ADVANTAGES OF LIQUIDATING CAST IRON IN INDUCTION FURNACES

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The most common casting alloy is cast iron, which accounts for more than 70% of annual casting output. This is explained by a number of advantages of cast iron and, above all, better casting properties than other alloys. One of the main processes affecting the quality of cast iron is smelting technology. The use of induction furnaces instead of cupola furnaces radically changes the technology of cast iron smelting. In this regard, there is a need for a more detailed consideration of the features of induction melting.

When switching to smelting in induction furnaces, the composition of the consumed charge changes. Instead of blast furnace cast iron, lightweight, low-quality materials (cuts, cast iron and steel shavings, lightweight steel scrap, etc.) can be added to the charge.

The use of a cheaper charge gives a tangible economic effect, the magnitude of which can vary widely depending on many, often mutually exclusive, factors. It can be considered that the difference between the cost of liquid cast iron produced in cupola furnaces and in induction furnaces is significant when calculated using existing selling prices.

An important advantage of induction furnaces is also a sharp reduction in air pollution from exhaust gases, especially in cases where industrial enterprises are located in close proximity to residential areas.

To study the features of melting various charge materials during induction melting, we conducted experiments in the laboratory of the Foundry Department of the Tashkent State Technical University named after I.A. Karimov (TSTU) to study the features of the technology for melting cast iron in induction electric furnaces.

The following questions followed during the melting process:
– mass of the charge used;
– electricity consumption for smelting;
– mass of liquid metal;
– mass of slag;
– duration of melting;
– temperature of cast iron when leaving the furnace;
– metal structure when studying individual cast iron samples.

As you know, an induction furnace allows heating and melting of scrap and waste throughout the entire volume of the crucible. The peculiarity of induction furnaces is that hydrodynamic flows are created in liquid cast iron, making it possible to add lightweight charge to the melt.

As is known, depending on the frequency of the current, induction crucible furnaces have different physical characteristics at different stages of heating and melting of the charge.

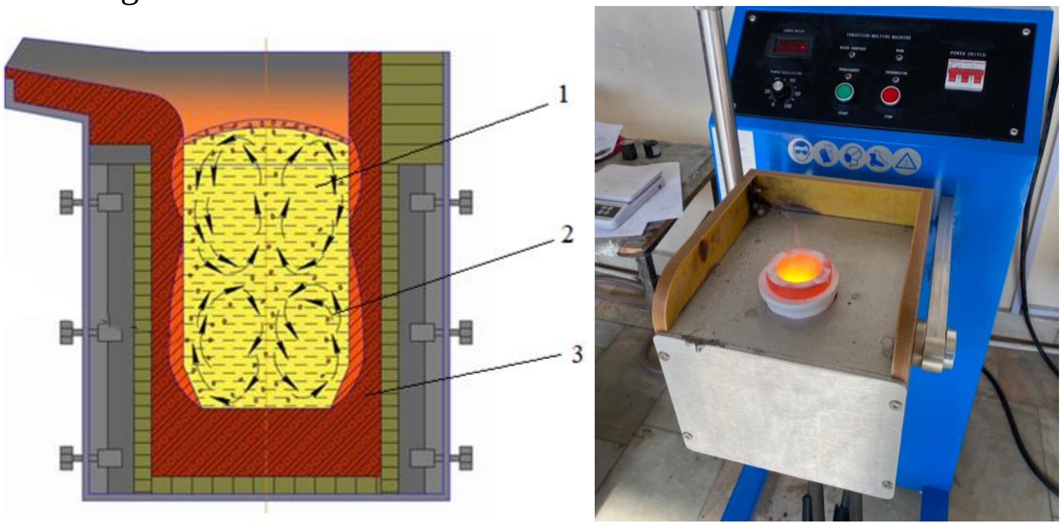

Figure 1. The structure of the induction furnace:
1-liquid cast iron; 2-slag; 3-crucible.

In general, analyzing the melting of cast iron in induction furnaces, it can be noted that the mechanical properties of cast iron differ significantly from the properties of cupola castings within the same chemical composition.

This fact is explained by the difference in the melting conditions and the charge materials used, as well as the significant influence on the crystallization of cast iron by the nature of the embryonic phase formed in the melt.

It is quite obvious that when using a larger amount of steel waste in the charge and high overheating of the cast iron, the composition of the embryonic phase changes significantly and the number of graphitization centers decreases. These factors, along with a lower content of impurities in cast iron (oxide gases, etc.), cause a change in the mechanical properties of castings and contribute to an increase in the susceptibility of cast iron to chill and shrinkage defects. At the same time, by combining high superheating and artificial carburization with special processing, it is also possible to create crystallization conditions under which the strength of cast iron can reach high values.

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