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NUMERICAL SIMULATION OF ELECTROMAGNETIC AND THERMAL FIELDS IN INDUCTION CHANNEL FURNACES WITH DEFECTS OF LINING

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Abstract

The numerical experiments and analysis of inhomogeneous distribution of electromagnetic and thermal fields in induction channel furnaces with various defects of their thermal insulation (lining) are carried out using finite element method and multi-physical modeling approaches. The problem is formulated in a nonlinear definition with strong mutual relations of subproblems for complex three-dimensional geometry. By the example of a furnace for melting of oxygen-free copper in the presence of leakage of the metal melt into furnace lining, the dependence of the temperature changes over the surface of the furnace body on the depth of penetration of the melt and its volume is determined. It is studied the changes in the temperature distribution

inside of thermal insulation as it degrades, i.e. when each of the four layers of material is reached by melt. The emergency configurations of the melt leakage, which require the furnace to be shut down and replaced are determined, and the analysis of the existing situations observed on the casting lines at industrial plants is carried out. The application of the proposed calculation technique allows to control the state of induction channel furnaces and develop the recommendations for increasing their resource. References 12, figures 3.

Key words: electromagnetic field, induction heating, numerical simulation, interrelated processes, copper melting, thermal insulation defects.

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