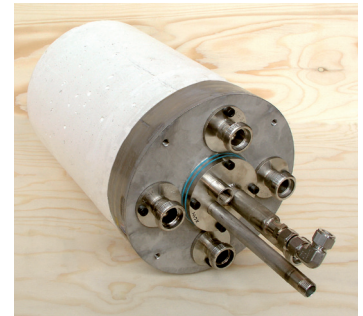
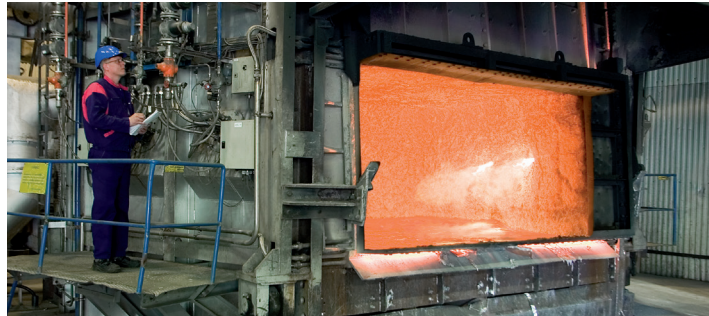




# Low-temperature Oxyfuel. Uniform heating for higher productivity, no hot spots and less emissions.



Low-temperature Oxyfuel in the melt shop at SAPA Heat Transfer, Sweden.

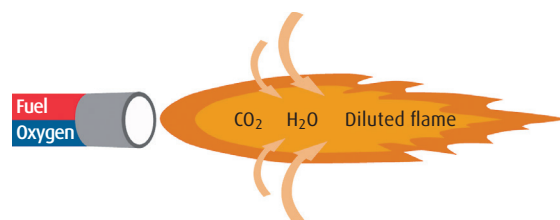
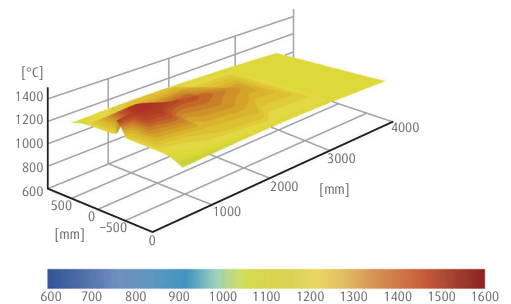
- Summary**
- Up to 100%, typically 30–50%, higher melt rate due to uniform heat distribution
  - Up to 50% lower fuel consumption
  - Low flame temperature, comparable to that of airfuel technology
  - Reduced CO<sub>2</sub> and SO<sub>2</sub> emissions and ultra-low NO<sub>x</sub> emissions

**Customer** SAPA Heat Transfer, Sweden.

**Challenge** With the increasing demands for non-ferrous metals, increasing the throughput of existing melting furnaces represents a challenge for the aluminum industry. Producers also need to constantly improve process yields, cut fuel consumptions and reduce gas emissions, such as CO<sub>2</sub> and NO<sub>x</sub>. This market situation is familiar to Linde, with extensive knowledge and experience of combustion and customer processes from over 130 oxyfuel installations in aluminum.

**Low-temperature Oxyfuel** Low-temperature Oxyfuel combustion technology is uniquely designed for the challenges that exist within the aluminum industry. Such challenges include boosting capacity, reducing fuel consumption, improving yields, and reducing emissions while avoiding hot spots with uniform furnace temperatures. The combustion occurs under a diluted oxygen concentration by mixing the furnace gases into the combustion zone. This process slows down the oxyfuel combustion reactions and results in lower flame temperatures, comparable to those of airfuel technology, which are below the point at which thermal NO<sub>x</sub> is created. The mixing of furnace gases into the flame also disperses the energy throughout the entire furnace for uniform heating and more efficient melting. The dispersed flame contains the same amount of energy but with a much more effective distribution. The overall result is more homogenous heating and melting, enabling not only a higher power input and thus higher melt rates, but also reduced formation of dross and NO<sub>x</sub> emissions.

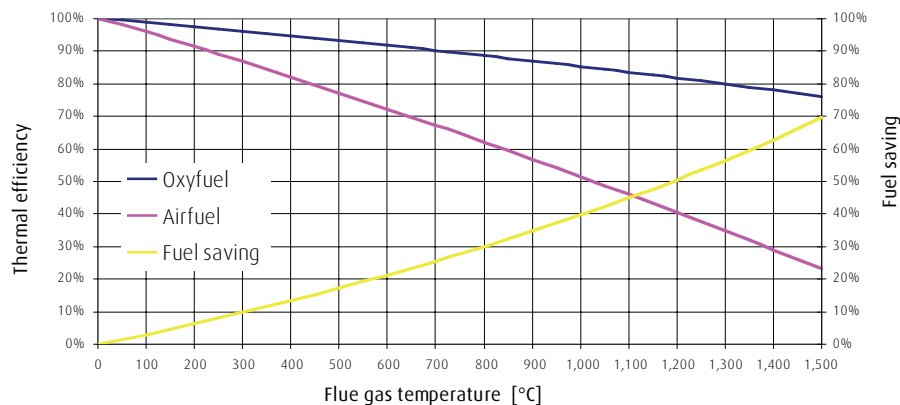
In-furnace temperature measurement shows a uniform and low flame temperature without peaks, which helps to achieve higher melt rates and thus avoiding hot spots and thermal NO<sub>x</sub>.



In Low-temperature Oxyfuel, the flame is diluted with the furnace gases, which lowers the flame temperature and promotes an effective heat distribution.

## Oxyfuel combustion

With oxyfuel combustion, removing nitrogen from the combustion and heat transfer process has several advantages including higher production output in new or existing furnaces, reduced fuel consumption, improved process control, and lower emissions. The thermal efficiency of Low-temperature Oxyfuel is equal to that of conventional oxyfuel.



## Features

- Comparable flame temperature to that of airfuel technology
- Adjustable degree of flame dilution
- Suitable for all types of reverberatory furnaces
- Power: 0.2–3 MW
- Self-cooling ceramic burner stone, 300 mm burner diameter, weight 80 kg
- Compact, powerful and modular design of burner for easy installation and maintenance
- Integrated flame monitoring by UV cell and pilot flame for automatic ignition

## Customer benefits

- Low-temperature Oxyfuel for a homogenous melting, resulting in increased furnace throughput capacity.
- Up to 100%, typically 30–50%, higher melt rate.
- Up to 50% lower fuel consumption
- Uniform furnace heating to avoid hot spots, thus reducing dross formation
- Low maintenance: no need for recuperator, electrical air blower or regenerative solution
- Substantially reduced flue gas volumes, up to 80%, for a compact exhaust solution
- Major reductions in CO<sub>2</sub> and SO<sub>2</sub> emissions – up to 50%
- Ultra-low levels of NO<sub>x</sub> emissions, reduced up to 90% reduction



## More capacity at SAPA

SAPA Heat Transfer, Finspång, Sweden is a producer of aluminum heat-exchanger strip for the automotive market. The company melts rolling mill scrap, wire mill scrap and primary ingots of various shapes and sizes. SAPA installed oxyfuel back in 1995 to increase production and to reduce NO<sub>x</sub> emissions. The 28-tonne melting furnace was optimized in collaboration with Linde in 2002. To further improve the furnace performance the new Low-temperature Oxyfuel was brought into use in mid-2005. Since the switch from conventional oxyfuel, SAPA has seen a 10% increase in melt rate, a 10% reduction in energy consumption, a 9% reduction in dross formation, and a 90% reduction in NO<sub>x</sub> emission.

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