



## Low-temperature Oxyfuel solutions in aluminum alloying furnace. 10-20% faster alloying with 40% less fuel.



The alloying and casting furnace at Stena Aluminum was converted to Low-temperature Oxyfuel in 2009.

- Summary**
- Turnkey oxyfuel installation in one alloying and casting furnace
  - 10-20% faster alloying process leading to increased productivity
  - Fast heating of metal allowing high tap temperature for delivery of liquid metal
  - 41% reduced specific fuel consumption
  - 47% reduced CO<sub>2</sub> emissions
  - Ultra low NO<sub>x</sub> emissions meeting highest environmental standards

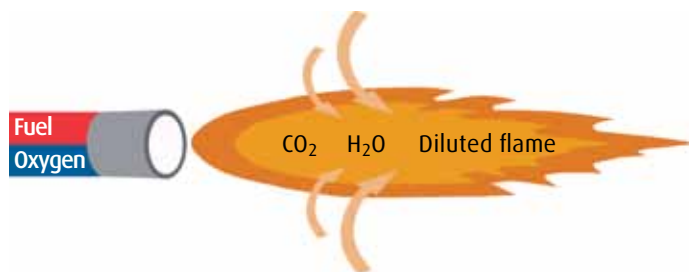
**Customer** Stena Aluminum, Sweden

### Background and customer objectives

Stena Aluminum is a leading producer of high-grade, customized aluminum foundry alloys. The plant in Älmhult Sweden has a capacity of about 50,000t/y. Since 2008, Stena Aluminum supplies liquid aluminum alloys by truck delivery. This put higher demands on productivity of the alloying and casting furnaces. To meet these demands the old air-fuel burner heating system was replaced by Low-temperature Oxyfuel from Linde. The objective were to speed up the alloying process and to quickly heat up the liquid metal to tap temperatures above 800 °C (1,500 °F) in order to allow for long distance transportation of liquid metal. By using Low-temperature Oxyfuel and replacing oil for LPG, there was a substantial reduction in CO<sub>2</sub> emissions and ultra low levels of NO<sub>x</sub> emissions.

### Low-temperature Oxyfuel

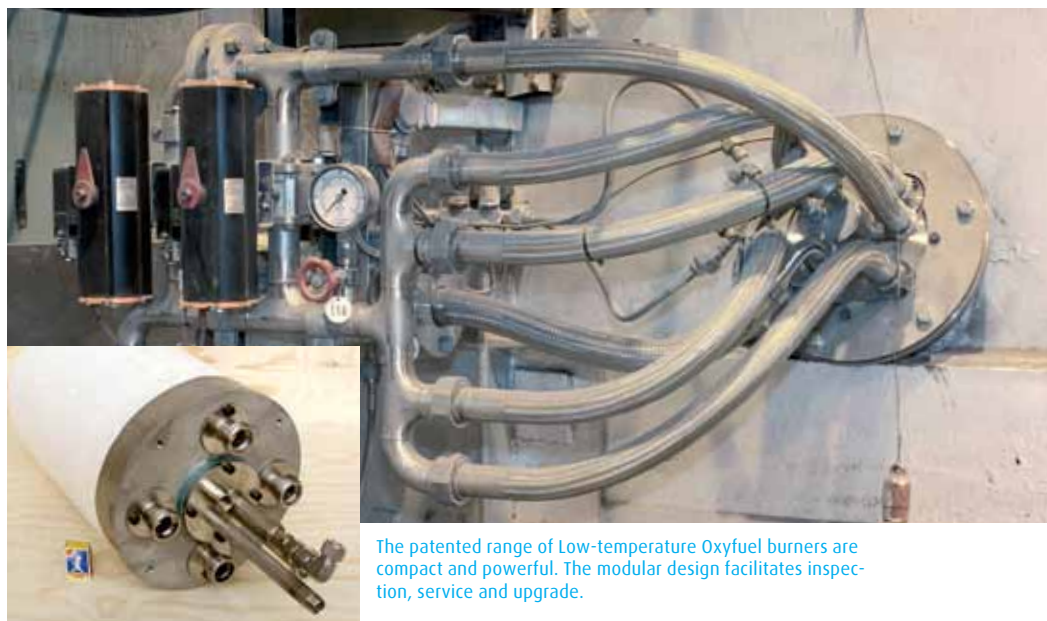
Low-temperature Oxyfuel is developed for the melting of aluminum in reverberatory furnaces. It is based on flameless oxyfuel combustion which is created by diluting the flame with the furnace gases, which in oxyfuel combustion contain no nitrogen ballast. The flame dilution also disperses the combustion gases throughout the furnace for more effective and uniform heating and melting of the aluminum avoiding hot spots and dross formation. The flame contains the same amount of energy as with conventional oxyfuel but with a lower flame temperature, thus the creation of NO<sub>x</sub> is substantially reduced.



With Low-temperature Oxyfuel combustion, the flame is diluted with the furnace gases. This lowers the flame temperature and promotes more uniform heat distribution.

### Low-temperature Oxyfuel installation and scope at Stena Aluminum

- Turnkey project with performance guarantee
- Replacement of two air-fuel burners by one 3 MW ceramic self cooled Low-temperature Oxyfuel burner
- New combustion control system for fuel and oxygen, with interface to the cast house computer control
- Flow trains for LPG and oxygen
- Implementation support and full service contracts



The patented range of Low-temperature Oxyfuel burners are compact and powerful. The modular design facilitates inspection, service and upgrade.

### Benefits for Stena Aluminum

- 10-20% faster alloying process and increased productivity
- Improved temperature uniformity and heat transfer allowing fast heating to tap temperatures above 800 °C (1,500 °F) without increase in dross
- 41% fuel saving per ton product
- Reduced CO<sub>2</sub> emissions by 47%
- Ultra low NO<sub>x</sub> emissions

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