

Table of Contents

Preface, Committees and Organizers

Chapter 1: Electrical Machines, Electrical Drives and Electromechanical Systems

Electromagnetic Induced Force Study in the Magnetoelectric Generator Winding A. Tatevosyan, A. Tatevosyan and V. Fokina	3
Research of Non-Sinusoidal Voltage in Frequency Converter of Medium Power Operation G.P. Kornilov, I.R. Abdulveleev and T.R. Khramshin	8
Concept of Designing Systems for Monitoring Technical State of Rolling Mill Electric Drives A.S. Evdokimov, V.R. Khramshin and S.A. Evdokimov	15
Induction Traction Motor Mathematical Model to Control Thermal State A.A. Goldovskaya, E.S. Dorokhina and A.B. Serov	21
Hybrid Synchronous Motor Magnetic Field Analysis E.E. Suvorkova, Y.N. Dementiev and L.K. Burulko	26
The Comparison of Methods of Testing Enameled Wire to Mechanical Stress A. Leonov and A. Supueva	33
Investigation of Non-Stationary Processes in a Nonlinear Inductor with the Massive Magnetic Core by Structured Modeling Methods L.A. Neyman, V.Y. Neyman and A.S. Shabanov	38
Building the Structure and the Neuroemulator Angular Velocity's Learning Algorithm Selection of the Electric Drive of TVR-IM Type L.E. Kozlova and E.V. Bolovin	44
Turn-to-Turn Short Circuit Diagnostic Improvement Method Based on ANN for Synchronous Generator Excitation Winding V.I. Polishchuk, E.O. Kuleshova and Y.Z. Vassilyeva	51
Mathematical Model of Synchronous Generator without Damper Windings which is Equipped with an Automatic Stabiliser Y.N. Isaev, V.A. Kolchanova and S.S. Tarasenko	56
Increase Adjustment Capacity Generators for Power Supply Systems with Distributed Generation S. Udalov, A. Achitaev and M. Yumanov	62
Electromagnetic Motor with an Active Teeth-Slot Zone for Vibration Technologies O. Rogova	67
Investigation of Synchronization Properties of PM Machines with Fractional Slot Concentrated Windings G.B. Vialcev and A.F. Shevchenko	73
Additional Torque in Multipole Permanent Magnet Machines Caused by Eccentricity A.F. Shevchenko and D.M. Toporkov	78
A Sensorless Initial Rotor Position Estimation for Permanent Magnet Synchronous Machines I.Y. Krasnov, S.V. Langraf and S.I. Chobanov	83
Developing a Highly Reliable Asynchronous Motor Development with an Asymmetric Magnetic Core for Special Operating Conditions B. Bakubaev, V. Denisenko and V. Nedzelskiy	90
Simulation Modelling of a Pulse Frequency-Phase Discriminator I.S. Bolgov, Y.N. Dementyev and V.A. Bolgova	95
Induction Motor Traction Drive with Slipping Protection A. Pugachev	101
An Analysis of the Main Factors on the Wear of Brushes for Brush-Type Motors and the Ways of Increasing their Lifetime O.S. Kachin, A.S. Karakulov and A.B. Serov	107

Respecting Life Cycle Management of Electrotechnical Equipment Based on Genetic Modeling Methods A. Petrochenkov	113
Asynchronous Motor Operation Ability Investigation with Numerical Simulation A.A. Shevchenko, V.V. Grechkin and Z.S. Temlyakova	122
Improving Energy Efficiency of the Variable Frequency Drive of the Forced-Draught Fan with the Two-Speed Asynchronous Motor E.A. Khramshina, A.S. Karandaev and R.R. Khramshin	128
Numerical Modeling of Dynamic Processes of the Reciprocating Reversible Electrical Machine I.V. Ivshin, A.M. Kopylov and A.R. Safin	134
Research of Highly Effective Magnetoelectric Disc Type Synchronous Motor A.G. Garganeev, S.V. Leonov and D.F. Fedorov	143
Diagnosis of Inverter Drives Faults A. Kislov, A. Kaidar and B. Shapkenov	147
Simulation of Voltage on Stator Winding Terminals of Induction Motor with Impaired Short-Circuit Winding of Rotor A. Novozhilov and A. Potapenko	155
Variable Frequency Control of Induction Motors for Emergency Demand Response D. Armeev, Y. Abramova and V. Luzhetsky	160
The Universal Mathematical Model of Excitation System of Synchronous Machines N. Ruban, Y. Borovikov and V. Sulaymanova	167
Research Characteristics of Aluminum Alloy Obtained by the Method of Rapid Crystallization in Electromagnetic Field M. Pervukhin and M. Kuchinskii	174

Chapter 2: Power Electronics

Itinerant Phase Converter with Improved Energy Performance M.M. Djaborov, S.V. Myatezh and N.I. Shchurov	183
Multilevel NPC Converters in Parallel Connection for Power Conditioning Systems M. Dybko, S. Brovanov and H.H. Lee	189
Stand-Alone Power Systems with IGBT Inverter V. Markovski, A. Kaidar and B. Shapkenov	197

Chapter 3: Engineering of Industrial Electricity Systems

Francis Turbine Modeling for Hydrounit on the Bases of the Doubly Fed Induction Machine R.K. Diyorov and M.V. Glazyrin	203
Analysis of Power Operational Properties Transformers with a Core of Amorphous Materials L.M. Inahodova, A.A. Kazantzev and R.E. Shaydullin	209
Subsynchronous Resonance in Independent Energo with Distributed Semiconductoring Load E.O. Orel, V.N. Anosov and V.M. Kaveshnikov	215
Analysing the Impact of Electrical Displacement and Leakage Currents in Transformer Insulation on Voltage Measurement Accuracy V. Lebedev and A. Yablokov	220
Population-Based Algorithms for Optimization of the Reactive Power Distribution and Selection of the Cable Cross-Section in the Power-Supply Systems V. Manusov, E. Tretyakova and P. Matrenin	230
On Methods of Investigation of Power Generator Differential Protection Behavior in Automatic Mode V. Glazirin, I. Litvinov and A. Osintsev	237
Equipment State Assessment System Based on Adaptive Neuro-Fuzzy Inference System (ANFIS) A. Khalyasmaa, A. Aminev and D. Bliznyuk	243

The Impact of Distributed Generation on Power Quality of the Electric Network A. Marchenko and A. Fishov	248
Improving of Energy Measurements Reliability Using Weighted and Normalized Residual Analysis E. Kochneva, A. Pazderin and A. Sukalo	255
Problem of Reliability, Verification of Electrical Power Systems Simulation and Ways of Solving it A. Gusev, A. Suvorov and A. Sulaymanov	261
Fixing Magnetically Operated Sealed Switches of Current Protections in Closed Electrical Pathways of Electrical Installations at 6-20 kV M. Kletsel and A. Berguzinov	267
Development of Calculation Methodology of Thermal Equivalent Circuit's Parameters for Predicting Temperature of High Voltage Cable Lines 110 - 500 kV E. Zaytsev	272
Efficient Ways and Means of Reliability Increase of Distribution Networks F. Byk and L. Kazakova	280
Phasor Measurements Application in Power Systems for Accelerated Power Flow Calculations in Emergency Control P. Bartolomey and S. Semenenko	286
Open Overhead Transmission Lines E. Shishkov, V. Goldstein and I. Krivihin	293
Peculiarity of Determination of Economic Current Density Values for 6 – 35 kV Power Lines under Modern Conditions I. Suvorova, V. Cherepanov and V. Basmanov	300
Investigation of Defect Formation Process in Transmission and Distribution Equipment E. Rychagova and V. Levin	305
Efficiency of Using Artificial Neural Network for Short-Term Load Forecasting S. Rodygina, V. Lyubchenko and A. Rodygin	312
Decision Support System Based on the Concept of Hybrid Simulation for Dispatching Personnel of Electric Power Systems M. Andreev, Y. Borovikov and A. Gusev	317
Technical Diagnostics of Electric Equipment with the Use of Fuzzy Logic Models V. Manusov and J. Ahyoev	324
Pre-Design Study for Construction of a Wind Power Station with the Capacity of 50 MW V. Galushchak, S. Khavronichev and T. Kopeikina	330

Chapter 4: Thermoenergetics Systems

Investigation of the Coal Char Conversion by Thermogravimetric Analysis G. Khudyakova, P. Osipov and A. Ryzhkov	339
Long-Term Experience of Running Operation Boilers Equipped with Furnace Working upon High-Temperature Circulating Fluidized Bed A. Lesnykh, S. Golovaty and D. Valovik	345
Combined Cycle Gas Turbine (CCGT) with Freon Steam Turbine A. Kuryanov, I. Mõik and O. Grigoryeva	351
Method for Selecting Quantity and Power of Diesel Generators Y. Sarsikev, B. Lukutin and R. Mustafina	359
High-Temperature Technologies of Electric Energy Production on Steam-Turbine Power Plants N. Rogalev, A. Rogalev and E. Oleynikova	364
Results of Mathematical Modeling to Study the Influence of Accounting the Process Moisture on Energy Indicators of Cogeneration Steam Turbines N. Tatarinova and D. Suvorov	370
Optimization of Pump-Throttling Substation of Heating Networks D.A. Makarov, V.P. Chernenkov and I.D. Likhachev	375
Grid Wind Power Plant with Compensation of Active and Reactive Power L. Payuk, O. Grechko and N. Voronina	379

Power Plants Process Control Improvement in Emergency A. Mikhaylenko and P. Shchinnikov	386
The Analysis of an Air Condenser's Performance in Russia's High Northern Climate A. Rylskiy, O. Borush and G. Pettersson	393

Chapter 5: Engineering Management in Energy

Assessment of the Impact of Sources of Funding on Project Successes Criteria of Energy Saving S. Chernov, J.A. Pacheco Soto and E. Kulack	403
Cross-Subsidization in Power Engineering Y. Dronova, K. Anikina and H. Harutyunyan	410
Mechanisms of Destruction by Alternate Current A. Myulbaer and Y. Tselebrovsky	416
Energy Efficiency of Investment Projects Public and Private Partnerships A. Tupikina, Y. Shablova and O. Arutynyan	422
Energy Service Contracts: Russian Practices E. Shablova, N. Gorodnova and A. Berezin	428
Impact Analysis of Excessive Fuel Consumption on Technical and Economic Performance of Coal-Fired Co-Generation Units A. Dvortsevov and I. Tikhonov	433
Assessment of Administrative Labor Organization in Electrical Engineering I. Mezhov, M. Kiseleva and A. Chuvaev	439
Optimal Control Mode of the Vakhsh Hydropower Reservoirs to Reduce Electricity Shortages in Tajikistan Y. Sekretarev, S.M. Sultonov and V. Shalnev	446

Chapter 6: Electrotechnologies in Electrometallurgy

Electrical Parameters of Induction System for Internal Cylindrical Surfaces being Heating A. Aliferov, S. Lupi, A. Meleshko and S. Rad'ko	453
Studies of Electromagnetic Stirrer Modes I.A. Uskov, E.L. Shvidkiy and V.E. Frizen	457
Optimization of Induction Heating Regarding Typical Quality Criteria: Problem Solution Based on 2D FEM Analysis Y. Pleshivtseva, B. Nacke and A. Popov	462
Analytical Analysis of Electromagnetic Processes in System "MHD Stirrer - Bath with Melt" V. Timofeev, M. Khatsayuk and A. Aliferov	468
Permanent Magnet Heater for Special Applications M. Forzan and F. Dughiero	476
The Study of the Thermal Processes in an Electrode Influenced by an Electric Arc O. Dutova, P. Domarov and T. Oschepkova	482
Developing and Testing of Improved Control System of Electric Arc Furnace Electrical Regimes A. Nikolaev, G. Kornilov and E. Povelitsa	488
Investigation of Electrical Parameters of Interleaved Conductors' Packages in High Power Electrotechnological Installations L.P. Goreva, D.S. Vlasov and M.S. Shvetsova	495
Mathematical Simulation of Acoustic Characteristics of Super-Power Arc Discharges in Electric Steel Furnaces R. Bikeev, V. Serikov and V. Cherednichenko	499
Design Optimization of Induction Heater in Planetary Reactors for Semiconductor Industry A. Nikanorov, B. Nacke and T. Zedler	505
Calculation of the Melt Surface Shape in Different Induction Crucible Furnaces A. Kuvaldin, M.A. Fedin and A. Kislov	511

Chapter 7: Mechatronics

Eddy Current Impact Estimation in Designing Vibroisolator with 3D Electromagnetic Stiffness Compensator E.G. Gurova	519
Characteristics Description of Electromagnetic Stiffness Compensator E.G. Gurova, M.G. Gurov and A.A. Sergeev	524
Switching Converters Development Systems for Electrostart Diesel Engine Start S.V. Makarov, A.V. Myatez and V.D. Suslyakov	529
Application of Energy Storage Devices at the Road City Transit Rolling Stock N.I. Schurov, A.A. Shtang and M.V. Yaroslavtsev	536
Ways of Decreasing Fuel Consumption in Vehicles V.V. Biryukov, M.V. Kalugin and A.O. Nevolina	542
Mechanical Oscillations Simulation of an Adaptive Flexible Mirror F. Kanev, N. Makenova and R. Nesterov	546

Chapter 8: Researching and Designing in Mechanical Engineering

Improved Cleaning of the Engine Cylinder from the Exhaust Gas Using the Active Ejection in the Exhaust Tract L. Plotnikov, B. Zhilkin and Y. Brodov	553
Energy-Saving Potential from Use of Heat-Reflective Screens with Solar Battery in Windows for Power Supply Systems of Buildings in Different Regions of Russia and France N. Smirnov, V. Tyutikov and B. Flament	559
Experimental Study on Electroplastic Effect in AISI 316L Austenitic Stainless Steel M. Breda, F. Michieletto, E. Beridze and C. Gennari	568
Enhancing Resistance of Cables to Hydrocarbons T. Matery and V. Kim	572
Improvement of Electrical Insulating and Anti-Wear Properties of Composites Used in Telemetry Systems A.R. Gallyamov, I.D. Ibatullin and A.Y. Murzin	578
Iterative Approach in Design and Development of Vertical Axis Wind Turbines E. Solomin, I. Kirpichnikova and A. Martyanov	582
Hardening of Aluminum Alloys with Nano-Dispersed Inclusions during the Implementation of Energy-Saving Process of Self-Propagating High-Temperature Synthesis in Aluminum Melt A. Ermoshkin, I. Timoshkin and A. Lutz	590
Synthesis of MAX-Phase of Titanium Silicon Carbide (Ti_3SiC_2) as a Promising Electric Contact Material by SHS Pressing Method D.M. Davydov, A.P. Amosov and E.I. Latukhin	596
Optical Recording of Bubble Dissolution of Diagnostic Gases in Electrical Insulating Liquids A. Ridel and A. Bychkov	602
Transport System of Viaduct Type S.V. Myatezh, I.E. Zhizhkina and D.S. Dubinina	606
Probability of the Spectrums Overlap in Case of Carrier Frequency Random Shift in Asynchronous Radio System without Feedback P.I. Puzyrev, S.A. Zavyalov and A.V. Kosykh	610
Improving the Operating Efficiency of Wells with Electrical Submersible Centrifugal Pump in the Fields with Hard to Recover Reserves A.V. Maksyutin, D.S. Tananykhin and D.A. Sultanova	617
<i>In Situ</i> Studies of Molecular Self-Assembling during the Formation of Ion-Conducting Membranes for Fuel Cells K.N. Grafksaia, D.V. Anokhin, J.J. Hernandez Rueda and D.A. Ivanov	623
Influence of the Vehicles' Shape and Length on its Pressure Drag Value Investigation T. Ogneva, A. Kulekina and E. Langeman	629

Determination of Internal Heat Power during the Induction Heating Based on Solution of Linear Inverse Heat Conduction Problem	
A. Diligenskaya and A. Mandra	635
Thermal Annealing Effect on Active Layer Structure in All-Polymer Organic Solar Cells	
D.V. Anokhin, K.L. Gerasimov, A. Kiriya and D.A. Ivanov	640
Metallurgy and Ancient Coins: A Multidisciplinary Research	
I. Calliari, M. Breda and C. Canovaro	645