**REGENERATIVE SYSTEM CONTROLS**

BLOOM Engineering has gained wide experience in controls for regenerative burner systems. For new burner systems as well as the rebuild of existing furnaces specific functional specifications are prepared, which ensure the optimal operation of the combustion system. Burner working modes ON/OFF and continuous operation are possible. BLOOM has developed a cascade control of the burner capacity with continuous turn-down to approx. 60–70% of the nominal capacity and further turn-down with ON/OFF control. This results in an optimum ratio between the requirements on high melting capacity with the lowest fuel consumption.

The visualization of the controls and the extended messaging system with archiving of operation data allows easy maintenance of the system and optimal adjustment processes. If required a special reduced version of control system is available, which allows a rebuild of existing systems devoid of extraordinary costs for their modification.

**SERVICE**

BLOOM Engineering supply direct service for regenerative burner systems. The main operation parameters of the system are checked depending on the demand. The burners and regenerators are inspected on their status. If necessary the adjustment and optimization of the system can be accomplished. Up to the customer needs a regular service of the system in defined time intervals can be contracted. **Please contact us!**
Regenerative burners are usually installed in pairs. While one burner fires, up to 90% of the exhaust gas is sucked through the regenerator of the second burner, which stores the heat of the exhaust gas in a ceramic media. The exhaust gas leaves the regenerator with a temperature of about 200°C and is routed through the exhaust fan in the stack.

The remaining exhaust gas leaves the furnace through hot gas duct and is used to facilitate the furnace pressure control. After preset time, usually 60 to 90 seconds, the burners are switched. Now the second burner fires: the cold air is passed through the hot regenerator and is heated up to a temperature, which is close below the temperature of the exhaust gas from the furnace. Next switch cycles follow.

The principle of regenerative heating technology is known since many years. With the steadily rising fuel prices and the upcoming emissions trading, the regenerative burner technology is an attractive solution for the furnace operators to reduce significantly the operational costs. Regenerative burner systems are established in the steel industry and are already the state of art in aluminium melting furnaces and many other applications. Successful applications in numerous furnaces with different fuels show that regenerative burner systems are a mature energy-saving technology for new furnaces and furnace retrofits.

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APPLICATIONS:
- Pusher and walking beam furnaces in steel mills
- Forge furnaces
- Continuous and batch heating furnaces in the steel industry
- Aluminium melters and holders
- Non-ferrous melting and holding furnaces
- Heat treating furnaces
- Ladle heaters
- Many others

The achieved air preheat, in average of only 100 to 150 K below the exhaust gas temperature, results in substantial energy savings, which are up to 50% compared to the cold air heating systems and up to 25% compared to the hot air systems with a central recuperator.

BLOOM regenerative burners use the most advanced LOW-NOx technology. The burner nozzle system with gas and air staging allows extreme low specific values for NOx emissions. Considering the achieved energy savings and low specific emission values a significant reduction of a total emission of nitrogen oxides (NOx) and carbon dioxide (CO₂) is possible.
CUSTOMIZED BURNER DESIGN

BLOOM regenerative burners have robust construction proper to the heavy operation conditions in steel and aluminum works. A simple burner and regenerator design makes their maintenance easy. If required the regenerative burners can be equipped with quick disconnect device allowing a dismounting of the regenerator for cleaning in minutes. The burners are available with a removable end plate for the cleaning of the burner. The regenerators dimensions and shape are customized, depending on the application and the available space. Rectangular, square or round regenerator designs can be offered to be installed either below or above the burners on the furnace roof. A lot of burner sizes are available in compact construction (burners and regenerators integrated in one housing which is particularly suitable for applications with limited space.

ADVANTAGES OF REGENERATIVE BURNER SYSTEM

The regenerative burner system eliminates a need for a recuperator with the coherent maintenance expenses. The waste gas temperature to the chimney and the total amount of waste gases are lower compared to a recuperative burner system. The waste gas duct and chimney have smaller dimensions. New continuous furnaces can be built shorter, so far the charge heating procedure allows it. The application of the regenerative burners in the booster zone of continuous reheating furnaces let the capacity rise by 10–15 % without an increase of the specific heat consumption and a need for changing of exhaust ducts. In aluminum melting furnaces a higher melt rate can be achieved at reduced energy consumption and lowest emissions. Bloom are able to provide turn-key solutions including the valving equipment, controls and fuel trains with our regenerative burner.

Various design of BLOOM regenerative burners

- compact
- regenerator below burner
- regenerator above burner

Burner capacity 400 – 12,000 kW
EXEMPLARY CAPABILITIES OF REGENERATIVE SIDE BURNERS
BLOOM 1100 SERIES ULTRA LOW NOx TM
BLOOM 1150 SERIES LUMIFLAME ULTRA® LOW NOx™

BLOOM regenerative burners are the most advanced development in low NOx combustion technology and fuel efficiency. They combine the excellent flame characteristics and the extreme efficient use of fuel energy. Using the gas and air staging as well as the port geometry optimization the burners supply a directed combustion zone with a very uniform temperature profile. BLOOM technology requires no complicated installations at the furnace refractory. BLOOM regenerative burners have excellent characteristics:

- Stable operation in regenerative mode at any operating temperature
- Well formed high momentum flame
- Transparent or luminous, uniform flame zone at high temperature
- Low carbon dioxide emissions
- Proper flame characteristics at turn down
- Refractory baffle protects the burner body, stabilizes and tailors the flame and provides gas nozzle support
- Production increase of existing furnaces
- Custom engineered for specific demands of the application
- Capacities from (400 kW to 12,000 kW)

The BLOOM regenerative burners provide a high momentum of combustion gases and long flame envelopes. The mixing of the furnace atmosphere and the „coverage“ of the batch by the flames is excellent. The flames of BLOOM regenerative burners ensure an intensive direct heat transfer to batch and a very efficient use of fuel energy.

BLOOM provide a perfect solution for wide variation of fuels:

- Natural gas
- Coke oven gas
- LPG
- Various liquid fuels

BLOOM 9400 Series regenerative flat flame burners are designed for a high radiation heat exchange with flame development mainly in the burner block, which is heated up to a high temperature. The intensive radiation of the hot burner block allows bringing heat to where it is required. High swirl of the combustion products generate intensive recirculation of furnace gases, as achieved by high velocity burners. The burners are foreseen mainly for side wall installation and are especially suitable for forging furnaces in the steel industry:

- Flat Flame
- Radiation and convection heat exchange
- Intensive recirculation of furnace atmosphere
- Low emissions
- Application in forging furnaces
- Capacities 600–850 kW

Various designs of regenerative burners

Regenerative Flat Flame Burner in forging furnace