

REBOX[®]

Oxyfuel combustion in a catenary furnace



Customer

Outokumpu Stainless AB, Annealing and Pickling Line, Avesta Works, Sweden

Equipment

- Oxyfuel burners
- Complete flow trains for oxygen and atomization media

Fuel

Oil

Installation date

2001

Background

Outokumpu Stainless (formerly AvestaPolarit Stainless) is a world leader in supplying different grades of stainless steel material to customers with high standards of quality. In 2000, Outokumpu set itself the goal of increasing capacity in its annealing line at the Avesta site and, at the same time, fulfilling strict legislation on emissions. Stainless sheets are hot-rolled in the Steckel mill and cold-rolled in the Z-high mill in thicknesses of 3-12 mm and widths of 1.2-2.1 m. The old Catenary furnace was 24 m long with a 75 tons/hour capacity. It was equipped with air burners and recuperators. Outokumpu has a wealth of experience with oxyfuel applications.

Customer objectives

- Increase production with a minimum extension of production line length
- Reduce fuel consumption
- Improve product quality for less downstream pickling
- Lower NO_x emissions

REBOX[®] – leading-edge technology

Since the beginning of the 1990s, AGA, a member of the Linde Group, has pioneered the use of 100 % oxyfuel applications in reheat furnaces in close cooperation with customers such as Outokumpu. This technology included a full oxyfuel conversion of the existing furnace and an extension of the furnace with a new 10 m furnace to achieve double capacity (150 tons/hour).

Oxyfuel combustion substantially increases the thermal efficiency of a furnace. This is primarily due to the fact that radiant heat transfer of furnace gases produced by oxyfuel combustion is significantly more efficient than that of airfuel. And due to the absence of nitrogen in the combustion mixture, the volume of exhaust gas is also substantially reduced, thus lowering total heat loss through the exhaust gas. Thanks to the improved thermal efficiency, the heating rate and productivity are increased and less fuel is required to heat the product to a given temperature, i.e. specific fuel consumption is reduced. This makes a valuable contribution to reducing the impact of company operations on the local environment.

Equipment installation

- 39 MW total power installation
- 45 ceramic-type oxyfuel burners in new 10-metre extension and original 24-metre furnace
- Separate flow trains for oxygen and fuel to all six zones
- Oxygen supply via pipeline from nearby air separation plant
- 10-metre furnace extension and complete overhaul of existing furnace, including removal of old recuperators and replacement of flue gas system and furnace lining
- SNCR De-NO_x with caustic ammonia injection

Results

- Production capacity increased from 75 to 150 tons/hour
- Fuel consumption reduced by over 40 %
- NO_x emissions below 65 mg/MJ
- Existing pickling line could handle the increased production capacity

Customer benefits

- Increased production capacity and flexibility in existing furnace to handle swift changes in incoming orders
- Substantial reductions of SO_x, CO₂ and NO_x to allow continued production
- Reduced fuel consumption and no electricity required for air blowers
- Reduced maintenance due to compact, simple and reliable ceramic burners and absence of recuperator



Subject to change
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