

Summaries

UDC 621.039.517

**Prozorova I.V., Ganovichev D.I., Kirichek E.A.
VALIDATION OF THERMAL AND PHYSICAL
CHARACTERISTICS OF THE REACTOR IVG.1M AT ACTIVE
ZONE CONVERSION INTO LOW-ENRICHED FUEL**

The article considers the thermo-hydraulic conditions of conversion active zone operation in the reactor IVG.1M. The article introduces the results of estimation of the main thermal and physical and hydraulic parameters of the active zone. The conclusion is made that the thermal state of the reactor IVG.1M with high- and low-enriched uranium content does not considerably depend on fuel enrichment at the same design features of fuel assemblies.

UDC 662.933.12

**Chernetskaya N.S., Minakov A.V.,
Brikman I.A., Chernetskiy M.Yu.
THE DESIGN STUDY OF THE PROCESSES
OF AERODYNAMICS, HEAT-AND-MASS TRANSFER,
COMBUSTION AND FORMATION OF NITROGEN OXIDES
IN DOUBLE-VORTEX FURNACE IN THE BOILER BKZ-640
WITH BLANK BLAST**

Based on the methods of computational fluid dynamics the authors have carried out the design studies of double-vortex furnace in the boiler BKZ-640 with blank blast. The influence of various operation measures in the furnace on the efficiency of fuel combustion, slagging conditions of water-wall surfaces and nitrogen oxides emission was estimated; the data on the integral and stationary distributions of temperature and thermal flows in the furnace were obtained.

UDC 536.2:51-74

**Polovnikov V.Yu., Khabibulin A.M.
THE FEATURES OF HEAT AND MASS TRANSFER
IN MOISTURE-RESISTING THERMAL INSULATION
OF THE RESERVOIRS FOR STORING CRYOGENIC LIQUIDS**

The article introduces the results of mathematical modeling of heat and mass transfer in the wallings of the reservoir for storing cryogenic liquids and the numerical analysis of cold losses of the given object considering insulation frost penetration, presence of moisture migration to the phase transition front and moisture condensation on the outer interaction loop. The authors have determined the ratios of heat input enlargement in the system considered owing to moistening, frost penetration and presence of phase transfers in the structures and on the surface of insulation layer.

UDC 536.2:532/533; 532.516

**Kraynov A.V.
MATHEMATICAL MODELING OF OPEN-TYPE CAVITY
DAMAGE AT INTERACTION WITH VISCOUS FLUID
AT OUTER CONTOUR COOLING**

The author has carried out the numerical study of conjugate heat transfer and hydrodynamics at viscous fluid movement in the open rectangular cavity considering its damaging. The viscous fluid flow pattern and temperature fields for solid and liquid phases were obtained. The influence of dynamic parameters and geometric characteristics on formation of contours of the crater produced was studied.

UDC 536.46

**Vysokomornaya O.V., Markov A.O., Nazarov M.N.,
Strizhak P.A., Yanov S.R.
THE NUMERICAL STUDY OF THE INFLUENCE
OF WATER SPRAY CONDITIONS ON TEMPERATURE
IN THE TRACE OF «WATER TOOL»**

Using several models of «water tools» of small size the authors have carried out the numerical study of macroscopic laws of drops monodispersed ensemble evaporation in water mist at its penetration through high-temperature combustion products. The dependences of integral characteristics of heat and mass transfer on the ratio of evaporation areas and the areas occupied by «water tool» were determined. Water spray conditions for the efficient temperature decrease in the combustion zone were defined.

UDC 621.18

**Anufriev I.S., Kuznetsov G.V., Shadrin E.Yu.,
Sharypov O.V., Anikin Yu.A., Dvoynishnikov S.V.,
Kulikov D.V., Rakhmanov V.V.
THE STUDY OF FLOW STRUCTURE IN A NEW
CONSTRUCTION OF VORTEX FURNACE
BY THE PARTICLE IMAGE VELOCIMETRY**

Using the particle image velocimetry the authors have studied the structure of isothermal swirl flow in the vortex furnace model in a new construction with horizontal axis of rotation and distributed tangential inlet air-fuel sprays. The average characteristics of the velocity field in some sections were measured. The authors have analyzed the feature of internal aerodynamics of the new construction of steam generator vortex furnace at different operating conditions.

UDC 620.9.001.5

**Fomichev A.S., Koretskiy D.A., Zavorin A.S.
PREDICTING COAL ASH DEPOSITS IN FURNACES
OF POWER-GENERATING BOILERS
ON THE BASES OF NUMERICAL MODELING**

The article introduces the results of investigations of wall slagging in the furnace of power-generating boiler P-67 operating on berezovsk coal of Kansk-Achinsk basin applying software product of numerical mathematical modeling «ANSYS Fluent». In the course of work the authors have obtained the important data for further improvement of boiler plant slagging model.

UDC 621.181.2.016:662.951.2

**Dolgov S.V., Zavorin A.S., Dolgikh A.Yu., Subbotin A.N.
TESTS OF BURNER DEVICE OF FLAMELESS COMBUSTION
AND INFRA-RED RADIATION**

The authors have developed the long-range construction of burner device of flameless combustion and infra-red radiation with porous filler for burning explosive gases. The article introduces the description of bench for burner device testing and the results of the latter. The obtained experimental data indicate the device operation capacity at combustion of fuel gases and liquid volatile fuels.

UDC 621.18

**Khaustov S.A., Zavorin A.S., Fisenko R.N.
NUMERICAL STUDY OF THE PROCESSES IN FIRE-TUBE
COMBUSTION CHAMBER WITH A REVERSIBLE TORCH**

The article demonstrates the use of application software package ANSYS Fluent 12.1.4 for numerical simulation of natural gas turbulent combustion in the reversible torch of fire-tube boiler in modes with vortex and forward feeder of air-fuel mixture. The authors have obtained the design fields of average velocities for the versions with different twist parameters, temperatures and components concentrations; they determined torch structure and heat release peak position. The reliability of the mathematical model is proved by tests in situ.

UDC 621.528

**Duraev N.N., Obukhov S.G., Plotnikov I.A.
SIMULATION MODEL OF DIESEL ENGINE
FOR INVESTIGATING ITS OPERATING CHARACTERISTICS
ON VARIABLE SPEED**

The article introduces a simple simulation model of diesel engine designed by the results of its pilot tests. The model is implemented in software environment MatLab Simulink and supports the adequate display of diesel engine operating characteristics on a variable speed and may be used for searching and developing the efficient algorithms to control the operation conditions of variable speed diesel generator set.

UDC 621.181.018: 504.3.054

**Taylasheva T.S., Krasilnikova L.G., Vorontsova E.S.
ESTIMATION OF BOILER HOUSES NOXIOUS EMISSIONS
INTO ATMOSPHERE IN TOMSK REGION**

The article introduces the results of estimation of boiler houses noxious emissions into atmosphere in Tomsk region. It is shown that maximum permissible concentration of noxious emission has not been exceeded.

UDC 628.928

**Korzhneva T.G., Ushakov V.Ya., Ovcharov A.T.
THE ANALYSIS OF ROOM HEAT LOSSES THROUGH THE
DAYLIGHTING SYSTEMS**

The paper is devoted to the analysis of room heat losses through translucent wallings formed by side light openings and hollow tubular light pipes for top light (daylighting combined system). The final target of the authors' researches is to develop the technique for calculating and selecting the optimal (in energy consumption and light comfort) parameters of daylight and lamplight systems. The authors focused on heat losses estimation and the efficiency of light transmittance by the combined lightning elements.

UDC 536.24

**Yukhnov V.E., Kraynov A.V.
THE ANALYSIS OF HEAT TRANSFER
IN ELECTROMAGNET ACTIVE ELEMENT**

The article describes the approximate method of determining heat loss in flat active element with finite size at symmetric cooling conditions. Heat loss characteristic is defined by Biot number. Based on finite-difference method the authors have studied unsteady thermal state in laminated core stack of magnetic circuit with uniformly distributed heat sources. The paper introduces the results of numerical simulation of unsteady two-dimensional thermal conductivity process in cross section of electromagnet active element.

UDC 621.313.12

**Nosov G.V.
DETERMINATION OF RAILGUN PARAMETERS.
P. I. CALCULATION AT CONSTANT CURRENT DENSITY**

The formulas for calculating railgun parameters at constant average current density were obtained. The author have determined such parameters as average magnetic induction in space between railgun tires, inductance, force and mechanical tension in tires, resistance con-

sidering adiabatic heating of tires, body peak velocity and railgun length. Average current density, strength and tire temperature growth are the factors determining possibilities of railguns for body acceleration. Therefore it is necessary to apply high-strength materials with maximum high conductivity, for example beryllium bronze, for producing tires. The reliability of the formulas obtained is proved by satisfactory fit with the results of calculation carried out by the other techniques.

UDC 621.313.12

**Nosov G.V.
DETERMINATION OF RAILGUN PARAMETERS.
P. II. CALCULATION AT HARMONIC CURRENT**

The formulas for calculating railgun parameters at harmonic current and non-uniform current density were obtained. The author have determined such parameters as average magnetic induction in space between railgun tires, inductance, resistance, peak temperature of tire surface at their adiabatic heating as well as mechanical tension in tires. Considerable temperature growth on tire surface is the factor determining possibilities of railguns for body acceleration. It can result in their melting and single use of railgun. The reliability of the formulas obtained is proved by satisfactory fit with the computer modeling results when determining inductance and resistance of railguns.

UDC 621.374

**Kurets V.I.
STAGE CRUSHING OF SOLIDS BY ELECTRIC PULSE**

The author has proposed the method for determining a calibration hole dimension in ground electrodes at the intermediate stages of raw material reduction. The results of the experimental study prove the considerable decrease of energy expenditure when using the stage crushing.

UDC 621.311

**Rogov G.V.
INTEGRATED INCREASE OF POWER QUALITY
IN COMPLEX NETWORKS**

The paper considers the methods for increasing power quality in complex networks with multiple disturbing loads. Active power conditioners affecting directly the value, symmetry and harmonic composition of voltage was proposed to be used. The author has developed the algorithm for controlling active power conditioner. The article demonstrates the efficiency of active power conditioners by the example of power supply system of Baykal-Amur railroad.

UDC 621.311

**Zhukov O.A., Ushakov V.Ya.
EXPERTISE IN POWER ENGINEERING AND ELECTRICAL
ENGINEERING. THE ORIGIN OF ELECTRO-EXPERTOLOGY**

The notions «expertise» and «expertology» were defined; the aim and the area of expertise application were stated; expertises in power engineering and electro-engineering were classified by the main features. It was shown that the knowledge about electro-expertises should be ordered in the form of development of general theory of electro-expertises (electro-expertology) to increase the efficiency of this activity. Currently there are all required preconditions (necessities, methodological base etc.) for its development on the basis of expertise general theory. Genesis, conceptual bases, categories of electro-expertology are considered in the article as the intermediate stage on its developing. The novelty of the work is in application of expertology fundamental notions to electro-engineering for developing electro-expertology.

UDC 621.315.61

**Merkulov V.I., Karpitsky O.V.
THE INFLUENCE OF BONDING VARNISH FILLER
ON DISCHARGE FORMATION IN SOLID LAYERED
DIELECTRICS AT LONG-TERM EFFECT OF APPLIED STRESS**

The authors have studied the influence of bonding varnish filler on discharge formation in solid layered composite dielectrics in the

system of electrodes generating non-uniform electric field. It is ascertained that filler introduction into bonding varnish composition results in redistribution of electric field intensities in composition layers and conditions the change in discharge tension value and the character of discharge forming at the interface of the dielectric studied.

UDC 621.311.1.016

Borovikov V.S., Kharlov N.N., Akimzhanov T.B.
ON THE NECESSITY OF INCLUDING STRAY-LOAD CURRENT HARMONICS LOSSES INTO PROCESS LOSSES AT ELECTRIC ENERGY TRANSMISSION

It has been ascertained that there are stray-load higher harmonic component losses of active power and energy in power transmission lines of 110 kW under conditions of high current distortion. In many cases the stray-load losses form a part of main losses but they are not considered at calculation of power process losses. The authors have made a conclusion that the stray-load current harmonic component losses of active power and energy should be calculated for each concrete line on the basis of tool survey of duty parameters and confirmed as process losses.

UDC 621.315.3.61

Merkulov V.I., Kim I.V.
ESTIMATION OF PARTIAL DISCHARGE ROLE IN DISCHARGE FORMATION AT SOLID LAYERED DIELECTRIC INTERFACE AT LONG-TERM EFFECT OF THE APPLIED STRESS

The authors have studied the influence of partial discharges on discharge formation at interface of solid layered composite dielectrics on exposure time of the applied variable stress in the system of electrodes generating non-uniform electric field. There are three stages in discharge formation at the interface of the considered composite layered dielectrics depending on time of stress application. It was shown that the change in partial discharge frequency rate at electrical aging reflects the discharge formation dynamics at the interface.

UDC 621.311.1.016

Kharlov N.N., Akimzhanov T.B.
INSTRUMENTAL ESTIMATION OF OPERATING EFFICIENCY OF FILTER DEVICES IN POWER SUPPLY SYSTEMS AT MINING ENTERPRISES

The authors have studied the change of reactor active resistance when adjusting their inductance. It was ascertained that in the reactor there are the components depending on skin effect, hysteresis and eddy current besides ohmic resistance depending on turning number. The operating efficiency of a filter device was estimated based on the data obtained at their instrumental survey. The conclusion was made on the necessity of considering the change of the parameters indicated when designing and adjusting the filter device. It was shown that the operating efficiency of the filter device may be estimated effectively due to the daily monitoring of modes.

UDC 621.3.011.7

Sytnik A.A., Klyuchka K.N., Protasov S.Yu.
APPLICATION OF INTEGRAL DYNAMIC MODELS WHEN SOLVING THE PROBLEM OF IDENTIFYING THE PARAMETERS OF ELECTRICAL CIRCUITS

The paper demonstrates the possibility of identifying the electrical circuit parameters applying Volterra integral equations of the second order. It was assumed that application of integral dynamic models of electrical circuits allows in some cases obtaining more exact result in comparison with traditional methods based on differential equation application. It was shown that the technique proposed may be used effectively to solve the problems of electrical circuit parametric identification when measuring input and output signals against the background of high-frequency interference, including the noise ones.

UDC 621.314

Mishin V.N., Rulevskiy V.M., Yudintsev A.G.
POWER SYSTEMS OF ALTERNATING CURRENT REMOTE-CONTROLLED UNDERWATER VEHICLES WITH THE CAPACITY OVER 10 kW

The authors have examined the power-supply systems of alternating current remote-controlled underwater vehicles with the capacity over 10 kW which allow solving the problems of increasing power density of underwater unit and improving its dimensions and weight.

UDC 62-83-52

Doroshchenko I.V., Zakharenko V.S.
DYNAMICS OF INVARIANT TEST BENCH ON THE BASIS OF ASYNCHRONOUSLY-THYRISTOR CASCADE

Using functional, block diagrams and simulation model of a load part of test bench on the basis of asynchronously-thyristor cascade the synthesis of control system was carried out and transients were calculated. Transient quality factors were determined.

UDC 621.313.333

Aristov A.V., Voronina N.A.
ANALYSIS OF POSITIONAL ACCURACY OF TWO-PHASE ASYNCHRONOUS MOTOR IN THE DISCONTINUOUS MOTION MODE

The authors have proposed a design procedure for positional accuracy of asynchronous motor operating in the mode of discontinuous motion according to a maximum value of fractional coordinate error. A real law of motion has been detected for a moving element of actuating motor at a phase mode of excitation of discontinuous operating mode; the error components have been estimated by amplitude, frequency and phase. A functional diagram of a gearless electric drive of discontinuous motion is introduced. It allows increasing the coordinate accuracy due to power frequency compensation.

UDC 621.313.13:621.396.677

Klabukov R.P., Muravlev O.P.
THYRATRON MOTOR FOR FAST ACTING DRIVE OF THE RADAR EQUIPMENT

The task to study the factors influencing the fast acting of thyatron permanent magnet motor was set. The recommendations to reduce the electromechanical time constant were proposed. The dependences of inertia moment and rotor volume on selection of magnets with higher energy indicators were obtained. The paper introduces the results of analysis of stator core magnetic loss.

UDC 621.313.333.2

Kachin O.S., Kachin S.I.
SINGLE PHASE INDUCTION MOTOR WITH INCREASED STARTING TORQUE

The paper describes the construction of single phase induction motor with increased starting torque; its operating principles are considered. The authors have proposed the methods of modernization of single phase induction motors to decrease energy consumption. The article introduces the experimental mechanical characteristics of the motor in comparison with the one of standard model. The design values of energy efficiency indices are given for different design versions of single phase induction motors on the basis of the proposed construction.

UDC 621.313.8

Kokov E.G., Muravlev O.P.
ACTIVE END CONNECTIONS OF ARMATURE WINDING IN MAGNETO-ELECTRIC MOTOR

The authors have developed the mathematical model of magneto-electric motor using end connections of armature winding and have analyzed the obtained dependences determining thyatron motor behavior.

UDC 62-83-523

Odnokopylov G.I., Bukreev V.G., Bragin A.D.
PRINCIPLES OF SUPPORTING FAULT TOLERANCE
OF INDUCTION MOTOR DRIVE BASED
ON BACKUP COMPONENTS

The authors consider the principles of supporting fault tolerance of induction motor with frequency inverter and backup half-bridge when restoring power multiplier faults. The paper introduces the results of modeling the processes in motor drive with performance restoration algorithms when switching the inverter structure. The efficiency of the performance restoration algorithms is estimated when phase current of induction motor is on and off.

UDC 621.313.062.4:621.314.632

Dementiev Yu.N.
VALVE INVERTER OPTIMAL CONTROL
N VARIABLE-SPEED ELECTRICAL DRIVES

The article considers the issues of valve inverter optimal control realized by means of flux linkage in valve electric drive with synchronous motor and grid-controlled inverter as well as in above-synchronous wound-rotor slip recovery system. The possibility of providing the reliable operation of variable-speed drives with valve inverter at optimal choice of control parameters is shown; the recommendations on their selection are given.

UDC 621.313.333

Turgenev D.V., Dementiev Yu.N., Langraf S.V.
THE METHOD OF FLUX LINKAGE ADAPTIVE FORMATION
FOR ASYNCHRONOUS GEARLESS ELECTRIC DRIVE
OF ELEVATOR WINCH

The article presents a method of forming flux linkage for a low-speed induction motor: as a function of load torque on the motor shaft influencing the characteristics of asynchronous gearless electric drive of elevator winch. The research results are represented in the form of design characteristics. It was ascertained that the use of adaptive method of flux linkage formation for the low-speed induction motor provides energy savings in electric drive of elevator winch.

UDC 621.34

Arzhanov V.V., Shurygin Yu.A.
Shinyakov Yu.A., Arzhanov K.V.
MINIMIZING ELECTRIC DRIVES POWER CONSUMPTION
IN THE PHOTOVOLTAIC POWER INSTALLATION

The paper introduces the results of designing the automatic guidance system of photovoltaic power plant to the Sun with minimization of energy consumption electric hover.

UDC 62-83-523

Odnokopylov G.I.
FAULT-TOLERANT MULTIPHASE INDUCTION
MOTOR DRIVE WITH NON-SINUSOIDAL CURRENTS

The author has considered the principle of constructing multiphase induction motor drive which allows supporting fault tolerant control at multiple faults of frequency inverter and motor based on programmable non-sinusoidal currents with performance restoration due to activation of the performance restoration algorithms in microcontroller. The paper introduces the results of modeling for emergency of «phase loss» type for a case of three-phase motor with partial restoration of induction motor performance.

UDC 621.317.7.089.6

Baranov P.F., Borikov V.N.
LOCK-IN AMPLIFIERS WITH DIFFERENTIAL INPUT

The article describes the design principles of the lock-in amplifier with a differential input to measure the difference of large signals with high accuracy. Types of informative parameters for classification

of lock-in amplifier were selected. The errors when comparing two voltages are estimated. The characteristics of commercially available foreign and domestic lock-in amplifiers with a differential input are given.

UDC 621.312/313: 621.317.31

Bedareva E.V., Tsimbalist E.I., Muravyev S.V., Baranov P.F.
INFLUENCE OF METHODS OF POTENTIAL
TERMINAL CONNECTION ON DYNAMIC BEHAVIOR
OF COAXIAL SHUNTS

Factors affecting the amplitude and phase-frequency characteristics of shunts in coaxial constructions were investigated theoretically. Based on electromagnetic processes in a shunt the analytical expressions were used and the equivalent electrical models of coaxial shunt depending on the method of potential terminal connection and selected frequency range were obtained according to these expressions.

UDC 621.373.1

Rybin Yu.K.
SYNTHESIS OF STRUCTURES OF PULSE SIGNAL
GENERATORS BASED ON SYMMETRY
AND REFLECTION PRINCIPLES

The author considers the possibility of applying symmetry and reflection principles when analyzing and synthesizing pulse signal generators. It has been ascertained that it is better to apply the symmetry principle for synthesizing oscillating systems on the basis of four-pole elements; and the better way to use the reflection principle is the two-pole elements synthesis. It was shown that oscillating system synthesis by the symmetry principle is carried out by conversion of amplitude characteristics of four-pole circuit device. Oscillating system synthesis by the reflection principle is carried out by mirror reflection of amplitude characteristic of linear two-pole device conductivity at amplitude characteristic of conductivity of nonlinear one. The approach proposed is shown for synthesizing the oscillating systems of electric signal generators, however it may find application when analyzing any step cyclic processes.

UDC 621.313.323

Suvorkova E.E., Dementiev Yu.N., Burulko L.K.
CHARACTERISTICS OF A HYBRID SYNCHRONOUS MOTOR

The paper introduces the results of research of magnetic fields and magnetic induction distribution in the air gap of synchronous-jet and electromagnetic parts of synchronous hybrid motor. The results of the analysis of magnetic field influence on electromagnetic torque and torque-angle curve of a hybrid synchronous motor are given.

UDC 621.314:621.316.925

Vaynshteyn R.A., Kolomiets N.V., Yudin S.M.
ZERO SEQUENCE CURRENT TRANSFORMERS
FOR SENSITIVE GROUND FAULT PROTECTION

The reasons of unbalanced current increase in zero sequence current transformer covering bunch of cables with high operating current were determined. The authors have proposed the method and the device for detecting faults causing unbalanced current increase at the stage of production of zero sequence current transformer.

UDC 621.314:2

Isaev Yu.N., Elgina G.A., Lavrinovich A.V.
DETERMINATION OF TRANSFORMER WINDING WIRES
DEFORMATIONS BY SELF-MAGNETIC FIELD

The article considers the longitudinal and transverse deformations of transformer winding conductor caused by short-circuit current. The effective ratios which allow estimating the conductor extension and shift in the winding at known current are given. The authors introduce the computation of ponderomotive force distribution for winding conductors in the transformer with round and rectangular section.

UDC 621.398.725:621.317.727.1

**Zarevich A.I., Muravyov S.V., Bedareva E.V.,
Baranov P.F., Sarychev S.V.
APPARATUS AND SOFTWARE SYSTEM
FOR COMPUTER-AIDED TESTS
OF HIGH CURRENT TRANSFORMERS**

The paper considers the hardware and software system for computer-aided tests of high current transformers. The system includes: pulse current source, standard current transformer, recording and switching facilities as well as software for controlling system operating and measurement results processing. The system has been experimentally approved by the example of high current shunts; impedance frequency dependences have been determined for the latter. It is shown that the system application allows determining effectively the dynamic metrological behaviour of the components and element base of power electronics.

UDC 378.662.016(571.16):378.5

**Ushakov V.Ya., Dulzon A.A., Chubik P.S.
TPU IS ON THE WAY TO HIGH RESOURCE EFFICIENCY**

The strategy of turning Tomsk polytechnic university into the university of resource efficient technologies has been stated before. It includes: the improvement of training specialists of all levels in terms of resource efficiency, the researches and innovations in this field, the increase of efficiency of spending all types of resources by the univer-

sity [1]. After publishing [1, 2] the section «Resource efficiency of the department» in the base module «Resource efficiency» was filled in with concrete content. The educational module «Energy resource efficiency and energy security» was developed in relation to master training by the program «Energy saving and energy efficiency» and in electric power program as the whole. The authors have analyzed the content of subjects forming the module. The way travelled by TPU (TPI) power engineers to specialists training in the field of energy resource efficiency is shown. Two programs developed to solve the problem of TPU turning into the university of high resource efficiency were briefly characterized. These programs are the complex «Program of development of resource efficiency at National Research Tomsk polytechnic university» and one of its components – «Program of energy saving and increase of energy efficiency at Tomsk polytechnic university for 2013–2015 and to 2018».

UDC 621.182.002.(571.16)(092)

**Zavorin A.S., Taylasheva T.S.
THE 60th ANNIVERSARY OF EDUCATIONAL PROGRAM
«POWER ENGINEERING INDUSTRY» AT TOMSK
POLYTECHNIC UNIVERSITY**

The article demonstrates the stages of formation of engineering training in boiler- and reactor engineering field at Tomsk polytechnic university. The most significant achievements of graduates in the development of power engineering industry are shown.