

Abstracts

ELECTROENGINEERING: Prominent events and great names

Baranov M.I.

Peter Leonidovich Kapitza - founder of strong pulsed magnetic field engineering.

A brief sketch on the history of the problem of strong constant and pulsed magnetic field generation is given. A significant contribution of the

5 prominent Soviet physicist - experimentalist P.L. Kapitza to solution of this problem is described.

Key words - **history, problem, generation, strong constant and pulsed magnetic fields, electrophysical installations.**

Electrical Mashines and Apparatus

Verbovoy A.P.

Interpretation of causes of change in inductive reactance of mutual induction and magnetization current in induction motors.

The paper is devoted to analysis of definitions and designations and to determination of inductive reactance of mutual induction. For an induction motor, it is shown that load increment and motor speed-down result in inductive reactance of mutual induction several times reduced and magnetizing current increased.

Key words - **induction motor, start, control, rotational speed, inductive reactance, mutual induction, magnetizing current.**

Voronovsky G.K., Orlovsky I.V., Ostashevsky N.A.

Calculation of energy parameters of induction motors based on active power consumption monitoring.

A problem of computer-aided simulation of induction motor operation modes to calculate energy parameters through active power consumption is analyzed.

Key words - **simulation monitoring, induction motors, active power consumption.**

Guetya A.N., Finkelshstein V.B.

Rotational electromotive force of an ac converter-fed motor with permanent magnets on the rotor.

The paper presents magnetic induction distribution on the rotor pole surface adjusted for a toothed magnetic core of the stator. Expressions for evaluating a rotational electromotive force at transient process calculations in an ac converter-fed motor are given.

Key words - **ac converter-fed motor, permanent magnet, induction distribution, electromotive force.**

Degtev V., Shulgin D., Dmitrieva T.

Analysis of electromagnetic properties of nonconventional windings.

A method of analysis of electromagnetic properties of nonconventional windings based on initial structure decomposition is suggested. An example of its application during synthesis of a single-layer winding subset is given.

Key words - **windings, vector diagram, method of analysis, electromagnetic properties.**

Zavgorodnyy V.D., Klimenko V.V., Snitkov I.F., Sheremeta R.N.

Design calculation principles for volume-type vacuum electropumps.

9 A design calculation technique for volume-type vacuum electropumps that allows determining the basic design parameters of the pump and parameters of its driving motor is expounded. An example of the technique application is given, comparison of calculated data with experimental ones made.

Key words - **design calculation, pump driving motor, vacuum electropump.**

Klementiev A.V.

Calculation of excitation electromotive force of a noncontact salient-pole synchronous machine with a variable-structure rotor winding.

13 Expressions relating excitation winding current to excitation electromotive force of the stator winding of a noncontact combined salient-pole synchronous machine with a variable-structure rotor winding are given.

Key words - **noncontact salient-pole synchronous machine, excitation electromotive force, variable-structure rotor winding.**

Ostashevsky N.A., Ivanenko V.N., Kovgan A. N.

17 **Investigation of magnetic field of a slotless DC motor with permanent magnet excitation at no-load.**

Results of magnetic field calculation in the cross-section of a slotless DC motor with permanent magnet excitation with asymmetric magnetic circuit at no-load are presented. Influence of the magnetic circuit asymmetry and different forms and dimensions of the permanent magnets on the magnetic field distribution is investigated.

Key words - **slotless DC motor, permanent magnet, main magnetic flux, dissipate factor, main pole, smooth-core armature, magnetic flux density.**

Pavlenko T.P.

20 **A dynamics model of arc discharge propagation**

The paper analyzes action of arc processes on the work surface of electrodes. The analysis is based on a combined equation of heat-and-mass-and-electron transfer in a dynamic system of "cathode - locally-heated plasma - anode". The analysis results in both obtaining solutions relating to discrete cathode spot displacement and demonstrating influence of high-enthalpy gas and plasma fluxes coming from near-electrode zones and direct action of erosion on contacts and electrodes.

Key words - **voltaic arc, electrodes, analysis**

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Rimsha V.V., Radimov I.N.
Modeling of a linear transversal flux switched reluctance motor.

Results of 3D modeling of magnetic field in a linear transversal flux switched reluctance motor are presented. On the basis of the magnetic field simulation results, electromagnetic forces acting on the moving element of the motor are calculated. Comparative analysis of results of unidirectional magnetic attraction force calculations for 2D and 3D simulations are given.

Key words - **linear switched reluctance motor, transversal flux, magnetic field.**

Sereda A.G.

Limit short-circuit current switching capability of ceramic contacts of fault-current limiters

Applicability of Ag-based composite materials doped with refractory component parts as the main contacts of fault-current limiters of enhanced switching capacity, like VA57-35, is analyzed.

Key words - **switching capability, fault-current limiters, Ag-based composite materials**

Fomin V.I.

Research into influence of conducting element branches on protective performance of quick-break fuses

The paper presents calculations of conducting element cross-section for various conducting element geometries as well as calculations of the basic protective characteristics under short-circuit current interruption and influence of the conducting element branch width on them.

Key words - **protective performance, quick-break fuse, conducting element**

Khvorost M.V.

Electromechanical similarity equations and their application to synthesis of a "semiconductor converter – traction induction motor" system

With application of a wave induction motor model in $i^?$ coordinates, simple and direct similarity equations relating system parameters to weight and energy parameters, as well as other characteristics of a traction motor, can be obtained. Mechanisms of action of the fundamental frequency and transmission ratio of the mechanical reduction gear are analyzed with and without restrictions on the air clearance perimeter as the basic linear dimension.

Key words - **similarity equations, synthesis, induction motor**

42 *Shynkarenko V.F., Avgustynovych A.A., Nestycajlo O.S.*

Progressive-motion cylindrical electric machines: genetic analysis and taxonomic structure of the class

The area of existence and the structure of progressive-motion cylindrical electric machines generic composition is determined. The taxonomic position of the class is scientifically substantiated and the hierarchical structure of the basic systematic blocks is found. A genetic analysis and research on properties of species twins of progressive-motion cylindrical electric machines are performed.

45 *Key words* - **cylindrical electric machine, progressive motion, genetic analysis, class existence boundaries, taxonomy, hierarchical structure.**

Shulzhenko N.G., Zozulin Ju.V., Pantelyat M.G., Rudenko E.K., Petushkova S.A.

Effect of slot wedge material on electromagnetic field, current density and losses distributions due to negative-sequence currents in a turbogenerator rotor at two-phase short circuit.

48 A 2D finite element analysis of transient negative-sequence electromagnetic field, current density and losses distributions at two-phase short circuit of a 300 MW synchronous turbogenerator rotor is carried out. Two variants of the rotor structure are investigated, one with wedges made of duralumin and the other - of titanium, without taking into consideration contact phenomena. It is demonstrated that utilization of titanium wedges results in essential decrease of the current density and power losses in the turbogenerator rotor

50 *Key words* - **turbogenerator rotor, wedge, negative-sequence currents, electromagnetic field, current density, power losses, finite element method.**

Shchapov P.F.

Routine inspection scheduling for oil-filled power equipment to identify aging processes with preset decision-making reliability

Theoretical aspects of random analysis-of-variance models application in problems of parametric chance identification of transformer oil physical-chemical figures with preset reliability within the bounds of preventive testing of oil-filled power equipment are considered. Practical results of minimum-acceptable periodical-testing time estimation in transformer-oil aging control over standard quality indices are obtained

Key words - **inspection scheduling, oil-filled power equipment, reliability, transformer-oil aging control**

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Electrical Engineering: Theory

Batygin Yu. V., Lavinsky V. I., Chaplygin E. A.

Some particularities of currents induced by low-frequency field of a single-turn solenoid in flat sheet metals.

A theoretical analysis of electrodynamic processes of eddy currents excitation in flat sheet metals is conducted. In a skin effect mode (a com-

69 pletely conducting blank or quite high frequencies), an induced current is the mirror reflection of an inductor current. Their directions are opposite (or there is a phase displacement of π). In a low-frequency field mode (thin-walled metals), the phase displacement decreases to the value of $\pi/2$. The direction of the induced current, compared

with that in the skin-effect mode, does not change.

Key words - eddy currents, sheet metal, skin effect

Weprik Ju.M., Lebedka S.M., Weprik W.Ju.

Mathematical modelling of transient processes in electric networks with an insulated neutral in phase coordinates.

A mathematical model of transient processes in an electric network with an insulated neutral in phase coordinates is developed. Transient process computation with application of implicit methods and discrete model representation of three-phase elements within an integration step allows reducing solving of a system of differential equations to reiterative generation and solving of a system of algebraic equations.

Key words - electric network, modelling, transient process, phase coordinates.

Kravchenko A.I., Bovda A.M.

Traction force of a magnetic muff as function of geometric parameters

By means of computer simulation, calculation of a linear model of a magnetic muff is performed. Dependences of traction force on the magnetic gap between the magnet rows and on the distance between the magnets in one row for different periodicity and constant weight of the magnets and the total traction force on the number of the magnets and on the magnetic gap at given dimensions of the muff and the magnets are obtained. Complicated nature of these dependences is revealed.

Key words - magnetic muff, traction force, geometric parameters, number of magnets

Naboka B.G., Besprozvannih A.V.,

Shtangey A.S.

Partial capacitance parameters as an indicator of behavior of NPP control cables.

Results of laboratory measurements of partial capacitance parameters of shielded-pair control cable specimens that were located in containment and pure zones and stored in nuclear power station storehouses are presented. Differences of partial

capacitance ratios and dielectric losses ratios are revealed, which are recommended to be utilized as an aged product indicator.

Key words - partial capacitance, control cables, containment nuclear power plant, aged product indicator.

Sebko V.P., Zhulidov A.O., Moskalenko O.I.

Correct evaluation of accuracy of three-parameter measurements with a contact electromagnetic transducer

A design procedure for relative accuracy of simultaneous measurement of relative permeability μ_r , radius a and conductivity σ of a cylindrical ferromagnetic rod with a contact electromagnetic transducer is considered. Calculation of mechanical stress measurement accuracy is analyzed taking into account μ_r and σ measurement accuracy.

Key words - contact electromagnetic transducer, accuracy, magnetic permeability, radius, specific conductance, mechanical pressure.

Sebko V.P., Bezzaponnaya V.M.

An overlay electromagnetic transducer for control of thickness and conductivity

In the given paper, a differential transducer with a magnetic circuit for thickness control of nonmagnetic sheet products and tubular product walls is analyzed. A connection circuit for such a transducer is suggested. Expressions that relate a differential EMF of the transducer to a change in sheet or pipe wall thickness are obtained. A technique of rational operating mode selection in terms of obtaining maximum sensitivity of a lay-on differential eddy-current transducer to the thickness of a product is introduced. It is shown that at a certain magnetization current frequency, maximum transducer sensitivity to the thickness of a product (flat or tubular) is achieved. Influence of magnetic intensity and product material conductivity on results of thickness control for a nonmagnetic product is also studied.

Key words - overlay electromagnetic transducer, thickness, conductivity, sensitivity, frequency, magnetic intensity.

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Education Structure in "Electrical Engineering" and "Electromechanics"

Baranov M.I.

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Noosphere of nature and a new conception of science development in the human society.

A new conception of science development in the human society that promotes harmonization of society and nature is presented.

Key words - nature, human society, science, conception, development