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IMPROVEMENT OF QUALITY OF CASTS FROM 35GL STEEL AT ELECTRO-IMPULSIVE ACTION ON FUSION IN PROCESS ITS CRYSTALLIZATIONS

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The dependence of the quality characteristics of cast details from structural steel 35GL on the effect of electric-pulse current in the process of crystallization of castings is considered. It is shown that the electroprocessing of the melt improves the casting structure and reduces the porosity of the castings.

Keywords: casting, steel, crystallization, electric-impulse action, structure, metal, porosity, castability

High requirement to quality of the cast details assist to development of new methods for production of casts, providing reduction of defects of macrostructure (clow hole, clow porosity and friability).

Analysis of achievements. A problem of improvement of structure for the cast steel is the object of numerous researches [1 -].

Thermal, mechanical and electromagnetic methods, sent to increase of quality and properties of casts from different alloys, are most widely used in a casting production.

Electric treatment of fusions in the process of melting and crystallization is intensively developing direction of adjusting of physical properties of casts. Imposition on the liquid crystallizable metal of electric field allows effectively to control by motion of fusion, by processes of heat and mass transfer, by structure and properties of casts [2]. In work [3] it is shown that the crystals of aluminium and copper alloys are penetrated by numerous shallow round pores the presence of which assists the decline of density of cast on 5 % as compared to its physical density. Passing of electric current through fusion of the mentioned alloys assists the decline of probability of appearance macro- and microdefects of structure [4]. Treatment of liquid fusion by an electric current stipulates the directed crystallization in interelectrode space, that allows to control by process of structure forming for casts. Side by side with this an electric current warms up cast additionally, stabilizing the temperature field at times and on volume.

Influence of electro-impulsive influences in the process of forming of structure for the steel casts before was not studied; therefore this direction of researches was perspective and actual.

Problem definition. A purpose of this work is a ground of possibility of decline of quantity of defects macro- and microstructures of the steel casts at application of electro-impulsive treatment of fusion in the process of its crystallization.

Exposition of basic materials of the article. The tests of technology of making of the experimental casts from 35GL steel with the use of electro-impulsive treatment of metal in the process of its crystallization were produced. The inundation of forms was carried out at a temperature 1510 °C by the method of casting on the burned out models. Electric treatment of casts was produced by electro-impulsive influence with next parameters: current strength - 40 A, porosity - 15, frequency – 10.64 Hertz's; duration of electro-impulsive treatment of fusion - 20 s.

According to normative requirements to casts from constructive steels, усадка in cast must not exceed 3 % [5]. It is set that a volume cockle of cast got on casting technology without application of electro-impulsive influence in the process of crystallization of metal consist 3.7 %, and its size, after application of electro-impulsive influence – 2.1 %, id est. diminished on 40-45 %. In the experimental casts we looked after the improvement of castings properties of metal: more effective fill-out.

The got results can be explained by that an electric current warms up local areas and microvolume of material, provides stabilizing of the temperature field on volume casts. As shown in work [6], electro-impulsive influence changes speeds of convective streams in fusion: speeds of streams of «displacement» from front of consolidation to the center of bar increase, that is accompanied by destruction of structure of circulation streams. On the whole, the absolute values of speeds of peripheral (near to the crust of consolidation) streams and ascending streams (near to the center of cast) increase in 1.5-2.0 time, that results in a transition from the mode of natural convection to the mode of the forced convection.

The researches on the study of influence of electro-impulsive treatment of fusion on its primary microstructure are produced. Research of phase composition of microstructure 35GL steel and bulk-tanker of grain became executed on the optical microscope of «4*xc–v*» with a digital chamber, connected to the computer. Photographs the microstructures of samples, got at increases ×100 and ×500, analyzed the method of comparison.

The study of structure of sample of cast, got at electro-impulsive treatment crystallizing metal testifies to the considerable diminishing of dendritic segregation - dendrites collapse, primary grains are ground down, a nonmetallics is dispergated in the volume of grains, and also non-metal layers on the borders of primary grains, intercrystalline porosity is removed and chemical (liquating) heterogeneity goes down substantially. The got microstructure is homogeneous and ferrite perlite with the selection of pearlite as a pearltic net. The bulk-tanker of grain diminished to 8 that conform to the requirements to 35GL steel.

Conclusions. Treatment of casts from 35 HL steel favorable influence renders an electro-impulsive current on the process of crystallization of fusion in a form, that improves the primary structure of the got cast and assists reduction of such defects, as a presence of gas holes inwardly and on the surface of product. There is an improvement of castings properties of metal: more effective fill-out and crystallization with less cockle; that assists the decline of porosity of cast

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