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THREE-DIMENSIONAL MODELING OF ELECTROMAGNETIC AND THERMAL PROCESSES OF INDUCTION MELTING OF COPPER TEMPLATE WITH ACCOUNTING OF INSTALLATION ELEMENTS DESIGN

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Authors

V.M. Zolotarev[2], M.A. Shcherba[1], V.V. Zolotarev[2], R.V. Belyanin[2]

[1] – Institute of Electrodynamics National Academy of Sciences of Ukraine,
pr. Peremohy, 56, Kyiv, 03057, Ukraine,
e-mail: m.shcherba@gmail.com

[2] – PJSC "Yuzhcable Works", Avtogennaia st., 7, Kharkov, 61099, Ukraine,
e-mail: zavod@yuzhcable.com.ua

Abstract

A three-dimensional mathematical model has been developed and an analysis of inhomogeneous distribution of magnetic and temperature fields have been made in the lined inductor of melting-holding furnace for copper melting and in the copper template. The analysis was done considering a complex geometry of the inductor (which typical dimensions of the elements differ significantly), nonlinear dependence of the copper conductivity on temperature, ferromagnetic properties of a steel magnetic core and an availability of water cooling of the

inductor coils and housing, accounting of the fluid temperature and mass transfer. A long-term process of the copper template melting of 18 hours duration at unsteady inductor power was considered. The local areas of the maximum of temperatures and temperature gradients in the lined inductor and their time changes were determined to analyze a reliability and a lifetime of the melting-holding furnace. References 18, figures 7.

Key words: Induction heating, coupled electromagnetic and thermal processes, three-dimensional mathematical modelling, nonlinear properties.

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