Problems of mathematical modelling of AC servomotor

Aleksander Patyk

Abstract. A mathematical model of AC servomotor is presented. A general case was taken into consideration in which an excitation winding and a control winding are different as to a structure and a number of winging turns. Cage equations were transformed to a set of orthogonal axes stationary against the stator. It was performed an analyses of a formal aspect of the localization of the orthogonal components pair of the transformed cage, which is coupled to the stator providing mono-harmonic distribution of the field in the air-gap (fundamental harmonic). Symmetrical components of the current were formulated in case of an asymmetrical stator winding. This enabled separating a pulsating component and two constant components from an electromagnetic torque. If both windings are identical or a referred excitation winding is identical to a control winding then methods of analysis relevant to symmetrical induction motors can be used. As an example there are presented results of measurement and computation of selected points of a control characteristic of a modelled motor with an amplitude control method.

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Plasma spraying of refractory cermets by the water-stabilized spray (WSP®) system

Pavel Ctibor, Vlastimil Brožek,
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Abstract. A mixture of tungsten powder was prepared with 3 to 20 vol. % of ZrC. This feedstock having a spheroidal character was fed into the plasma of the water-stabilized plasma (WSP®) gun by means of an inert gas carrier. Coatings with thickness of about 1 mm were sprayed on graphite substrates. Pure tungsten and pure ZrC were sprayed under similar conditions. Microhardness, surface roughness, XRD, XRF, dilatometry, Raman microspectroscopy and depth-sensing indentation were used for the coatings characterization. ZrC as well as W-ZrC coatings are hard and their elastic modulus is high. They can serve as surface protection of graphite substrates with various shapes.

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Magnetic field distribution in magnetoelastic pressure force sensor

Iveta Tomčíková

Abstract. Modelling of the magnetic field distribution in a magnetoelastic sensor core with respect to the variation of material permeability due to mechanical stress is proposed. The calculated results of output sensor voltage are verified by measured values and presented in tabular and graphical forms.

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Magnetic field of screened bifilar transmission line

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Abstract. For solutions of Laplace equation in non-conducting areas and Helmholtz equation for electric field of a screen, the second Maxwell equation is used and boundary conditions for magnetic field are determined. These conditions provide some parameters describing magnetic field inside, outside and in the screening shell of a single-wire transmission line with non-coaxial phase conductors. The components of this field are expressed in terms of the modified Bessel functions in cylindrical coordinates. The solution respects the effects of the reverse reaction magnetic field of eddy currents induced in the screening shell as a result of the internal proximity effect. It allows calculating the total magnetic field (of elliptic character) everywhere in the cross-section of the screened bifilar transmission line. Evaluation of the influence of the shell on the total magnetic field of the line is performed by comparing the modulus of this field with the modulus of field calculated for unscreened line along the internal and external surfaces of the shell, and inside the shell.

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Coupled electromagneto-thermo-mechanical analysis of selected electrical and electromechanical devices

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Abstract. A coupled approach to numerical analysis of selected electrical and electromechanical devices (induction heaters, specific types of actuators, rotating electrical machines, and some others) is presented giving complete information about their electromagneto-thermo-mechanical behavior in various operation conditions. The corresponding mathematical models (nonlinear and often non-stationary) are mostly solved by the finite element method using both classical and newly developed algorithms. The methodology is illustrated by several examples whose results are discussed.

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