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The Journal «Vestnik of Ivanovo State Power Engineering University» is included in the List of Leading Reviewed Scientific Journals and Publications, which are approved by the State Commission for Academic Degrees and Titles for publishing the main scientific results of the dissertations on the candidate and doctoral degrees.

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HEAT AND POWER ENGINEERING

UDK 621.311.22

CALCULATION RESEARCH OF HRSG E-50-0,7-250 CHARACTERISTICS WHILE VARYING DUTIES WITH GAS TURBINE PLANT – 6P

A.V. MOSHKARIN, Doctor of Engineering, B.L. SHELYGIN, Candidate of Engineering, T.A. ZHAMLIKHANOV, Post Graduate Student

The authors give the analysis of operating ability of HRSG E-50-0,7-250 type while varying duties based on the calculation research. The authors consider features and characteristics of boiler's heating surfaces operation. The most economical operating conditions are revealed.

Keywords: HRSG, CCGT, GT (gas turbine), an operating mode, combustion heat of equivalent fuel, heat recovery, natural gas.

UDK 621.311.22

GTE-110 OPERATING CHARACTERISTICS FOR CCGT-325 MW POWER UNIT

A.V. MOSHKARIN, Doctor of Engineering, B.L. SHELYGIN, Candidate of Engineering, T.A. ZHAMLIKHANOV, Post Graduate Student

The GTE-110 static characteristics are developed according to VTI data research. Functional dependences of fuel consumptions and exhaust gases, efficiency coefficient of GTU, temperature and excess air coefficient after GTU from its electric power and outdoor temperature are determined. Operating range of GTE-110 electric loads is defined.

Keywords: gas turbo unit (gas turbine), outdoor temperature, excess air coefficient, efficiency coefficient, electric power, variable operating mode.

UDK 621.321

EDUCATIONAL AND LABORATORY PROGRAM SYSTEM ON OPTIMIZATING OPERATING MODES OF HEATING TURBINE UNITS

G.V. LEDUKHOVSKY, A.A. POSPELOV, Candidates of Engineering, A.A. BORISOV, Post Graduate Student

The authors give the description of the educational and laboratory program system on structural and operating optimization of heating turbine units with specified diagrams of thermal and electric loads.

Keywords: heat power station, load diagram, operating mode, fuel rate, structural and operating optimization of heat-and-power engineering systems.

UDK 621.321

SIMULATING PROBLEMS OF CARBON DIOXIDE CHEMICAL ADSORPTION AND DESORPTION PROCESSES IN HEAT MASS EXCHANGE EQUIPMENT OF POWER UNITS

A.V. MOSHKARIN, Doctor of Engineering, V.N. VINOGRADOV, G.V. LEDUHOVSKY, Candidates of Engineering, A.A. KOROTKOV, Engineer

The authors formulate the problems of mathematical modeling and researches of physical and chemical mechanisms of carbon dioxide chemical adsorption and desorption processes in heat mass exchange equipment of power units.

Keywords: deaerator, oxygen desorption, carbon dioxide desorption, deaeration process simulation, jet compartment, bubbler.

UDK 621.184

PERSPECTIVITY OF HYDROGEN GAS ANALYZER FOR DIAGNOSTICS OF WATER CHEMICAL MODES OF THERMAL POWER PLANTS' BOILERS

V.N. VINOGRADOV, Candidate of Engineering, V.K. AWAN, Post Graduate Student

The authors determine the role of hydrogen gas analyzer in chemical-engineering monitoring system of thermal power plants chemical modes. The meaningful hydrogen gas sources in its boiler circuit and links between hydrogen gas concentration in water and steam with boiler's operating modes are given. The authors suggest the hydrogen gas applying examples for diagnostics of water chemical modes of thermal power plants including combine-cycle power plants and recommendations for increasing its information capability.

Keywords: thermal power, boilers, water-chemical mode, corrosion, hydrogen measurement.

UDK 536.24

MODELLING CYCLICALLY CONJUGATED HEAT EXCHANGE IN REGENERATIVE AIR HEATER

N.N. YELIN, Doctor of Engineering, M.Yu. OMETOVA, Candidate of Engineering, G.B. RYBKINA, Engineer

The author considers a heat exchange mathematical model in regenerative air heater with fixed brick nozzle based on differential equations system in partial derivatives with boundary conditions for convective and radiative heat exchange. The model allows to calculate unsteady temperature field of the nozzle and to define optimal operating conditions of the process.

Keywords: regenerator, heat exchanger, unsteady heat transfer.

UDK 699.865

ENERGY-EFFICIENT EFFECT OF APPLYING HEAT-REFLECTING SHIELDS FOR GREENHOUSE FARMING POWER SUPPLY

V.M. ZAKHAROV, Candidate of Engineering, N.N. SMIRNOV, Senior Teacher, V.I. ASHEULOV, Doctor of Biology, D.A. LAPATEEV, Student

The new energy-efficient constructions of the greenhouses with heat-reflecting shields are suggested. The authors give data of decreasing heat losses while applying screening constructions with regulated heat transfer resistance in greenhouses.

Keywords: heat-reflecting shield, greenhouse, regulated resistance of heat transfer, decreasing heat losses, ice crust.

UDK 620.93

INFLUENCE OF THERMAL AND PHYSICAL PROPERTIES OF SOLID HOUSEHOLD WASTES ON TEMPERATURE MODE OF THERMAL RECYCLING

O.I. GORINOV, V.A. GORBUNOV, O.B. KOLIBABA, Candidates of Engineering, O.V. SAMYSHINA, Engineer

The authors present the research results of humidity effect and mass fraction of the inorganic component of solid household wastes on temperature mode of thermal recycling when preliminary preparation and additional energy source for their thermal decomposition are not required. The authors determine humidity limits which are possible for thermal destruction of solid household wastes.

Keywords: solid household wastes, thermal recycling, temperature mode, humidity.

ELECTRICAL POWER ENGINEERING

UDK 621.316.1

RELIABILITY CALCULATIONS OF ELECTRICAL DISTRIBUTION NETWORKS WITH THE AUTOMATIC LOAD TRANSFER

V.K. SLYSHALOV, Doctor of Engineering, G.V. TCHEKAN, Post Graduate Student

The authors suggest a mathematical model for estimating the reliability of distribution stations with automatic load transfer and adjoining sites of the power grid.

Keywords: reliability, automatic load transfer, availability factor, probability of failure.

UDK 621.311: 621.331

SITUATION CONTROL OF MODES OF RAILWAY ELECTRIC SUPPLY SYSTEM BASED ON FUZZY CLUSTERIZATION METHODS

A.V. KRYUKOV, Doctor of Engineering, V.P. ZAKARYUKIN, Candidate of Engineering, N.A. ABRAMOV, Post Graduate Student

The article describes a method of situation control of the modes of traction power supply systems on railways based on a fuzzy clusterization process. 16 situations assigned can be evolved from a big array of modes based on the clusterization. A rational control strategy can be applied for each situation.

Keywords: railway electric supply systems, situation control, fuzzy clusterization.

UDK 316.621.925

ANALYZING PHASE-COMPARISON PROTECTION OPERATION WHEN A SHORT CIRCUIT OVERLAPS PREFault OPEN-PHASE NETWORK OPERATING MODE

S.E. BOBROV, Post Graduate Student

The author estimates the phase-comparison protection operation while combining both a short circuit and an open-phase operating mode. Separately, the author considers the combination of a breakage on the adjacent line and a three-phase fault on the protected line, as well as B and C phases breakage and one-phase short circuit in B phase on the protected line. The author presents the methods negating errors because of high-frequency communication between the subsets. The author gives fundamental principles of the algorithm, correcting defects of phase-comparison protection principle while combining both a short circuit and an open-phase operating mode.

Keywords: phase-comparison protection, open-phase operating mode, short circuit, errors, high-frequency transmission channel.

UDK 621.321.11

MATHEMATICAL MODELS OF OPTIMUM STRUCTURE OF OPERATIVE SERVICE OF ELECTRIC NETWORKS

A.P. VASILEV, candidate of science, I.I. BANDURIN, research staff

Mathematical models are shown allow to choose optimum structure of operative service of the enterprises of electric networks, and also allow to choose optimum places of placing of bases of service and automatics and telemechanics devices on substations by criterion of a minimum costs for system of operative service.

Keywords: operative service, an electric network, substation, automated mechanisms, telemechanics.

ELECTROMECHANICS

UDK 621.314

DIESEL-GENERATOR POWER PLANT WITH SHAFT FREQUENCY ROTATION

O.S. KHVATOV, Doctor of Engineering, A.B. DARYENKOV, Candidate of Engineering, I.M. TARASOV, Post Graduate Student

The article proves that efficient performance of diesel engine power plant is possible only at variable shaft frequency rotation. The authors describe a structure chart of diesel engine power plant at variable shaft frequency rotation based on synchronous generator.

Keywords: power plant, diesel-generator, synchronous generator, frequency converter.

UDK 537.24

INCREASING SURFACE CONDUCTANCE OF CONSTRUCTIONAL MATERIAL

T.Yu. STEPANOVA, Candidate of Engineering

The author researches into the influence of anti-static preparations on physical and mechanical properties of constructional material. The author proves that polyethylene glycol has the best antistatic effect.

Keywords: surface resistivity, antistatic agents, electrolyte, electrizability.

UDK 621.321

DEVELOPING EFFECTIVE TECHNOLOGY OF PREPARATION OF LUBRICATING FLUID FOR METAL WORKING

E.V. KISELEVA, Post Graduate Student

The author experimentally proves the efficiency of applying mechanoactivation and states that transition to disperse systems positively influences processing characteristics of lubricating fluid.

Keywords: mechanoactivation, dispersion, stability, wear characteristic, friction coefficient.

UDK (539.3+624.07):534.1

DIMENSIONED NONLINEAR VIBRATIONS OF ROD WITH TWO ANCHORAGES

A.I. MUNITSYN, Candidate of Engineering, L.N. KRAINOVA, Applicant, N.A. SABANEEV, Senior Teacher

The author presents an analytical solution of forced bending vibrations of a rod with two anchorages. The rod has close fundamental frequencies of forced vibrations in two mutually transverse plains due to close values of main axial torques of cross-section inertia. The authors consider geometrical nonlinearity, caused by length changes of the rod central line in its spatial motion. Rod vibrations are researched in the area of the main resonance.

Keywords: forced vibrations, fundamental frequencies, geometrical nonlinearity, main resonance.

AUTOMATION CONTROL SYSTEMS

UDK 621.34: 62-50

MICROPROCESSOR IMPLEMENTATION OF STATE AND LOAD OBSERVERS FOR ELECTROMECHANOTRONIC MODULES

A.R. KOLGANOV, Doctor of Engineering, S.K. LEBEDEV, N.E. GNEZDOV, Candidates of Engineering

The authors suggest a calculation method of ultimate realizable dynamics of observers during their realization in microprocessor control system which calculates in numbers with fixed point without overflowing of variables. Maximum values of pass bands are defined for observers of first and second order astatism. The description of experimental installation and software is given.

Keywords: electromechanotronic modules and systems, electric drive, state observer, microprocessor.

UDK 621.3:007; 621.3:001.891.57

PARAMETERS IDENTIFICATION OF ASYNCHRONOUS MACHINE IN ESTABLISHED MODES

A.M. VODOVOZOV, Candidate of Engineering, A.S. ELYUKOV, Student

A New algorithm of electric parameters identification of asynchronous motor, received on the basis of the analysis of machine mathematical model is offered at the established frequency of rotation.

Keywords: asynchronous electric drive, parametrical identification.

UDK 621.34: 62-50

RESEARCHING APPLICATION OF FUZZY CONTROLLERS IN TECHNOLOGICAL PROCESSES CONTROL SYSTEMS

M.S. KULENKO, Candidate of Engineering, S.V. BURENIN, Senior Teacher

The author considers questions of using the controllers based on fuzzy logic in automatic control systems of different configurations. The author presents the research results of fuzzy controllers systems. The efficiency of using fuzzy controllers is shown by the example of system integration of fuzzy regulation of pulling transported flexible material.

Key words: fuzzy logic, terms, fuzzification, proportional and floating controller.

UDK 623.41.418

AN OVERVIEW OF INTELLECTUAL CONTROL METHODS OF COMPLEX DYNAMIC SYSTEMS

P.M. POKLAD, Post Graduate Student

An overview of modern control methods on artificial intelligence basis is presented. Block diagrams of fuzzy-control and artificial neural networks are given. Advantages, disadvantages and features of intellectual control methods are described.

Keywords: artificial intellect, neural net, fuzzy control, perception, genetic algorithm.

ECONOMICS

UDK 621.039.003

FINANCING METHODOLOGY AS A COMPONENT OF SUCCESSFUL IMPLEMENTATION OF NPP CONSTRUCTION PROJECTS

T.V. IVANOV, Yu.V. CHERNYAKHOVSKAYA, Candidate of Economics

The authors consider and analyze different mechanisms of financing NPP construction projects which increase their investment attraction and competitiveness. The authors discuss such a mechanism of state and business interaction as Public Private Partnership.

Keywords: Nuclear Power Plants, investment, state allocations, stock capital, debt financing, internal rate of return, public private partnership, balance and non-recourse financing, Mankal consortium model.

UDK 331.101.262:51.003.12

SIMULATION ON PROJECT SUPERVISING AS SOLUTION OF NON-TYPICAL PROBLEMS OF HIGH INDETERMINACY

M.A. SHASHENKOVA, Candidate of Economics, T.V. GVOZDEVA, Senior Teacher, A.A. RAZHEVA, Post Graduate Student

The article suggests a problem-oriented model of project supervising based on natural organization concept. Self-organization based on communicativity and intellectual level rates is regarded as the main mechanism of developing organization environment.

Keywords: intellectual potential, organizational potential, natural organization, self-organizing system, project-oriented technology.

UDK 316.334.52

SOCIOLOGICAL MONITORING OF EVERYDAY-LIFE CORRUPTION IN IVANOVO REGION

I.S. KUPRIYANOV, Post Graduate Student

The author analyzes the results of sociological research of everyday-life corruption market in Ivanovo region, carried out during 2008–2009. Quantitative characteristics of bribery both in the region, and in different social-economic institutions are presented. The author pays special attention to dynamics of corruption practice and estimates of annual volume of corruption services in the region.

Keywords: everyday corruption, bribe, corruption scope, corruption risk, corruption market volume.