Equipment Spotlight…

Preventing the Negative Effects of Dross Generation

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High oxidation rate, poor thermal efficiency, and reduction of furnace melting efficiency are generally recognized as negative factors caused by the presence of dross. The contaminated scrap available on the market often leads to excessive dross formation, despite the low oxidation target of the latest generation of melting furnaces installed and operated in many casthouses today.

Effective skimming and furnace cleaning are therefore important factors in achieving efficient production in addition to quality and cost-effectiveness. These are the main advantages that aluminum manufacturers such as Aludium, Novelis, Logan Aluminium, Southwire, Hindalco, and others have achieved by using the latest generation of furnace tending vehicles and equipment supplied by T.T. Tomorrow Technology SpA in Due Carrare, Italy.

Dross skimming machine in operation at an aluminum melting furnace.

Furnace Tending: It is well known that dross acts as a thermal insulator on the surface of the molten bath and reduces the efficiency of heat transfer from the flame to the metal. Dross adhering to the furnace walls and corners, as well as the presence of solid deposits of dross and heavy metals on the furnace bottom, reduce bath capacity. Metal quality is also reduced due to the presence of uncontrolled alloy constituents and composition-polluting elements (especially iron) that can easily dissolve in aluminum.

The ability to easily and quickly skim dross from the molten metal surface results in a higher heat exchange efficiency and, thus, a reduction of metal oxidation and a shorter melting cycle. Efficient and effective removal of dross from the furnace walls and the furnace bottom likewise improves the quality of the melt. Together, these are all factors that lead to cost savings and higher productivity.

The tending machines supplied by T.T. are able to remove dross from the melt surface and/or clean the furnace itself. The automation of these routine furnace tending procedures significantly improves all aspects of the melting process. It also ensures that these often unpleasant and strenuous operations can be routinely carried out automatically during night shifts when personnel are not present.

The skimming machine implements a long tool that moves back and forth across the bath surface. The tool movements can be precisely controlled by using a fully automatic mode or by the operator (in the machine cabin or using a remote console at a location away from the machine). The highly controlled process eliminates oscillations that often occur with conventional de-drossing systems, thus minimizing the unintentional removal of aluminum while maximizing the cleanliness of the melt.

The furnace cleaning equipment prevents the buildup of dross, sludge, and metal that would gradually reduce furnace capacity and adversely affect metal composition. The equipment reduces the time necessary to effectively and accurately de-dross and clean the furnace. It also prevents unplanned downtime, since the process for removing solid deposits requires more complex work on a cold furnace using hammers, excavators, etc. Since the cleaning equipment avoids these harsher scraping and cleaning methods, it is able to extend the service life of the refractory material due to reduced thermal and mechanical stress on the refractories.

Overall, the use of proper tending equipment will increase furnace utilization and lower gas consumption. It also provides greater safety in the casthouse, as the operators are kept away from the open furnace door during de-drossing and cleaning operations. The equipment is flexible, reliable, easy to implement, and requires minimal maintenance, while providing a high economic return.

Updated Vehicles and Robots: In the last two years, T.T. has updated its entire range of furnace tending vehicles and robots. The company has provided the aluminum industry with a new vehicle model, which features rubber tires, a diesel engine, and all-wheel steering. It incorporates a telescopic boom up to 40 ft (12 m) in length. The multipurpose vehicle can be used for scrap feeding as well as furnace tending.

In addition, the company has introduced a new generation of skimming robots, featuring full WiFi-controlled automation. One key advantage of the robots is that they can be installed on rails without the need for any special foundation or complex construction work. In most cases, the robots are pre-assembled and delivered ready to be placed on the rail prepared in front of the furnaces, which allows quick startup after operator training. Through the automated operation of the robot, a single operator in a multi-furnace casthouse can perform all tending work required, including charging, skimming, alloying, and furnace cleaning. The new robots have been delivered to many customers in Europe, North America, and a number of other regions.

Two Decades of Service: T.T. Tomorrow Technology is celebrating 20 years of producing machines for the aluminum industry in 2020. Over the past two decades, the company's development and production of equipment and vehicles designed to skim and clean furnaces has been driven not only by productivity and quality issues, but also by health and safety regulations that require operators to be protected from injury, heat, and other hazards in front of furnace doors. Different customer requirements have led to the design and manufacture of various state-of-the-art machine concepts. The company is characterized by its ability to understand and adapt to customer needs and the aspiration to perfect the design of its equipment. Always focused on providing the best solution for aluminum melting furnaces, the company feels well prepared for any new challenges that may lie ahead. ■