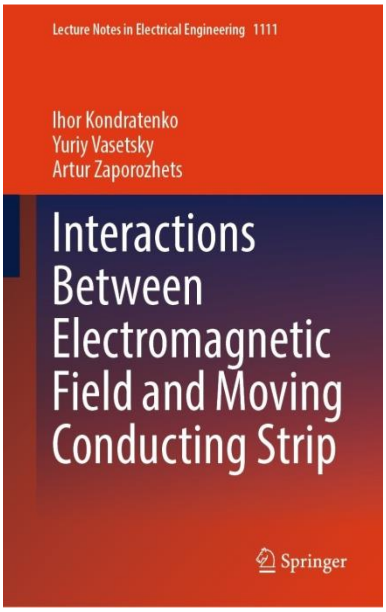

International scientific publisher "Springer" published the monograph "Interactions Between Electromagnetic Field and Moving Conducting Strip.

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The authors of the work are the corresponding member of the National Academy of Sciences of Ukraine, Head Department of Electromagnetic Systems of the Institute of Electrodynamics of the National Academy of Sciences of Ukraine, Doctor of Technical Sciences, Professor Ihor Kondratenko; the chief researcher of the Institute of Electrodynamics of the National Academy of Sciences of Ukraine, Doctor of Technical Sciences, Professor Yuriy Vasetsky and the Deputy Director for Scientific and Organizational Work of the Institute of General Energy of the National Academy of Sciences of Ukraine, Doctor of Technical Sciences Artur Zaporozhets.

The book combines two interrelated directions of research. One of them is devoted to the development of the theory for solving of a certain class of three-dimensional electromagnetic field, taking into account eddy currents in a moving conducting magnetizing body. Preference is given to the developed of the analytical solution methods of the three-dimensional quasi-stationary problem of field conjugation in the system: "a contour of an arbitrary spatial configuration with an alternating current located near conducting body with a flat boundary surface". The second direction refers to the development of mathematical models for solving applied problems, which involve the use of developed methods for calculating the electromagnetic field and their characteristics. The main application of calculation methods is aimed at solving problems of heat treatment non-ferrous and ferrous metal strips using the induction method of heating in a transverse magnetic field.

The Chapter 1 deals with mathematical models for studying the electromagnetic interaction of field sources with a conducting half-space. The mathematical models based on the presented exact analytical solution of the field conjugation problem, which has no restrictions on the geometric configuration of the external field sources, the properties of the media and the frequency of the field. The approximate methods of calculation are presented. They allow considering the most essential geometrical, electro-physical and heat-transfer properties of electromagnetic systems. The mathematical model of heat transfer is substantiated, in which the temperature is uniform throughout the thickness, and the process is considered adiabatic in the longitudinal directions.

In Chapter 2, studies on solving inverse problems of finding of the inductors geometry are formulated as parametric optimization problems in a certain class of current contours of spatial configurations. It is substantiated the expediency of using inductors in the form of current spatial contours with edges raised above the surface. The optimal configurations of spatial inductors are found for the important practical heating conditions. Methods for achieving uniform heating of non-ferrous and ferrous metal strips over the entire width and in the local area are analyzed.

The research in Chapter 3 is dedicated to issues related to the use of single-phase transverse magnetic field inductors with magnetic core in induction heating devices for thin moving metal strips. For used mathematical models there are no restrictions on the thickness and width of the metal strip, the frequency of the field and strip speed. In addition to the distribution of the electromagnetic field and current density, specific expressions are obtained for energy and force characteristics. It is established that minimum heating non-uniformity for single-phase inductors is approximately 15%.

A distinctive feature of the research in Chapter 4 is the simultaneous solution of electromagnetic and thermal problems in a three-dimensional setting, taking into account the constant velocity of the moving conductive object. Both one-sided and two-sided inductors are considered. The induction heating system includes both the heating element (inductor and heated object) and its electrical power source. The results for specific canonical contour shapes are presented. The chapter concludes with an investigation of the influence of the finite height of the current-carrying conductors of the inductor.