LIGHT METAL AGE

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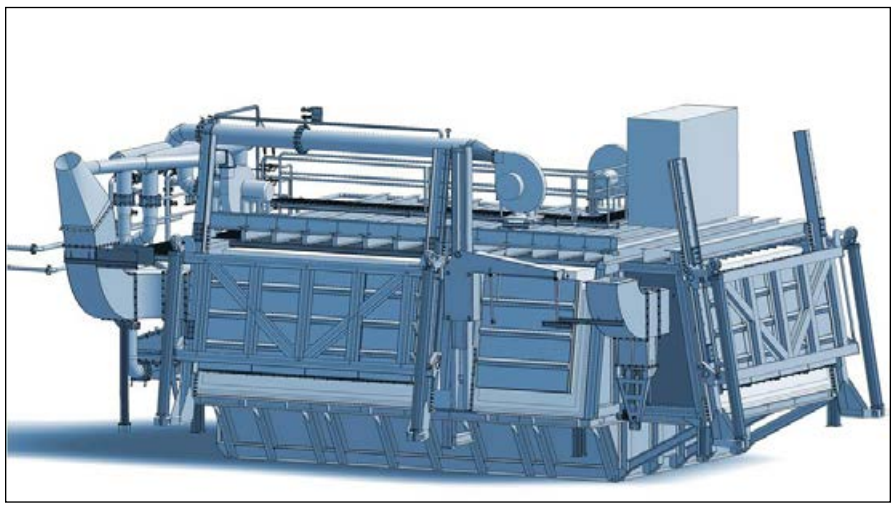
New Equipment Spotlight…

Double-Chamber Melting Furnace Advantages

Reiter & Crippa (R&C), part of the Presezzi Extrusion group, recently supplied a 70 tonne fixed double-chamber aluminum melting furnace to Indinvest LT. R&C is also supplying a complete foundry plant to another company in Italy including a decoater for scrap, an 80 tonne fixed crucible furnace, and a fume extractor. These two projects establish R&C in the foundry landscape, providing tangible examples of production systems that can operate for aluminum recycling at the highest levels of quality and energy conservation, with low environmental impact, in line with European "Best Available Techniques."



Front view of Reiter & Crippa's double-chamber furnace design.

The 70 tonne double-chamber melting furnace is now under commission at Indinvest's main facility in Latina, Italy. Indinvest is a leading company in the field of systems for aluminum windows and doors. They cover the whole process from aluminum melting and billet casting, to extrusion, machining, and finishing, with a yearly production of 40,000 tons. In its 30-year history, the company has always been quality oriented, emphasizing product innovation and customer service. They have a strong focus on the environment, having achieved ISO 9001:2008 and ISO 14001:2004. The double-chamber melting furnace was chosen to replace one of Indinvest's existing single-chamber furnaces to improve the flexibility in the selection of the raw materials for the casthouse, and its overall efficiency in terms of fuel consumption and metal loss.

Furnace Design

R&C's double-chamber furnace is a stationary design with a melt transfer pump. It has a hot and cold chamber. The hot chamber is heated by two natural gas regenerative burners, designed to provide the largest part of the required fusion heat. The cold chamber, into which all the contaminated material is charged, is heated by a natural gas oxygen burner, capable of operating at a highly oxidizing air/fuel ratio, supported by further oxygen injection nozzles, for the oxidation of the organic material present in the charge.

The scrap is charged onto a dry hearth, where it is heated up slowly, allowing a controlled pyrolysis of the organic matter. This is then burnt by the excess oxygen created by the devices in the chamber atmosphere. The efficiency of the combustion of the organic material is monitored by a laser probe measuring the concentration of oxygen in the exhaust gas. As soon as an oxygen excess is detected, all the burners return immediately to the stoichiometric operation. The scrap is then dipped into the molten bath when it is clean, reducing in this way the production of dross.

The furnace is fitted with an electromagnetic stirrer, which circulates the melt between the two chambers under the level of the internal separating wall, and is therefore also a strong vehicle for heat transfer between the two chambers. The molten metal is transferred to the holding furnace by a melt transfer pump operating in a side well.

The chambers are managed with separate temperature control to obtain the ideal vault temperature in each of them: higher for reverberation and heating of the melt in the hot chamber and lower for the controlled pyrolysis of contaminated scrap in the cold chamber. The lower temperature of the cold chamber reduces the formation of slag from the dirty and high surface area scrap; the slag produced in the cold chamber is then trapped by the internal separator and cannot contaminate the hot chamber, where the surface is clean and available for the best heat transfer from reverberation. The reduced vault and wall temperatures in the cold chamber also reduce heat dispersion when the door is opened.

Enhanced combustion management in the cold chamber permits both the reduction of polluting emissions, allowing for an increased quantity of scrap containing organic material in the mix of the charge and a reduction of the energy used for melting, thanks to the comprehensive exploitation of this organic material as a source of heat.

The furnace is designed so that skimming operations are performed through a small side door of the cold chamber, allowing fast skimming and reduced heat loss. Owing to this design, the size and shape of the charging dry hearth of the cold chamber are optimized to host large scrap charges for a reduced number of openings per hour. The door of the hot chamber is opened very seldom, maintaining a stable high temperature in the vault.

The refractory lining and insulation are engineered to be state-of-the-art to allow the best durability and contribution to fuel saving.

Conclusion

In summary, Indinvest's new double-chamber furnace offers a number of advantages compared to the single-chamber furnace, which it replaced. The double-chamber furnace increases the percentage of contaminated material in the load mix. It reduces CO, HC, and particulate emissions. It also reduces gas consumption per ton of aluminum produced. The new furnace provides better melting performance with reduced metal loss.