

# REBOX<sup>®</sup> oxyfuel solutions in reheating.

33% shorter heating time at ASCOMETAL in Fos-sur-Mer, France.



With oxyfuel, ASCOMETAL achieves the same reheating volume in 9, instead of 13 pit furnaces.

## Summary

- Flameless oxyfuel implemented in nine pit furnaces.
- 33% shorter heating time with 40% fuel savings
- 40% reduction of CO<sub>2</sub> and NO<sub>x</sub> emissions
- Guaranteed performance

## Customer

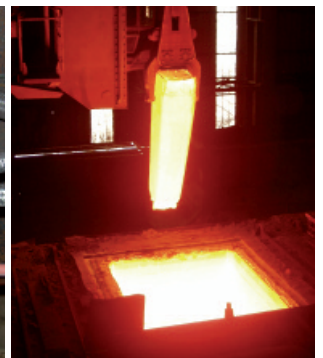
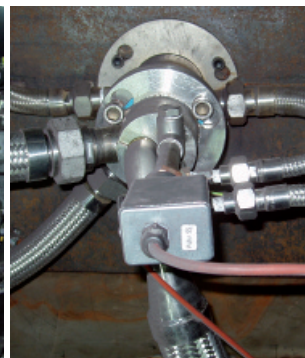
ASCOMETAL in Fos-sur-Mer, France, member of the Severstal Group.

## Background

ASCOMETAL is a market leader in special steels long products, mainly for bearings, springs, oil and gas drilling equipment, as well as for automotive and special engineering markets. The Fos-sur-Mer site has 580 employees and produces 100,000 tonnes of engineering steel and 140,000 tonnes of bearing steel. The company used to reheat hot-charged and cold-charged ingots in 13 airfuel-fired pit furnaces prior to rolling in the billet mill.

## Customer objectives

ASCOMETAL started investigations on how to increase the utilisation of their 13 existing airfuel-fired pit furnaces, which had aging recuperators, with the goal to increase the process efficiency. With a reduced number of furnaces employed a higher tonnage output per furnace would also provide better energy utilisation and less refractory work. The increasingly strict legislation on emissions, in particular for NO<sub>x</sub> but also the potential cost of CO<sub>2</sub> imposed tough environmental objectives on the project. ASCOMETAL met with Linde to discuss these objectives and a contract was signed in September 2004.

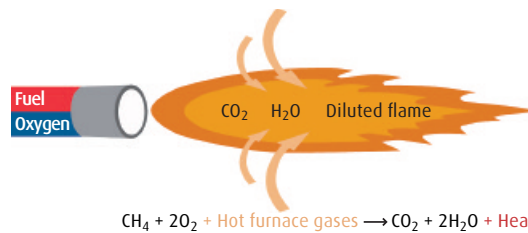


**Jean-Pierre Riegert,**  
Head of Technologies and  
Development at ASCOMETAL:

"REBOX<sup>®</sup> oxyfuel solutions will also be implemented at our other site Les Dunes, since they have already demonstrated in the Fos-sur-Mer plant to improve the utilisation of our existing equipment: 33% shorter heating time and 40% lower fuel consumption with reduced emissions."

## Flameless oxyfuel

Flameless oxyfuel combustion was employed for effective and uniform heating and to achieve low statutory  $\text{NO}_x$  emission levels. Flameless combustion is created by diluting the flame with the furnace gases, which in oxyfuel combustion contain no nitrogen ballast. The flame dilution also disperses the combustion gases throughout the furnace for more effective and uniform heating of the metal. The flame contains the same amount of energy as with conventional oxyfuel but with a lower flame temperature, the creation of  $\text{NO}_x$  is substantially reduced. The oxyfuel burners are dual-mode. In the conventional mode, they heat up to  $800^\circ\text{C}$ . At this temperature level, fuel and oxygen will auto-ignite and thus the burner enters the flameless mode. The patented range of flameless oxyfuel burners, both self-cooling burners with ceramic stone and water-cooled burners, are compact and powerful with an integrated UV cell and ignition device. The modular design facilitates inspection, service and upgrade.



In flameless oxyfuel combustion, the flame is diluted with the furnace gases. This lowers the flame temperature and promotes more uniform heat distribution.

Water-cooled burner; maximum power capacity: 3 MW; diameter 105 mm.

## REBOX® installation

- Equipment for nine pit furnaces (eight 80 tonnes and one 120 tonnes)
- For each pit furnace; 2 water-cooled flameless oxyfuel burners, totalling 2x2 MW power input (replacing airfuel burner, recuperator and electrical combustion air blower)
- Separate flow trains for natural gas and oxygen
- Stand-alone process control system to verify functionality and safety
- Instructions for new damper design and furnace modifications
- Installation, commissioning, training and fine-tuning
- Guaranteed performance contract

## Customer benefits

- 33% shorter heating time, same reheating volume is now achieved in 9 instead of 13 pit furnaces
- Effective mill availability increased from 86% to 92%
- 40% specific fuel savings
- 40% reduction of  $\text{CO}_2$  and  $\text{NO}_x$  emissions
- Improved temperature uniformity
- Reduced scale formation
- Reduced flue gas temperature
- Exhaust volumes reduced by 70–80%
- Improved reheating process and control of furnace pressure
- Reduced noise due to removal of electrical combustion air blower

## REBOX® oxyfuel solutions

In more than 100 fully converted reheating and annealing furnaces, Linde's REBOX® oxyfuel solutions provide more throughput and flexibility at lower total costs. The broad REBOX® technology and application experience combined with long and detailed customer process experience results in fast and safe project handling. We provide turnkey installations with guaranteed performance.



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