Summaries

UDC 539.4:538.3

A.P. Surzhikov, T.V. Fursa, N.N. Khorsov

MATHEMATICAL MODEL OF ELECTRICAL RESPONSE TO COMPOSITE MATERIALS ACOUSTIC EXCITATION

The paper considers the mathematical model of electrical response emerging in the sample with the double electrical layer inclusion located at the prescribed distance from the capacity signal receiver when the latter is mechanically excited by the flat acoustic wave of the prescribed length. It is established that the electromagnetic response results from the total change of the electric field intensity connected with the displacement of the double electrical layer charges which is caused by the deformation of the layer and the sample at its acoustic excitation. The paper shows the agreement of calculations with experimental data.

UDC 539.4:538.3

T.V. Fursa, A.P. Surzhikov, N.N. Khorsov, K.Yu. Osipov, V.A. Zatsepin

STYDYING INTERCONNECTIONS OF STRUCTURAL CHARACTERISTICS OF LAYER-TYPE COMPOSITE MATERIALS WITH THE PARAMETERS OF ELECTRICAL RESPONSE TO IMPULSE MECHANICAL EXCITATION

Using the method of physical simulation, the process of dynamoelectric transformations in layer-type composite materials at their elastic impulsing is considered. The paper points out the interconnection of electric response parametres to impulse mechanical excitation with impulsing characteristics, correlation of geometrical dimensions and number of layers in layer-type composite materials.

UDC 539.3

A.A. Bespalko, B.A. Lyukshin, N.Yu. Matolygina, G.E.Utsin, T.V. Fursa

SIMULATING ELASTOPLASTIC WAVE PROCESSES IN DIELECTRIC LABORATORY SAMPLES

The paper states the results of the studies which enable to define the impact of samples structural features on the type of wave processes in them. From the point of view of continuum mechanics, simulation of wave processes at exposing part of the sample to impulse load is performed. The numerical analysis reveals the interrelation of nonhomogenity characteristics with the change in the parameters of wave processes occurring in the solid.

UDC 622.02:531

A.A. Bespalko, L.V. Yavorovich, P.I. Fedotov

CONNECTION OF ELECTROMAGNETIC SIGNALS PARAMETRES WITH ELECTRICAL CHARACTERISTICS OF ROCKS AT ACOUSTIC AND QUASI-STATIC EXPOSURE

The paper shows the influence of rock conductivity on the amplitude of electromagnetic signals at acoustic excitation. The experimental results are given that point out the connection of electromagnetic emission and polarization currents with load steps of epidote- garnetiferous skarns and black iron ore at quasi-static exposure.

UDC 539.21:539.1

A.P. Surzhikov, T.S. Frangulyan, S.A. Gyngazov, N.N. Koval, V.N. Devyatkov

MICROHARDNESS CHANGE OF FERRITIC CERAMICS WHEN EXPOSED TO IRRADIATION BY A HIGH-CURRENT IMPULSE BEAM OF LOW ENERGY ELECTRONS

The paper studies the influence of a high-current impulse beam of low-energy electrons on changes in microhardness of near-surface layers of ferritic ceramics. The dependence of the measured microhardness on the value of the indenter load through elastic recovery of the cast (scale effect) is revealed. It is shown that depending on the number of impulses of electron exposure, the measured microhardness value may both decline (single-pulse radiation) and rise (10 impulses) in relation to the initial state of the sample. The analysis of the results is performed taking into account the contribution of elastic recovery of the indenter's cast to the effects of radiation changes of ceramics microhardness.

UDC 621.315.612:666.638

R.U. Usmanov

INFLUENCE OF ALUMINUM OXIDE INCLUSIONS ON MAGNETIC PHASE TRANSITION IN FERRITIC CERAMICS 3СЧ18

The paper suggests the method for studying chemical and structural homogeneity of ferrimagnetic materials which is based on the analysis of magnetic phase transition in Curie temperature range. Using the example of 3СЧ18 – Al_2O_3 model systems, it is shown that the form and the temperature maximum position of the curve of the specific magnetism derivative $\partial\sigma/\partial T$ are very sensitive (not worse than 0,6 mol. %) to foreign phase inclusions.

UDC 665.65

Yu.M. Annenkov, A.S. Ivashutenko

CERAMICS SINTERING AND MODIFYING IN HIGH-FREQUENCY AND ULTRA-HIGH-FREQUENCY FIELDS

Based on the theory of radiation sintering, the physical model of high-frequency and ultra-high-frequency sintering is suggested. It is shown that high-frequency and ultra-high-frequency fields are a powerful means of ceramics sintering which ensure improvement of ceramic structures properties.

UDC 666.7:537

Yu.M. Annenkov, A.V. Kabyshev, A.S. Ivashutenko, I.V. Vlasov

ELECTRIC PROPERTIES OF CORUNDUM-ZIRCONIUM CERAMICS

The works have been performed on studying electrophysical properties of corundum-zirconium ceramics in the wide temperature range. The new effect is discovered in ceramics with zirconium dioxide domination. This effect consists in high-temperature maximum of dielectric conductivity with the values of several millions units. The paper suggests a probable explanation for this effect.

UDC 621.762

Yu.M. Annenkov, V.V. Ivanov, A.S. Ivashutenko, A.A Kondratyuk

EFFICIENCY OF VARIOUS COMPACTION METHODS OF CORUNDUM-ZIRCONIUM POWDERS WITH DIFFERENT DISPERSION DEGREES

The paper presents the comparative analysis of various compaction methods of corundum-zirconium powders with different dispersion degrees, as well influence of the plasticizing agent on compaction process efficiency. It is shown that the densest solidities are obtained by using the magnetic-impulse compaction method. In view of this fact, the considered method is proposed to be used as a major compaction method for nano-ceramics manufacturing.

UDC 669.10

A.S. Saigash, D.Yu. Gerasimov, A.A. Sivkov

APPLYING FUNCTIONAL COATINGS TO METALLIC SURFACES BY HYBRID COAXIAL MAGNETOPLASMA ACCELERATOR

The paper shows the possibilities of the method of applying various metallic and composite functional coatings to metallic surfaces by hybrid coaxial magnetoplasma accelerator. The results of experimental studies and the properties of the obtained materials are given.

UDC 535.34:599.216

A.V. Kabyshev, F.V. Konusov

OPTICAL PROPERTIES OF POLYCRYSTALLINE ALUMINUM OXIDE AFTER RADIATING BY CHROME IONS AND ANNEALING

The paper studies the parameters of optical absorption of polycrystalline aluminum oxide after radiating it by chrome ions followed by vacuum annealing. The paper reveals the influence of substitution defects, interstitial ions of chrome and aluminum and complexes with their participation on the absorption characteristics and the nature of optical transitions between localized states and permitted bands. The contributions to the properties change are pointed out due to separate substitution defects, their clusters and complexes and own vacancy defects. The influence on the absorption of defect formation and chemical interaction of implanted chrome atoms with the crystal lattice atoms is assessed. The most probable character of substitution defects clusters and complexes of impurity-defect type is found out.

UDC 539.12.04

N.V. Guschina, V.V. Ovchinnikov, B.Yu. Goloborodsky, L.S. Chemerinskaya

STUDYING THE PROCESSES OF VOLUME DECOMPOSITION OF OVERSATURATED SOLID SOLUTION Al – 4 mas. % Cu AT RADIATING BY Ar^+ IONS WITH ENERGY 20 keV

The paper studies the changes in microhardness and lattice constant of the solid solution of the alloy Al – 4 mas. % Cu when exposed to radiating by Ar^+ ions with the energy 20 keV, as well as in the process of the succeeding deterioration. It is established that in the course of radiation, starting with low doses – 10^{15}...10^{16} ion/cm^2, deep decomposition of the oversaturated solution takes place, leaving out the zone stage of decomposition followed by releasing second-phase particles at extremely low temperatures (<60 °C) at which only the zone deterioration stage takes place when exposed to traditional heating. The depth at which phase separation occurs exceeds ions projective paths by several orders of the value. Decomposition rate also increases by several orders (in comparison with traditional thermostimulated deterioration at the same temperature). All these factors combined with the significant influence of low radiation doses confirm the determining role of radiation- dynamical contribution to initiating volume processes in metastable media.

UDC 539.12.04

A.R. Shkolnikov, V.V. Ovchinnikov, N.V. Guschina, F.F. Makhinko, L.S. Chemerinskaya , S.M. Mozharovsky, V.A. Kozlovskikh, L.I. Kaigorodova

CHANGES OF DISLOCATION STRUCTURE AND PHASE COMPOSITION OF THE ALLOY AMr6 WHEN EXPOSED TO RADIATION BY Ar+ IONS WITH ENERGY 40 keV

Using the method of electronic microcopy, it is established that radiation of 15×15×3 mm^3 clad (with the protective surface Al layers ~130 mcm) samples of industrial aluminum alloy AMr6 by Ar^+ ions with the energy 40 keV after cold rolling results in significant narrowing of the boundaries of intragrained cellular dislocation structure and increase in its regularity degree. When after removing the clad layer, the alloy is directly exposed to accelerated ions, the developed polygonal structure is formed in it which is similar to the one formed at initial stages of recrystallization annealing.

Besides, radiation by Ar+ ions causes grinding and solving of coarse intermetallides of crystallization origin which cannot be removed by both deformation and annealing at 320 °C. All the revealed changes are observed in the cross cut along the entire samples depth which significantly exceeds projective passes of ions (approximately 10^5 as much). Low temperatures (<170 °C) and radiation doses beginning with $0{,}6 \cdot 10^{15}$ cm^{-2} (radiation time^{-1} s) as well as great impact depth confirm significance of radiation-dynamic effects.

UDC 539.12.04

V.A. Ivchenko, E.V. Popova, V.V. Ovchinnikov, A.V. Kozlov

SPATIAL DISTRIBUTION AND ATOMIC STRUCTURE OF RADIATION DAMAGES IN PLATINUM RADIATED BY NEUTRONS

Using the method of field-ion microscopy, spatial distribution and atomic structure of radiation damages in Pt radiated in the reactor ИВВ-2М at temperature ~310 K until fluences of intermediate and rapid (E>0,1 MeV) neutrons: $6{,}7 \cdot 10^{21}$ and $3{,}5 \cdot 10^{22}$ m^{-2} is revealed. The concentration of radiation damages equal to $9 \cdot 10^{22}$ m^{-3} formed in the volume as a result of the evolution of dense cascade atomic displacements is experimentally measured. From the submitted experimental data the average value of the radiation cluster diameter (depleted zone) is found which amounts to 3,2 nm.

UDC 621.313.12

G.V. Nosov

GENERATING POWERFUL CURRENT IMPULSES BY ELECTROMECHANICAL VARIABLE INDUCTANCE SOURCES

The paper shows the possibility of applying electromechanical variable inductance sources for power supply of autonomous electrophysical plants by series of powerful current impulses. The parametres of these generators are given which are more powerful than impact-excited synchronous generators and have greater impulse energy if compared with capacitive generators.

UDC 621.311.016.001.24

S.G. Slyusarenko

ACCOUNT OF PHYSICAL FEATURES OF ENERGY TRANSMISSION THROUGH THE ELECTRIC NETWORK ELEMENT IN CALCULATION ALGORITHMS OF STEADY STATE MODES

The paper studies the maximum existing mode of energy transmission through the element of the joint branch of the electric network design model. The analysis of ambiguity of the mathematical model of its mode condition is performed. The way of checking the existence of the solution to the design problem of the steady state mode and the iteration process control algorithm for obtaining physically acceptable results are suggested.

UDC 621.311.1.018.3

N.N. Kharlov

ENERGY SPECTRUMS OF VOLTAGES AND LOAD NODE CURRENTS

The paper determines the constituent elements of energy spectrums of voltages and load node currents with the sharply changeable and quickly changeable operation modes. Based on the calculation ratios, the "energy quality criterion of voltage" is suggested. The example of practical application of the obtained results is shown.

UDC 621.317.1

E.I. Goldshtein, A.O. Sulaimanov, N.L. Batseva

SPECTRAL ANALYSIS OF CURRENTS (VOLTAGES) IN ONE-PHASE AND THREE-PHASE CIRCUITS USING VOLT-AMPERE CHARACTERISTICS

The paper sums up the investigation results on developing procedures of defining spectral portraits of multiple frequency signals with the use of volt-ampere characteristics. The area of the volt-ampere characteristic of the initial and the comparison signal is minimal when

the frequencies of these signals coincide. The area goes to zero when phases coincide.

UDC 621.317.1

A.O. Sulaimanov, E.I. Goldshtein

DEFINITION OF INACTIVE CAPACITY AND ITS COMPONENTS ACCORDING TO ARRAYS OF CURRENT AND VOLTAGE INSTANTANEOUS VALUES

The paper suggests using reverse power integrals for the quarter of a period for the definition of the inactive capacity while volt-ampere characteristics are is suggested for the definition of a displacement power. The deformation power shall be defined as the difference between inactive capacity and displacement power. The efficiency of the suggested methods for one-and three-phase chains of the alternating current is shown.

UDC 621.372.4:537.52

Yu.N. Isaev, V.A. Kolchanova, O.P. Shpilnaya, E.O. Kuleshova

DEFINITION OF THE OZONIZER INFLUENCING PULSE OPTIMUM SHAPE

The paper describes the possibility of the optimum type of the input voltage for the electrical replacement schemes of the first and second order barrier discharge. The definition algorithm for the optimum shape of the voltage influencing pulse causing minimum energy consumption by the electrical schemes of ozonizer replacement is suggested.

UDC 621.372.4:537.52

Yu.N. Isaev, O.P. Shpilnaya, E.O. Kuleshova

TOMOGRAPHY CALCULATION METHOD OF DISCHARGE AND VOLUMES OF APOCRYPHAL FLAT ELECTRODES DISTRIBUTION

The paper suggests the reconstructive tomography method for the calculation of discharge and volumes of flat apocryphal conductors' distribution. Examples of discharge and volumes distribution reductions are shown on the model problems. Results of well-known volumes calculations are compared with the tomography approach.

UDC 621.387.35

V.A. Lavrinovich

ELECTRODE GEOMETRY OF VACUUM LIGHTNING ARRESTER INFLUENCE ON THEIR EROSION

Electrode geometry of vacuum lightning arrester (residual pressure less than 10^{-4} Pa) influence on their erosion resistance is investigated. Comparative testing of all electrode assembly geometry is conducted on vacuum lightning arresters models. The switched current pulse has a form of a damped sinusoid with the period of 640 Maxwell, damping factor equal 1,8 with a magnitude of 55 kA at the charging voltage of 6,6 kV. The general induction coefficient of the circuit measured using the method of short circuit amounts to 8,4 mkHn. Electrode pictures after arresters' testing are offered. The advantage of electrode framed structure if compared to other tested constructions from the point of view of the electrode erosion is shown. The lightning circuit which was covered with erosion is considered the weakest point in all constructions. It is shown that sharp change in electrode erosion velocity of vacuum lightning arresters begins after exceeding the switched current at 10 kA. Obtained data may serve the basis for further development of vacuum lightning arresters of sealed off constructions.

UDC 621.314

S.V. Pustynnikov

COMMUTATOR FOR THE DIRECT CURRENT CIRCUITS WITH THE INDUCTIVE LOAD

The paper analyses work of thyristor commutator for the interruption of direct current circuits with the inductive load. Calculation ratio for operating capacitor discharge voltage and opening time at stated parameters of the interrupted circuit and thyristor commutator are obtained. Calculation results are experimentally proved.

UDC 621.313

S.I. Kachin, Yu.S. Borovikov, O.S. Kachin, V.Yu. Sablukov, E.N. Klyzhko

THE ANALYSIS OF COMMUTATING PROPERTIES OF THE ELECTRIC DRIVE ARMATURE COILS AT COMMUTATION COMPLETION STAGE

The paper considers armature coils properties influencing the nature of commutation at its completion stage. Analytic dependences for the calculation of basic parameters of commutation intensity of commutator electric machines are introduced. It is shown that obtained expressions allow accurately forecasting commutation sections damping efficiency on the stage of spark discharge appearance under the brush and carrying out armature coils parameters selection that provide the increase of their commutation properties.

UDC 621.313

A.A. Osadchenko, A.B. Tsukublin, O.L. Rapoport

MONITORING OF BRUSH AND COLLECTOR ASSEMBLY OF THE PROPULSION ELECTRIC DRIVE DURING ITS OPERATION

Sparking capacity monitoring of brush and collector assembly of the propulsion electric drive during its operation is shown. Evaluation method for sparking value on the collector using the split brush by means of current registration taking place through separate insulated parts of the brush is developed. Device for sparking indication is constructed, which is installed on the brush and collector assembly of the propulsion electric drive and which allows registering the necessary transversal current value. For calibration of sparking indication device in its operation conditions video control channel is implemented. It provides visual evaluation of sparking force in a real time mode.

UDC 621.318.38

R.F. Bekishev, A.S. Glazyrin, P.A. Karagodin, S.V. Tsurpal, D.V. Shelestyuk

ANALYSIS OF EXPERIMENT RESEARCH ON VIBRATING ELECTROMAGNETIC ACTIVATOR CONTROL SYSTEM IN DIFFERENT MEDIUMS

The research of the vibrating electromagnetic activator control system in the open air and in the water was conducted. On the basis of the experimental analysis the most appropriate control method for the construction of a search adaptive system was chosen according to five criteria.

UDC 621.318.38

R.F. Bekishev, A.S. Glazyrin, S.V. Tsurpal

MATHEMATICAL MODEL OF THE AUTOMATIC CONTROL SYSTEM BY VIBRATING ELECTROMAGNETIC ACTIVATOR

The main requirements to the automatic control system by vibrating electromagnetic activator are introduced. The developed mathematical model of the control system is described. The expression for the recommended integration stage of differential equations is introduced.

UDC 621.313.062.4:621.314.632

Yu.N. Dementiev, A.A. Rasstrigin

DEPENDENT CONTROL OVER ROTOR CONVERTER IN AN HYPERSYNCHRONOUS CASCADE

The scheme of hypersynchronous cascade with an intermediate link of DC and one of the most common and reliable ways for dependent control of rotor converter at the rotor flux are considered. The equations that explain the control principle are introduced. Basic expressions for the calculation of hypersynchronous cascade static data, as well as control and static mechanical characteristics are carried out.

UDC 68-83-52

N.V. Koyain, O.P. Maltseva, L.S. Udut

THE CONTOUR LOOP OF ELECTRIC DRIVE SYSTEM OPTIMIZATION BY STANDARD METHODS

Generalization of standard methods of the contour loop of the electric drive system optimization is conducted. The quality indices under the treatment of control and perturbation influences are classified and completed. The modular and linear optimums of contour loop setting are considered.

UDC 68-83-52

N.V. Koyain, O.P. Maltseva, L.S. Udut

THE CONTOUR LOOP OF THE ELECTRIC DRIVE SYSTEM OPTIMIZATION BY SYMMETRIC OPTIMUM

The symmetric optimum of contour loop of the electric drive system setup is considered. The qualitative data obtained under the treatment of control and perturbation influences are classified.

The influence analysis of the number and fast time constants correlation in direct actuating path on the optimized contour operation data is performed.

UDC 621.313.333

A.G. Garganeev, A.T. Yarovoy, L.Yu. Babushkina, A.S. Karakulov, S.V. Langraf, A.A. Rasstrigin

ENERGY-SAVING VECTOR CONTROL MODIFICATION OF INDUCTION MOTORS

The modified vector control system that allows decreasing a heat waste in the induction motor that operates under slowly changeable load moments is considered. On the basis of the motor equation system that is presented in the form of polar coordinates, the analytical dependence of variable conditions is obtained. The structural scheme and the simulation model of the induction motor vector control system at optimal specified flux are developed.

UDC 621.313.333:658.562

O.O. Muravleva

POWER EFFECTIVE INDUCTION MOTORS FOR A CONTROLLED-VELOCITY ELECTRIC DRIVE

The possibility of power effective induction motors production without cross section geometry changing for controlled-velocity electric drives which provides energy saving is considered. Energy saving methods due to the application of the increased power induction motors in pump units of housing and communal services is determined. Carried out economic calculations and the analysis results show economic effectiveness of the increased induction motors application in spite of the induction motor cost increase.

UDC 621.313.333:536.24

D.M. Glukhov, O.O. Muravleva

MULTIPHASE INDUCTION MOTORS SIMULATION AT EMERGENCY OPERATION MODES

Mathematical model of multiphase induction motor thermal processes is proposed. This model allows calculating temperature excess of the motor under phase failure. Model adequacy is experimentally proved.

UDC 62-83-523

G.I. Odnokopylov, I.G. Odnokopylov

SURVIVABILITY INCREASE OF VARIABLE-FREQUENCY ASYNCHRONOUS ELECTRIC DRIVE

Construction principals of three-phase variable-frequency asynchronous drive are considered. The work of this drive is organized in the way that if one three phases fails, the work still can be carried out within two-phase regime due to reconstruction algorithm activation within the microcontroller. It should be taken into consideration that circular rotating field remains to be the same. Simulation data elaborated for emergency situation of the type "phase disconnection" is shown. The results of the comparative analysis carried out to state the fact that asynchronous engine works within both two-phase and three-phase modes are shown. Besides, limits set for application of two-phase emergency mode along with the efficiency reconstruction algorithm are defined.

UDC 621.313

V.S. Baklin, A.S. Gimpels

MATHEMATICAL MODEL OF FREQUENCY-REGULATED ASYNCHRONOUS ENGINE

Within the programming environment Delphi the mathematical model of frequency-regulated asynchronous engine was developed and implemented. The influence of iron saturation of magnetic circuit on engine's parameters is taken into consideration. Loading moment is either active or reactive. Compensation of voltage drop on stator frame active resistance is foreseen. Mechanical characteristic of deceleration device is taken into consideration. Mathematical model makes it possible to obtain asynchronous engine's characteristics when it operates on frequency converter. It can be also used when designing frequency-regulated asynchronous engine.

UDC 621.313

E.V. Beierlein, O.L. Rapoport, A.B. Tsukublin

TESTING OF ASYNCHRONOUS MACHINES BY LOADING-BACK METHOD

Loading-back scheme elaborated for asynchronous engine system tests - asynchronous generator is introduced. The scheme provided allows to save electrical energy in the course of asynchronous machines testing in conditions of locomotive depot. It can also be used for post-maintenance of asynchronous machines tests in conditions of locomotive depot.

UDC 621.313

V.V. Scherbatov, O.L. Rapoport, A.B. Tsukublin

MODELING OF DRIVE MOTOR THERMAL STATE TO FORECAST THE RECOURSE

Thermal mathematical model issued to determine steady-state temperature of the whole drive motor volume is elaborated. This model can be used to forecast the recourse of insulation thermal condition.

UDC 621.313

O.P. Muravlev, A.I. Verkhoturov, V.V. Golemgrein

DYNAMICAL CHARACTERISTICS OF SYNCHRONOUS HYBRID ELECTRIC MOTOR

Mathematical modeling of transient electromechanic processes is carried out. The influence of engine's parameters on dynamical characteristics is evaluated. The recommendations about asynchronous hybrid engines development and design, which possess high dynamical stability, are given.

UDC 681.5:622.244

S.V. Leonov, O.P. Muravlev, A.G. Karankevich

EXPERIENCE OF DEVELOPMENT OF HERMETICAL ELECTRICAL MACHINES POWER S OURCES OF DIRECTIONAL DEVICE

Data concerning development of electrical machines power sources of downhole device applied for deviating hole and horizontal hole drilling for oil and gas are shown. Some devices, which allow to increase failure-free operation time of downhole generator were offered. It becomes possible due to hermetical elements of electrical machine magnetic system.

UDC 621.314.5

A.G. Garganeev

APPLICATION OF CONTINUITY OF SERVICE SYSTEM IN URGENT MEDICINE

The peculiarities of elaboration of uninterrupted power system of acute medical departments on the basis of voltage changer are considered. Both functional schemes of uninterrupted power system and oscillograms of transitional processes of output voltage, when the system works for paralleled dissimilar loads are shown.

UDC 621.313.048

A.N. Dudkin, V.S. Kim, S.S. Maryin

RESEARCH OF INTERNAL MECHANICAL STRESS IN FILLING AND DIPPING VARNISH

The analysis of influence of various factors (backing and aging conditions) on the level of inner mechanical stress in dipping (FL-98 and BT 987) and filling (UR-231) compositions is carried out. The results obtained show that in the process of lacquering backing in compliance with technical conditions of inner mechanical stress value is small and changes slightly at temperature aging.

UDC 621.313.017.7

V.A. Zhadan, S.V. Govyazova

THERMAL CALCULATION FOR TOTALLY-ENCLOSED ELECTRICAL MACHINES WITH NATURAL COOLING SYSTEM AND FINNED BODY

Thermal calculation method for totally-enclosed asynchronous engines with natural cooling system and finned body is shown. It is based on tests results for engines of APM type. Application of thermal calculation method at the design stage of new 2AP type roller engines is proved to be possible. Both comparison results of engines pilot sample thermal tests of type 2AP and calculations made on the basis of method offered are shown.

UDC 621.001.5;621.311;621.316.9;621.313

K.I. Zapodovnikov, D.A. Savin, Yu.N. Tanovitski

DIGITAL THREE-PHASE DYNAMIC MODEL OF ELECTRIC SYSTEM WITH THERMAL POWER PLANT

Power supply system model, which works within the real time and, which has an unlimited modeling interval is shown. This model is developed to conduct research in the field of fast electromagnetic and long electromechanical processes. This model consists of two thermal power plants with synchronous generators, synchronous and asynchronous machine, source of unlimited capacity, block transformers, power transmission line, passive loading and switching block to simulate such damages as short circuit and breaking. It is shown that parameters of model coincide with synchronous machines passport characteristics. Expected work of block at starting, transitional, and stationary regimes is demonstrated. Model's potential such as tasks forming language and results visualization environment is described.

UDC 621.311.016.35.001.24

T.S. Gurin, G.Z. Markman, N.N. Kharlov

TURBOGENERATOR OPERATIONAL RELIABILITY BEING PART OF ENTERPRISE POWER-SUPPLY SYSTEM

Peculiarities of turbogenerator dynamical transition when it is part of enterprise power-supply system are studied. Generator loading values and duration of short circuit within different system's knots of inner and outer power supply of enterprise are defined. It is stated that simultaneous operation of enterprise sources remains to be stable.

UDC 621.316.9.01

R.A. Vainshtein, V.V. Shestakova, S.M. Yudin

ELECTRICAL PROCESSES PROBABILITY MODEL AT ARCHING FAULT IN ELECTRIC POWER LINE WITH CAPACITIVE CURRENT COMPENSATION

Mathematical model developed to examine electrical processes within the electric power line with capacitive current compensation at arching intermittent fault taking into consideration factors probabilistic nature, which define the process examined is offered. The results obtained with the help of developed model are used to fulfill the protection against ground faults in electric power lines.

UDC 621.311.161

A.V. Shmoilov

PROBABILISTIC ADJUSTMENT OF STEPPED CURRENT RELAY PROTECTION

Existent expertly managing and offered probabilistic approaches of guarantied channel adjustment of relay protection and automation are represented. This approach allows to evaluate technical effect value at each taken setting. Besides, it allows to provide optimal setting adjustment of each channel on the basis of maximal technical effect.

UDC 621.311.161

L.V. Krivova, A.V. Shmoilov

PRACTICAL CALCULATIONS IMPROVEMENT OF SCHEMES RELIABILITY OF ELECTRIC CONNECTION

The efficiency of practical calculations of reliability index of electric connection schemes by means of their conditions aggregations is shown. Due to this, both reliability index calculations of estimated objects as part of aggregated conditions and state indexes are not made. The results obtained can be used in the course of projecting and exploitation.

UDC 620.92.004.18

B.V. Lukutin, O.B. Lukutin, E.B. Shandarova

POWER-EFFICIENT GENERATION SYSTEMS OF ELECTRIC ENERGY FOR SELF-SUPPORTING WIND-DRIVEN ELECTRIC POWER STATION

New structural designs of electrical annex of self-supporting wind-driven electric power stations, which allow to increase energy generation and its utilization up to 30...40 % are described. It is offered to increase station power-efficiency with the help of accumulator battery number regulation and introducing adjustable valve ballast with thermal loadings to the structure of wind-driven electric power stations.

UDC 621.311.001

A.S. Gusev, S.V. Svechkarev, I.L. Plodistyi

FULLY-VARIABLE MATHEMATICAL MODEL OF ELECTRICAL POWER LINES

Basis and synthesis of mathematical model of electrical power lines, which allows to reproduce the whole range of both normal processes and fault within three-phase electrical power lines of different length, taking into consideration electromagnetic mutual influence of parallel chains and probable corona effect are considered.

UDC 621.311.001

A.S. Gusev, S.V. Svechkarev, I.L. Plodistyi

ADJUSTING MATHEMATICAL MODEL OF SYNCHRONOUS MACHINES EXCITATION SYSTEM

Synthesis results of adjusting excitation system mathematical model of synchronous machines are shown. This model allows to implement various excitation systems with different control modes. The results proving that this mathematical model was tested are shown.

UDC 621.311.001

A.S. Gusev, S.V. Svechkarev, I.L. Plodistyi

PRIME ENGINE MATHEMATICAL MODEL OF SYNCHRONOUS GENERATORS

Processing effect of prime engine mathematical model is considered. It allows to simulate all kinds and types of prime engines without any decomposition and with high reliability level. Besides, different regulating systems of boiler units and turbines are also considered in details. Approbation data and practical application of results are shown.

UDC 332.122

O.A. Surzhikova, I.E. Nikulina

TECHNICAL AND ECONOMICAL ASPECTS OF ENERGY SUPPLY FOR ISOLATED CONSUMERS

Energy supply problems of remote and underpopulated regions of Russia are revealed. The perspectives of unconventional renewable energy sources utilization in such regions are considered.

UDC 621.311:658.26

N.P. Sobina, A.V. Titarenko, Yu.V. Khruschev

BUSINESS PROCESSES OF ELECTRICITY DEMAND SCHEDULING OF INDUSTRIAL ENTERPRISE WITHIN MARKET ENVIRONMENT

Both analysis results of conditions and final aims and industrial enterprise operation on electric power wholesale market using business process scheme, as an approach for understanding and structuring of difficult problem are shown.

UDC 621.311

G.N. Klimov

ENERGY BALANCE ROLE IN ENERGY EFFICIENCY PROGRAM IN TOMSK REGION

The evaluation of energy efficiency indicators is carried out. The influence of structure planning is shown. Besides, the influence of consumption and energy recourses production on conditions and development of fuel and energy industry and social sphere of Tomsk region is shown.

UDC 371:351.851

N.M. Kosmynina

MANAGEMENT OF SCIENTIFIC AND RESEARCH WORK OF STUDENT OF TPU ELECTRICAL ENGINEERING DEPARTMENT

The paper considers organization and the most efficient management principles of scientific and research work of students of TPU Electrical Engineering Department, among which there is the development and keeping of documentation on the Research Work in compliance with the requirements of ISO 9001:2000; development of all stages of holding students activities; implementation of modern IT; use of various motivation techniques aimed at students involvement into the research activities as well as their scientific supervision.

UDC 316.6

Yu.S. Borovikov, Yu.V. Volkov, O.Yu. Dolmatov, T.A. Mochalina

PLANNING OF THE UNIVERSITY PERSONNEL RESERVE

The paper suggests methods of defining the most appropriate quantity of personnel reserve based on the model of forecast changes in personnel reserve. An approach allows planning and organizing work aimed at providing the university with highly-qualified personnel.

UDC 621.313(09)

R.F. Bekishev, A.B. Tsukublin

THE FOUNDER OF TOMSK SCIENTIFIC SCHOOL OF IMPULSE ELECTROMECHANICS (TO THE 85th ANNIVERSARY OF G.A. SIPAILOV)

On January 3, 2005, we celebrated the 85th anniversary of Gennady Antonovich Sipailov, doctor of technical sciences, honored professor of TPU, Honored worker of science and engineering of the Russian Federation, Honored worker of higher school of the Russian Federation, active member of the RF Academy of Electrotechnical Sciences. Among his major scientific interests were investigations of physical-technical basics of building autonomous electric machine-valve impulse transformers of the new generation and their application as energy sources. Gennady Antonovich is remembered as a great scientist, wise educator and a charming Person.

UDC 744

B.L. Stepanov

HISTORY AND DEVELOPMENT OF TPU DEPARTMENT OF PERSPECTIVE GEOMETRY AND GRAPHICS

The paper considers the emphasis Tomsk Technological Institute (Tomsk Polytechnic University) places on the teaching process of perspective geometry and graphics from the first days of its foundation. History and development of the Department of Perspective Geometry and Graphics is shown. The paper describes teachers who made their greatest contribution to the hard process of teaching students such sciences as perspective geometry and graphics, as well as modern methods of teaching.