

# Abstracts

## **ELECTROENGINEERING: Prominent events and great names**

*Boev V.M.*

### **Emf of self-induction and mutual induction in respect to the “electronic state” concept.**

The paper presents an attempt to explain physical meaning of self-induction and mutual induction processes on the basis of vector potential

- 5 realization as “an electricity current equivalent”. It is dedicated to the 175-th anniversary of the first series of “Experimental Research into Electricity” by Michael Faraday.

*Key words* – **electro moving force, self-induction, mutual induction, vector potential**

## **Electrical Mashines and Apparatus**

*Branspiz Yu.A., Pshenichnyi A.N.*

### **Analytical calculation of a tractive force of a shell-type electromagnet with a cone armature**

A technique for analytical calculation of a tractive force of the a pot electromagnet with a cone armature is described. Its practical acceptability for engineering calculations is shown.

*Key-words* - **shell-type electromagnet, force, armature**

*Verbovoy A.P.*

### **A technique for determination of electromagnetic parameters and current density in rotor windings of induction motors.**

This paper introduces a technique for determination of electromagnetic parameters of a squirrel-cage rotor winding in an induction motor. The technique treats a squirrel cage rotor winding as an equivalent single-turn winding ( $w_{02} = 1$ , in publications on the subject  $w_{02} = 0,5$ ) with the number of phases equal to the number of the stator winding phases ( $m_{02} = m_{01}$ , in publications  $m_{02} = Z_2$ ). The new technique makes it possible to calculate electromagnetic parameters and current density with higher accuracy.

*Key words* - **induction motor, winding, electromagnetic parameters, phase**

*Getya A.N., Finkelstein V.B.*

### **Calculation of inverter-fed electromotor characteristics with allowance for transient processes.**

In the paper, influence of transient processes in an inverter-fed electromotor on its mechanical characteristic behavior is studied. A current curve within the commutation range is obtained. A technique of mechanical characteristic calculation with allowance for transient processes is introduced.

*Key words* - **inverter-fed electromotor, mechanical characteristic, transient processes**

*Kanyuk G.I., Shuvanov A.N., Bliznichenko L.N.*

### **General principles of mathematical modeling for working processes and elements of electronic-hydraulic servo- mechanisms.**

General principles of mathematical modeling for working processes and elements of electronic-hydraulic servo- mechanisms (EHSM) have been developed. These general principles have been applied to developing specific mathematical models for EHSM of simulation dynamic benches.

- 8 *Key words* - **electronic-hydraulic servo-mechanism, mathematical model**

*Klimenko B.V., Bugaychuk V.M., Grechko A.M.*

### **A pre-production model of two-position electromagnetic drive for an average-voltage vacuum switch.**

On a pre-production model of a two-position electromagnetic drive for a vacuum switch, a design solution to a problem of increasing retention force of the core moving element with the coils de-energized is shown. Principle of operation of the suggested electromagnetic drive design is considered. The structural features of the basic elements of the vacuum switch are presented.

*Key words* - **vacuum switch, magnetic system, electromagnetic drive, retention force**

*Kuzmin V.V.*

### **Problems of state-of-the-art electric engineering on the way toward new energy sources creation.**

The paper considers problems of current theory of electricity (contradictions and paradoxes) that complicate development of scientific foundations for new-generation energy sources creation.

*Key words*– **electricity theory, contradictions, paradoxes, energy, sources, new-generation**

- 15 *Larin A.M., Tkachenko A.A., Larina I.I.*

### **Estimation of field-winding electromagnetic parameters of a synchronous generator through sudden three-phase short-circuit tests.**

The basic procedures of an experimental technique for estimating field-winding electromagnetic parameters of a synchronous generator are given. The technique is based on application of experimental data registered during sudden three-phase short-circuits at the electric machine terminals. Research results for a CG 18,75 salient-pole synchronous generator and a TBB-160 turbogenerator are given.

*Key words* - **synchronous generator, field-winding electromagnetic parameters, sudden three-phase short-circuit**

*Lashko Yu.V., Chorny O.P.*

### **Protection system for asynchronous motor with controlled cutoff setting.**

Reasons for advancement of electric motor protection equipment based on anticipatory-

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functioning principle are substantiated. Controlled-setting protection based on energy conversion quality index application is introduced.

*Key words* – AC motor, protection system, anticipatory-functioning principle

*Luschik V.D.*

**Asynchronous motors with phase-wound rotors with cascaded behavior at startup.**

The paper presents overlapped windings schemes and principle of functioning of an asynchronous motor with a phase-wound rotor in cascaded operation mode at startup. Application of overlapped windings allows improving startup behavior.

*Key words*– AC motor, phase-wound rotor, cascaded operation mode, startup characteristics

*Puilo G.V., Trischenko E.V.*

**A generalized mathematical model for synthesis and analysis of power transformers with cross-over windings.**

The article considers a generalized mathematical model of power transformers with cross-over windings that allows automated synthesis, analysis, and optimization of power transformers with magnetic cores and windings of various structure.

*Key words* - power transformer, generalized mathematical model, magnetic core structure

*Rassalsky A.N.*

**A monitoring and control system for power transformers.**

Functional capabilities and principles of designing a monitoring system for power transformers installed in a number of substations of RJSC "UES of Russia" at present are given in the paper.

*Key words* - transformer, power systems, monitoring, database

*Senderovich G.A.*

**Automatic determination of specific phase and short circuit type**

A fault location automation technique is introduced in the article. An emergency mode analyzer block scheme is given, a specific phase and short circuit type automatic determination algorithm is developed.

*Key words* – electrical set, analyzer of shorting, fault location technique, automatic determination algorithm

*Chepelyuk A.A.*

**Parameter optimization of electromagnetic systems with transverse-motion armatures and ferromagnetic shunts in operating clearances.**

Parameters of an electromagnetic system with a transverse-motion armature and ferromagnetic shunts in the operating clearances have been optimized to decrease amount of the magnet wire and improve other parameters of the considered electromagnetic system.

*Key words* – electromagnetic system, ferromagnetic shunt, transverse-motion armature, optimization

*Schapov P.F.*

**Information parameter space optimization under field inspection of transformer oil decomposition.**

The paper considers an analysis-of-variance method for regression models of parametric change in transformer oils quality applied to determine an optimal number of controlled physical and chemical parameters that provide maximum information under preventive multiparameter inspection of operational transformer oil decomposition processes.

*Key words* - transformer oil, parametric ageing, optimization of control

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## High Electrical and Magnetic Field Engineering

*Baranov M.M., Baranov M.I.*

**A quantum-mechanical model of electromagnetic wave absorption by a conductor and phenomenon of the conductor electrical explosion.**

On the basis of quantum mechanics principles, an approximate mathematical model has been developed to describe space-time maximum-temperature distributions in both a thin heated electrically-exploding conductor (EEC) with a high-density conduction current and in plasma products generated after electrical explosion of the conductor. A hypothesis of initiation of spark discharge of macroscopic wave electronic packets in an EEC with conduction current and in the further generated high-current plasma channel has been put forward and scientifically substantiated, the electronic packets formed, respectively, by free electrons of the EEC material and by electrons of the generated plasma.

*Key words*- electromagnetic waves, conductor, plasma, absorption, quantum-

**63 mechanical model, macroscopic wave electronic packet, electrical explosion**

*Batygin Yu.V., Lavinsky V.I., Chernogor T.T.*

**Diffusion processes during expansion of tube work-pieces in magnetic pulse metal working.**

The article presents analysis of electrical dynamic processes during magnetic pulse expansion of thin-walled metal cylinders onto a dielectric or metal matrix. Particular attention is paid to the situation when diffusion effects become quite noticeable, that is the field penetration depth is commensurable or even more than the thin-walled metal tube thickness

*Key words* - diffusion effects, inductor systems

*Zolotaryov V.M., Antonets J.A., Schebenyuk L.A., Golik O.V.*

**Research into electrical and mechanical parameters correlation for double enameled-wire isolation.**

Correlation of stability indexes for electrical

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and mechanical parameters of enameled wire with double isolation is established, the data obtained by in-process measurement.

*Key words* - enameled wire, electrical parameters, mechanical parameters, in-process measurement

## Electrical Engineering: Theory

*Krjukova N.V., Geljarovskaja O.A., Danko V.G., Lupikov V.S., Sereda A.G.*

### **A method of magnetic moment determination for a frame construction of electrical device.**

A frame construction of electrical device is considered and a method for determination of its magnetic moment is grounded. The method includes calculations of mutual inductivity electromotive forces caused by linear elements of the frame construction and power circuits via obtained analytical relationships, drafting of an equivalent circuit for the frame construction, its modification with an M-circuit method, calculation of magnetic moments for independent loops of the M-circuits and their separate summation for cosine and sine components of the frame construction currents.

*Key words* - electrical device, frame construction, equivalent circuit, magnetic moment, modeling

*Sebko V.P., Zhulidov A.O., Philonenko D.V.*

### **Inaccuracy of three-parameter measurements with a two-frequency contact electromagnetic method.**

A technique of simultaneous estimation of magnetic permeability  $\mu_r$ , conductivity  $s$  and radius  $a$  of a cylindrical conducting product with a contact

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electromagnetic method is considered. According to the technique, components of a converter signal are found through preset values of  $\mu_r$ ,  $\sigma$  and  $a$ . After that, instrument measurement errors are set into the components to obtain conditionally-measured components of the signal that are used to determine conditionally-measured values  $\mu_{ry}$ ,  $\sigma_y$  and  $a_y$  and inaccuracy of the measurements.

*Key words* - specific electric resistance, inductance, radius, electric current, magnetic permeability, frequency, inaccuracy

*Sebko V.P., Pushay I.A.*

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### **On an electromagnetic parameter calculation procedure for a conducting core with longitudinal current.**

A procedure of electromagnetic parameter calculation for a ferromagnetic cylindrical core with a longitudinal finite-frequency alternating current is considered. Expressions for calculation of the core active resistance, total and internal inductance, as well as those for the core-ends voltage drop and phase angle between the voltage drop and the longitudinal current in the core are received (under external inductance compensation).

*Key words* - core, current, amperemeter, voltmeter, electromagnetic converter, radius

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## Power Stations

*Voronovsky G.K., Pokalitsyn S.N., Orlovsky I.V.*

### **Energy saving potential of the chemical water purification facility in Kharkov CHPP № 5.**

Mechanisms of power consumption data generation for the chemical water purification facility in Kharkov Combined Heat&Power Plant № 5 are

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studied. Energy-saving measures that result in decreasing annual power consumption of the plant auxiliaries by 1400 MWh are substantiated.

*Key words* - heat and power plant, energy, saving, power consumption

## Education Structure in "Electrical Engineering" and "Electromechanics"

*Busel N.P., Pisaric V.V., Sasin A.V., Mikhaltsov A.P.*

### **A universal laboratory complex with software – a basic element of an engineer's training in electrical engineering**

A conception of making a universal laboratory bench in the course of "Electrical Engineering and Electronics" is considered, taking into consideration the interrelation of separate investigations and application of their results while switching from simple elements and devices to more complex units and control circuits.

*Key words* - electrical engineering, laboratory complex, computerization

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