroy recuperators. There are no boundaries between air and waste gas streams to be maintained against leakage. Materials of construction have been chosen to withstand the corrosive effects of exhaust gas borne volatiles.

Regenerators can be easily cleaned of dirt or condensed fouling by dropping the bed support plate and removing bed material through the rear hatch. Clean heat transfer material can be replaced through the top hatch. A regenerator can be cleaned while the other burner in the pair fires direct (a non-reversing mode) to maintain furnace operation.

**Warning:**

Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and insurance Underwriters recommendations, and care in operation.

**Basic piping arrangement of two burner TwinBed II system.**