

REBOX®

Revamping a walking beam furnace with oxyfuel combustion



Customer

Complete turnkey project for Outokumpu Stainless AB, Degerfors, heavy plate mill, Sweden

Equipment

- Flameless oxyfuel burners
- Control system

Fuel

LPG

Installation date

2003

Background

Outokumpu Stainless AB (formerly AvestaPolarit Stainless) is one of the world's leading stainless steel producers. Outokumpu supplies different grades of steel to suit individual customer needs and demanding application requirements.

In 2002, Outokumpu decided to meet changing market demands by increasing capacity in the hot-rolled plate mill at the Degerfors site by 30 %, at the same time fulfilling strict legislation on emissions. Plates range in length from 0.9 to 13 m and from 0.9 to 3.2 m in width. They weigh up to 8.6 tons with a thickness between 5 and 105 mm.

The walking beam furnace is 4.5 m wide and 28 m long with an annual capacity of 120,000 tons. It was equipped with air burners and recuperators. This furnace is the sole source of material for the hot rolling mill where the heavy plates are produced. The position of the walking beam furnace excluded an extension.

Customer objectives

Outokumpu has a wealth of experience in oxyfuel applications from AGA, a member of the Linde Group. Outokumpu thus decided to discuss the possibility of increasing capacity while achieving low emission levels with Linde.

- Increase capacity in existing furnace
- Reduce fuel consumption
- Improve temperature uniformity in the material
- Ensure production downtime does not exceed 25 days
- Comply with stricter legislation on emissions (lower NO_x emissions)
- Complete turnkey commitment from Linde

REBOX® – leading-edge technology

Since the beginning of the 1990s, AGA has been pioneering the use of 100 % oxyfuel applications in reheat furnaces. With an installed base of more than 80 furnaces, AGA has the necessary experience and capacity to deliver complete turnkey projects.

The use of oxyfuel combustion substantially increases the thermal efficiency of a furnace. This is mainly due to the fact that the radiant heat transfer properties of the furnace gases produced by oxyfuel combustion are significantly more efficient than those of airfuel. Due to the absence of nitrogen in the combustion mixture, the volume of exhaust gases is reduced substantially, thus lowering the total heat losses through the exhaust gas. As a result of the improved thermal efficiency, the heating rate and productivity are increased. In addition, less fuel is required to heat the material to a given temperature, i.e. specific fuel consumption is reduced. This makes a valuable contribution to reducing the overall impact of company operations on the local environment.

Flameless combustion

Flameless combustion technology is ideal for heating in a large furnace with a limited number of burners where compliance with low statutory NO_x emission levels is required. Flameless combustion has the advantage of reducing the temperature of the flame and thus the creation of NO_x. It also disperses the combustion gases effectively throughout the furnace, ensuring more effective and uniform heating of the material.

Equipment installation

- Total power installation of 16 MW
- 26 flameless REBOX®-S oxyfuel burners (separated jets)
- Separate flow trains for both oxygen and fuel to each burner in two zones; two gas distribution piping systems regulated at constant pressure
- Complete control system for on/off regulation of the burners; even temperature-controlled zones activated by software
- Completely revamp furnace including removal of old recuperator, installation of new flue gas system and new furnace lining
- Rebuild dark zone into active heating zone

Results

- 30% increase in overall capacity; 40-50% increase in heating capacity in existing furnace
- Reduction of over 25% in fuel consumption
- Good temperature uniformity in the material
- NO_x emissions below 70 mg/MJ
- Total turnkey commitment from Linde
- Production downtime to revamp and rebuild furnace only 25 days

Customer benefits

- Increased production capacity; however, at the same time significantly lowering CO₂ and NO_x emissions
- Greater flexibility to handle swift changes in incoming orders
- Improved temperature uniformity in slabs and furnace
- Fuel consumption reduced
- 80% reduction of flue gases enabling small flue gas ducts
- Reduced maintenance effort due to compact, simple and reliable self-cooling ceramic burners and elimination of recuperator



Subject to change
43491090 0704 - 1.1 ku

REBOX® is a registered trademark of the Linde Group