**ENGINEERING SCIENCE**

**S. N. Litunov, N. V. Revzina, V. Yu. Yurkov**
The curved reflector design

The article describes design algorithm of the curved reflector that generate uneven direct irradiation compensate energy steam. Plane form construction lead to the spatial problem solution. CorelDraw application visualizes mathematical models.

**Keywords:** light, reflection device, reflector, intensity radiation.

**V. A. Korotkiy**
Geometric modeling of surface through its projection on four-dimensional space

The article describes how to build the surface passing through the closed loop, based on increasing the dimension of the containing space. For the constructive realization of the corresponding graphical algorithm is used hyper drawing by Naumovich. Examples of a surface passing through three or four loops formed flat and curved lines.

**Keywords**: descriptive geometry, hyperdrawing by Naumovich, generalized drawing Monge, smooth surface on a closed path, cylindroid, conoid.

**N. V. Revzina**
Line-segment reflector design

The article describes math modeling algorithms of the line-segment reflector that redistribute emanating from the source energy according to the production need. The line solution gives the opportunity to apply the obtained data to the revolution surfaces and elongated geometry constructions. The research results in the narrow-spectrum polymerization apparatus details production used in printing and other industries.

**Keywords**: reflection device, reflector, intensity radiation, polymerization.

**V. V. Shalay, V. I. Trushlyakov, V. Yu. Kudentsov**
Modeling the initial period of functioning of gasification system of liquid rocket fuel

The simulation of the interaction between the liquid residues of components of rocket fuel with a gas flow of the injected fluid for the initial period of operation of the gasification system is considered. There are defined modes of deformation and disintegration of a teardrop shaped liquid residual fuel in the volume of the fuel tank. It is based on the simulation results of the proposed hypothesis about the dynamic process of the initial stage of gasification. Presents the results of the numerical simulation.

**Keywords**: fuel tanks, modeling, two-phase flow, rocket fuel, gasification.

**V. V. Akimov, P. V. Petunin, I. A. Klishev, A. V. Kuxnetsov**
Analysis of structure and properties of the modified steel of P6M5

The structure and properties of experimental steels after various heat treatment regimes are analyzed. It is shown that resistance of cast stamped inserts of steel R6M5 has superior resistance than similar rolled steel R6M5.

**P. D. Balakin, Yu. A. Buryan**
Mathematical model of platform motion for determining the geometry of the masses and the vibration test of complex man-made objects

There are developed gamma differential equations for modeling motion of the platform test bed in special cases combinations of parametric properties of the platform and the external force field.

**P. D. Balakin, Yu. A. Buryan**
Development of control and simulation system of platform buildup test stand

There is proved design and traffic control systems stand to determine the inertial characteristics and vibration test of complex man-made objects. There is formulated a common approach to the compilation of differential equations of motion mounting platform with the object under force excitation of the general form and its private varieties.

**Yu. A. Buryan, V. N. Sorokin, M. V. Silkov, Yu. F. Galuza**
Hydraulic inertial transducer movement based on rubber-shell

The article discusses a mathematical model based on the selections and anti-vibration support, consisting of the parallel connection of the hydraulic shock absorber and rubber-metal inertial transducer movement based on rubber-shell.
It is shown that the choice of a commercially available shock absorber and adjust the characteristics of the hydraulic inertial transducer motion can provide the desired frequency settings antivibration mountings to improve vibration isolation power plants in the most dangerous frequency ranges.

**V. I. Kuznetsov, O. A. Sharikov**
Some suggestions to option differential equations of physical process of vortex effect confuser

There is given description of a new method of processing mechanical mixtures using physical process of a vortex effect confuser and variant of differential equations of motion of  mechanical mixture of particles in the process of the vortex effect confuser.

**V. I. Kuznetsov, O. A. Sharikov**
Method for integrated processing of mechanical mix using properties of vortex effect confuser

The article describes new method and laboratory model of new vortex separator in the form of confuser, using the properties of the vortex effect confuser intended for moving and processing mechanical mixtures. The method first creates conditions to effectively manage swirling flows, namely: to create, send, share, and straighten again to form swirling flows.

**Keywords**: vortex flows, the separator - confuser, swirl, tangential nozzle.

**A. Yu. Popov, D. S. Rechenko, A. G. Kisel, E. V. Leontyeva, M. G. Matveeva**
Formation of lubricant film of cooling liquid when processing heat resisting and titanic alloys

Titanic and heat resisting alloys are applied in aircraft industry, mainly in the plane engine, and the details executed from it are responsible and high-loaded. At production of details from these materials the cutting operations intended for quality receiving a surface have essential value. Thus, the quality of a surface has very high requirements and the tough admission. Important criterion of the indicator of quality of a surface is a roughness (microroughness) and accuracy of a form and the sizes which are formed when turning. At production of details from titanic and heat resisting alloys turning operations as they borrow up to 80% of whole technological process of production of details of the engine of the plane have essential value. The quality of the processed surface is of great importance as details of such class have high requirements to production accuracy.

**Keywords**: metal working, cutting processing, lubricant cooling liquid.

**D. I. Chernyavskiy, D. D. Chernyavskaya**
Determination of optimal parameters of formation of shock-rotational momentum when drilling concrete by hammer drill

The article is devoted to the problem of optimizing the parameters of drills for drilling rocks and building materials. The optimal ratio between the kinetic energy of translational and rotational motion of the drill when drilling concrete with the aim of reducing energy consumption for destruction of hard brittle material.

**Keywords**: hammer drill, tension of compression and expansion, kinetic energy, destruction of concrete.

**A. L. Akhtulov, L. N. Akhtulova, I. A. Gadzhiev, S. I. Podolyak**
Estimation of introduction of economical manufacture in organizations on repair and service of equipment

In the article the basic problems of effective introduction of tools of economical manufacture in the Russian industrial organizations are considered. The special attention is given to two aspects: to the complex technologies forming at working philosophy of economical manufacture, and the methodical approach of substantiation of financial results at introduction of tools of economical manufacture.

**Keywords**: economical manufacture, structural divisions of the organization, integrated and specific parameters, model of process, parameters of repair manufacture.

**O. A. Bondarev, V. P. Belousov**
Design geometry of working surface of coulter-ripper natural sand and clay soils

There is proposed settlement of coulter-ripper conditions of minimum resistance to its motion in the workflow. It takes into account the weight of the clipped layer of soil, soil structure, the internal friction of the soil layers and the dynamic friction on the working surface of the soil-coulter ripper. The working surface coulter-ripper constructor sets a guide curve and forming a line segment. This gets certain ruled surface. The share represented an array of solid and combines its base bit. Normal section of the rack is designed as a curvilinear trapezoid.

**Keywords**: Blade Ripper, geometry of working surface, strength calculation, minimizing the required engine power.


**V. A. Doroshenko, O. V. Zalogin**
Evaluation of reliability of the hydraulic drive installation LO-15A

The article assesses the reliability of the hydraulic actuator drive installation LO-15A according to the statistics of equipment failures at various modes of loading machine in real climatic and weather conditions of the equipment. Statistical data are obtained by observing work of three identical units for 4 years at the wood-processing complexes of the Urals.
The estimates produced by treatment of probabilistic and statistical methods information about the failure of individual elements of the hydraulic transmission as a whole on 13 indicators. There are established distribution laws denials of basic elements hydraulic installations, assessed failure rate, set the weakest links hydraulic transmission, reducing the overall reliability and the main sources of failure.

**Keywords**: reliability of hydraulic drive, woodworking equipment and machines, statistical data on failures.


**O. S. Lomova**
The analysis of impact of precession of axis of workpiece on accuracy in cylindrical grinding

The paper mathematically shows the relationship the relationship of errors execution and location of the cylindrical grinding machines technological bases with the accuracy of production details. The obtained dependences allow to predict the accuracy of processing in case of the error performance center hole details or misalignment of the centers of the machine and adjust the cutting conditions in order to stabilize the dynamic accuracy of the machine.

**Keywords**: accuracy, the process of grinding, machining accuracy, radial displacement axis, the deviation of the shape, the contact points.


**B. E. Lopaev, G. I. Suprunov, P. B. Grinberg**
The study of influence of heat treatment on wear resistance of coverings from self-fluxing mixture of hard alloys

Selection of heat treatment carried out to improve the wear resistance of the self-fluxing mixture of hard alloys deposited by air-plasma method on blade cultivator tines.

**Keywords**: heat treatment, structure, microhardness, air-plasma spraying and wear resistance, samples.

**A. A. Smolin, E. V. Vorobev**
The system of technical diagnostics

The article is devoted to the description of system of technical diagnostics of condition of objects of the mobile equipment capable to provide control of technical condition of a sample of mobile equipment and to issue recommendations about elimination of revealed malfunctions.

**Keywords**: technical diagnostics, system of technical diagnosing condition, functional task, malfunction.

**V. R. Edigarov, E. V. Litau, V. V. Maliy**
Combined electro mechanical treatment with dynamic force impact

The effect of combined treatment with electro-dynamic force influence on the performance properties of the surface layers of workpieces is studied. There is obtained peculiarity of the influence of additional impact in the EMO on the mechanical properties of the hardened layer.

**Keywords**: electro-treatment, dynamic force impact, shock loading, the surface layer.

**V. S. Evdokimov, V. A. Maksimenko, V. S. Nikolaev**
The experimental research of combined season-acting cooling device

The direction of our research is the solution for the problem of northern construction connected with change of soil condition - permafrost that leads to accidents. For permafrost there have used soil thermostabilizers. We carry out work which purpose is research of dynamics of temperature condition of soil round the thermostabilizer in the winter and summer mode of operation for a climatic zone of the South of Western Siberia. Temperature fields of soil round the thermostabilizer are experimentally obtained. Settlement results are confirmed with pilot research. For evaluation of the work of a vaporizing zone of the thermostabilizer entered the new parameter of volume heat content which considers in itself the volume of the frozen soil and temperature level. On the basis of the thermopile the sample for the perspective construction of the energy effective device for soil freezing is designed.

**Keywords**: termostabilization of soil, temperature fields, thermopile, frozen soil.

**K. S. Larionov, V. V. Merkulov**
Investigation of ultrasonic method of hidden defects and the influence of the deformation of the pipeline on the accuracy of diagnosis

The article considers both the diagnosis of latent defects in the pipeline in order to improve the quality of diagnosis of trunk oil pipelines, as well as the impact of the pipeline deformation on measurements.

**Keywords**: environmental safety, pipeline defects, flaw detector, piezoelectric transducer.

**E. A. Omelchenko, D. Yu. Fadeev**
To the question of the estimation of limits of forcing of diesels taking into account requirements to the extrass of harmful substances with working gases

For example, promising diesels family T, developed by LLC "CHTZ-Uraltrac" illustrated the technique estimates the impact of various factors on environmental parameters and limits forcing restricted to valid values for these parameters. Calculations showed that with the use of structural

measures aimed at reducing mechanical tension and toxicity of exhaust gases, is possible in principle to increase the level crossing promising diesels LTD "CHTZ-Uraltrac" family T 14.5 to 34 kW/l (when the rotational speed of 2400 min-1) and bring it to the level of the best foreign analogues.

**Keywords**: diesel engine, forcing, liter capacity, mechanical tension.

**M. S. Peshko, A. V. Fedotov**
The adaptive system of control of multi-looped controlled object with the use of the fuzzy logic

There is examined the adaptive system of automatic control of multi-looped controlled object with the block of adaptation built with the use of methods of fuzzy logic. There are examined setting of task, method of its solution and results of investigation of the system.

**Keywords**: intelligent control system, nonstationary object control, fuzzy regulator.

**N. E. Rakimjanov, A. H. Shamutdinov**
The use of the dynamic bench tests in predicting lifetime of hydraulic shock absorber

There is conducted a bench test on spectrum analyzer "Diana-2M" to detect shock pulses at the place of contact of piston rod and guide sleeve of hydraulic shock absorber with the aim forecast lifetime of hydraulic shock absorbers.

**Keywords**: hydraulic shock absorber, guide bushing, lateral dynamic response of stock, size of gap, lifetime, intensity of shock pulse.

**Yu. V. Titov, D. S. Rechenko, K. K. Gosina, R. U. Kamenov, A. Yu. Popov**
Classification of abrasive tool for high-speed method of soot

The article presents the urgency of obtaining ultrafine powders, various methods for their preparation, the advantage of mechanical methods, and in particular the use of pulverizer, as its image and principle of operation. System modifies feeder liquid nitrogen. Mechanical methods for producing a powder impossible without abrasive tools, their types, the application and a brief description as presented in the article. Proper application of the abrasive tool improves efficiency and reduces the size of the resulting powder.

**Keywords**: nanotechnology, ultrafine powder, mechanical method, grinding wheels, high-speed method, grinding heads.

**V. Yu. Usikov**
Justification of rational laws of the decentralized control of air pressure in tires

There is considered a promising way to improve the patency of multipurpose vehicles. The results of the experiment conducted by the calculated rolling wheel propulsion along a single deformable abutment surface in function of the load accommodation passage and air pressure in the tire are obtained. The recommendations on decentralization adjusting the air pressure in the tires and the results of experimental studies are given.

**Keywords**: cars, multi-purpose, cross-country, deformable bearing surface, paddle wheels, the control of air pressure in the tires.

**E. P. Tselykh, D. A. Polonyankin, E. A. Rogachev, V. I. Surikov**
Improvement of tribological properties of rubber through surface modification of refractory metals

The paper analyses the influence of surface modification of rubber refractory metals: molybdenum, tungsten and tantalum for abrasion and friction on metal. It is shown that for a given surface spraying technology is the OCM film. The improvement of tribotechnical and other performance properties of rubber.

**Keywords**: rubber, refractory metals, nanostructured coatings, friction, coefficient of friction, the temperature of the substrate.

**I. A. Sysuev, I. V. Prud, E. A. Derzhavina**
The question about development of universal test-object to determine saturation of Russian-language text set

The article considers the program-instrumental method of determining the saturation of a text set of printed and electronic publications on parameter of brightness (0-255) using instrumentation program for creating and processing bitmap graphics Photoshop. The possibility of modernization of the method and question of development of appropriate test-object is considered which provide the universalization of its use relative to Russian texts.

**Keywords**: text set, saturation of text set, program-instrumental method of determining the saturation of the text set of print and electronic publishing, universal test-object.

**I. A. Sysuev, I. V. Prud, E. A. Derzhavina, O. E. Serduk, V. V. Skitchenko**
The effect of paper color on saturation of text and contrast of graphic image of pages of printed publications

The article considers issues that relates to creation of attractive and readable external graphic image of page of printed publications. Evaluation of a graphical image of page is one of the important parameters - contrast. The improved software tool and method for estimating the saturation of a text set of printed publications is provided that allow taking into account the color of the substrate (paper). The change of the contrast graphic image of the page is shown when using colored paper.

**Keywords**: a graphic image of the page, print publications, contrast, saturation of text, a method for estimating the saturation of a text of printed publications.

**Yu. D. Toshchakova**
Experiment to determine the region of incomplete mixing of paints in colorful box offset machine

Full-scale experiment is to determine the quasi-solid body, which is formed in a colorful box offset machine due to thixotropic ink. The basis of the experiment is a temperature measurement in a colorful box. There is defined area of flow of paint to the area as a quasi-solid body rotating.

**Keywords**: quasi-solid body, colorful box, mixing paint, printing ink.

**V. R. Vedruchenko, V. V. Krainov, N. V. Zhdanov, M. V. Koksharov, D. K. Kuznetsova**
Choosing utilization scheme of free-piston engines exhaust gases and estimating engines real heat consumption in the structure of cogeneration engine

The importance of using cogeneration engines in a small energetics is shown. The technological, technical and economic advantages are laid down.
The technological analysis is implemented for the most popular utilization schemes of free-piston engines extract gases that gives possible a scheme decision more reasonable.
The procedure for estimating of gas-piston engines exhaust gases in various conditions is shown.

**Keywords**: cogeneration, gas-piston engine, heat, heat supply, utilization, combined power generation.

**A. A. Kuznetsov, A. Yu. Kuzmenko**
The test results of catenary insulators for portable diagnostics device

The article presents the technical means, methods and test results insulators for catenary railway transport. The catenary plot is represented as a line model with distributed parameters. It shows a diagram of the experiment, the shape of diagnosing pulses to determine the possible location of malfunction insulator.

**Keywords**: diagnosis, network of contacts, insulator, rectangular, portable device diagnostics, line with distributed parameters.

**V. L. Yusha, A. A. Gurov, V. K. Vasiliev, A. V. Zinovieva, E. A. Likhobabina**
Assessment of influence of working camera configuration of two-rotor pneumatic unit with nonlinear rotors synchronization on efficiency of its working process

The design procedure of a working process of the double-rotor pneumatic aggregate with nonlinear synchronization of the rotors reflecting structure specificity of clearances and gas distribution windows in the working chamber as well as a structure of flat slotted clearances with hydrodynamic grooves are presented in the paper. According to the results of settlement parametric analyses, the intensity influence of working gas leakage on the efficiency of a working process is defined; the recommendations concerning arrangement of the working chamber are presented.

**Keywords**: pneumatic aggregate, working process, mathematical sample piece, flat clearances, hydrodynamic grooves.

**V. P. Beloglazov, L. V. Beloglazova**
Geometric variations of real installation IVAC

This article provides an analysis of the results of experiments on the selection of geometry for a sample work on an industrial plant. The aim of the article is finding one or another depending on the geometric elements that have great influence to give IVAC high effective efficiency. Upon completion of work is concluded with ready-dependencies and task for further work to improve the installation IVAC.

**Keywords**: ash collection, geometry, modeling, industrial sample, ash.

**V. P. Beloglazov, L. V. Beloglazova**
The effect of temperature on the quality of ash collection in IVAC

The purpose of this article is carrying out numerical simulations to determine the temperature range in which IVAC could maintain the efficiency of 99% and over. For this purpose there has been developed geometric model in SolidWorks and counted the flow behavior in the program ANSYS CFX. The article presents the problem of relevance, the boundary conditions can be seen visually and mathematical boundary conditions. Conclusions are attached at the end of the article as a result of the research.

**Keywords**: inertial vacuum ash collector, fly, speed, high efficiency.

**S. V. Glukhov, A. V. Kovalenko, D. A. Churikov**
An integrated approach to improve energy efficiency of heat supplying enterprises of Omsk region

The article contains rapid method of determining inefficient heat sources and heat supplying systems and decision algorithm for upgrading boiler-houses and heat networks. Also it was suggested to create a database of key indicators of the heating systems. Examples of application of rapid method are followed by the formation of direction of reconstruction for the specific heat sources located in Omsk region

**Keywords**: municipal heat generation system, technical and economical characteristics, heat network, energy saving.

**D. V. Rysev, P. V. Rysev, V. K. Fedorov, D. V. Fedorov, S. N. Shelest, E. E. Shmulenkova, A. I . Zabudsky**
The electromechanical resonance of generator as consequence of determined chaos mode in power systems

The comparison of the determined chaos mode in the power system with the electromechanical resonance mode in the system generator – the compensated power line is carried out. The different power systems mathematic models are considered. The received results allow to specify criteria of dynamic stability of power systems in the conditions of the chaotic modes.

**Keywords**: electromechanical resonance, determined chaos, power system.

**A. V. Ded, S. V. Biryukov, A. V. Parshukova**
On the question of standards for power quality

Stages of development in Russian power quality standardization are considered. A brief comparison of GOST 13109-97 is introduced into the action with GOST 32144-2013.

**Keywords**: power quality, voltage deviation, frequency deviation

**A. V. Ded, A. V. Parshukova**
About quality of electric energy. GOST 32144-2013

There are considered questions of normative documents characterizing standards of quality of electric energy.

**Keywords**: power quality, voltage deviation, frequency deviation.

**N. A. Kovaleva, Yu. M. Denchik, V. V. Anikin**
Sources of harmonic current and voltage in electrotechnical complex for oil production from deep wells

The study is done of sample well #118 of mechanized oil Ermakovsk deposits consisting of a set of ground and underground electrical equipment. On the well source of harmonic components there is node network load (0.4-2) kV SS "Elekton- 05". Oscilloscope for non-sinusoidal currents and voltages is developed for engine measurements using electric power quality analyzer series EAC-823 based on Windows CE. The analysis of the resulting complex data revealed elevates ratios of n-th harmonic components side voltage of 0.4 kV (input) commercial transformer. There is a harmonic composition of current and voltage in the test points.

**Keywords**: electric network, commercial transformer, ratio n-th harmonic component of voltage, non-sinusoidal voltage, measurement system, experiment.

**V. V. Erbes**
Development of algorithm evaluating effectiveness of energy-saving devices and technologies in power networks of railways

In this paper there is developed an algorithm processing and calculating of electricity saving through introduction of energy-saving devices and technologies in power networks of railways. The algorithm includes methods of correlation, dispersion and regression analysis and non-parametric statistical methods.

**Keywords**: energy-saving devices and technologies, influence factor, algorithm, F-test, Cramer-Welch test, Wilcoxon test.

**V. I. Guzhov, S. P. Ilinykh, R. A. Kuznetsov, E. S. Kabak**
Digital holographic interferometry for real-time experimental study of stress-strain state of dynamic objects

Various aspects of digital holographic system for the study of geometric parameters of dynamic objects are considered. The architecture of the system and algorithms for the reconstruction of digital holograms, decode them, allowing efficient use of parallel computing technology GPGPU. This allows measurement of geometrical parameters of objects in real time.

**Keywords**: digital holography, hologram, measurement system.

**Yu. N. Klikushin, V. Yu. Kobenko, S. M. Novikov**
Classification of signals distribution by color scale

The method of classification of signals distributions, based on its transformation to color RGB-vector is offered.

**Keywords**: identification, model, classification, classification tree, distribution, signal, tester, color vector.

**V. A. Maystrenko, D. D. Privalov**
Dynamic error of signals phases difference measurement at exit of bandpass filters in presence of interference

The analysis of a dynamic error of pulse radio signals phases difference measurement at the exit of bandpass filters is carried out. The influence of additive white Gaussian noise, and also an additive interference on the specified error is considered. The results defining interrelation of relation a signal/interference at the exit of the filter and an error of phases difference measurement are obtained.

**Keywords**: phases difference, dynamic error, transients.

**V. S. Budyak**
Improvement of decametric waves radiotechnical complexes electromagnetic situation

This article presents the results of decrease reasons analysis in indicators of electromagnetic compatibility of radio engineering complexes (REC) of decameter waves range (HF) by infrastructure of radio-receiving centers from structure of REC by means of on-line monitoring of helio-, geophysical conditions (GC) of signals propagation on ionospheric radio paths. Two options of sounder realization, providing decrease in intensity of an electromagnetic situation during their direct operation as a part of REC, are considered.

**Keywords**: radiotechnical complex, electromagnetic situation, equivalent one-channel chirpsounder, multichannel sounder.

**D. A. Boreyko**
Research of inductance parameters in the form of a 3D П-shaped spiral with various coefficient of overlapping of turns

Issues of inductance multilayered integrated coils creation are considered. The comparative analysis of inductance designs in the form of a 3D П-shaped spiral with various coefficient of turns overlapping is carried out and the design with a combination of high electric characteristics and the minimum overall dimensions is defined. The area of possible application of this design is specified. The direction for further researches in the designated area is designated.

**Keywords**: integrated elements, multilayered inductance, electromagnetic modeling, reactance factor.

**I. V. Veremeev**
Multiband tunable filter on SAW resonators with bandpass tuning

The review of application possibility of switchable SAW filter bank and tunable filters on SAW resonators in front-end communication systems is presented. New way of development multiband tunable ladder-type SAW filters combining advantages of switchable SAW filters bank and tunable filter with variable capacitors and SAW resonators is presented. There is offered design of the multiband filter allows to switch bandpass in wide range and to tune bandwidth and central frequency.

**Keywords**: tunable filter, multiband, SAW resonator.

**V. N. Zadorozhnyi, A. S. Zavalnyi, O. B. Shiklo**
The simulation expertise of transport project solutions

Problems and methods of performing the simulation exanimation of projects, which are offered to be solutions for transport problems in big cities, have been considered in the article. The examples of the express simulation expertise of the solutions, which were made to correct the traffic situation in Omsk, are given.

**Keywords**: simulation, road network, automated traffic control system.

**V. N. Zadorozhnyi, M. A. Kornach, E. A. Pender, M. I. Ganeeva**
Two-level multi-model approach to problems of optimization of the transport infrastructure of city

There is proposed a multi-level analytical and simulation method to search for the optimal allocation of financial resources allocated to improving the quality of pavement on sections (road) transport network.

**Keywords**: transport networks, parametric optimization, multi-level analytical and simulation modeling.

**V. A. Maystrenko, E. D. Bychkov, V. V. Kladov**
Tasks of designing of protection of a WEB-server from DDoS-attacks system with application of the device of fuzzy logic

Tasks of designing of system of protection of a WEB-server from DDoS-attacks with application of the device of fuzzy logic on the basis of Rules-Based Fuzzy Models/Setems of a conclusion are considered.

**Keywords**: fuzzy logic, a web-server, a script of commands, algorithm of system of protection.

**I. M. Zuga, V. G. Khomchenko**
Normalization of space criteria in optimization of process complex facilities layout targets

Normalization of four-dimensional space of process complexes facilities layout quality criteria is done. Normalizing coefficients to represent criteria hyperspace close to unit hypercube are introduced.

**Keywords**: facilities layout, schemes quality criteria, normalizing coefficients, unit hypercube.

**I. M. Zuga, V. G. Khomchenko**
Normalization of free parameters space at automated optimization synthesis of process complex facilities layout applying local coordinate systems

There is proposed normalized free parameters space applying local coordinate systems to optimize mutual spatial arrangement layouts of process complexes facilities. There are two ways of normalization which ensure the transition to dimensionless (relative) parameters of schematic synthesis.

**Keywords**: facilities layout, optimization synthesis, parameters normalization, local coordinate systems.

**O. N. Demchenko, A. B. Korobova**
The application of the partially order mathematic methods with the automation for the optimization of teenage clothes patternmaking using computer program

The article describes the partially order mathematic method, that will help to optimize of teenage clothes patternmaking process and find the best kit of combinatorial geometric elements; the optimization criterion formulated; the sequence of determination the best result using partially ordered sets worked out.

**Keywords**: partially order mathematic methods, teenage clothes, automation of the patternmaking, combinatorial combinations, basic goods element.

**D. V. Dorkin**
Development of database "System Components garments"

This article discusses way to develop conceptual model of a relational database "System Components garments" containing information about materials, threads and appropriate combinations of compounds used in the manufacture of light industry. This scheme is based on the total information systems of materials and their proven performance in a convenient form for use and allows you to further their refill in conjunction with other software.

**Keywords**: database, multi-component material system, the conceptual data model.

**M. A. Ivashchenko, A. B. Korobova**
Using skeletal animation when designing belt products in automated mode

The article considers the prospects for the use of three-dimensional design, general concepts and principles for virtual fitting belt products in an automated mode.

**Keywords**: computer-aided design, virtual fitting, skeletal animation, color coding.

**PHYSICAL AND MATHEMATICAL SCIENCES**

**V. N. Zadorozhnyi, V. A. Badryzlov**
Research of dynamics of growth of connectivity degree of nodes of the random graphs in models of virtual networks

The models of growing networks, including virtual social networks based on graphs Barabashi-Albert and graphs with the nonlinear rule preferable binding are considered. The processes of growth of connectivity degree of nodes taking into account the moments of entry of these nodes into a network are investigated. The modification of this class of models considers processes of natural and adjustable losses of nodes and links in network is offered.

**Keywords**: growing networks, random graphs, stationary and transient random processes.

**V. N. Tarasov, I. V. Boyarkina, V. V. Degtyar**
Mathematical model of preumatic wheels capacity

The analysis of mathematical models of carrying capacity pneumatic wheels is done. There is revealed its features and practical ability.

**Keywords**: mathematical modeling, pneumatic wheel, stiffness coefficient, protector, frame, deformation.

**V. N. Tarasov, I. V. Boyarkina, V. V. Degtyar**
Physical and mathematical modeling capacity of preumatic wheels

There is performed mathematical modeling of capacity of preumatic wheels based on the method of cutting off contact point from the shell of the tire, the method of physical modeling of preumatic wheels on the experimental stand.

**Keywords**: carrying capacity, shell, contact surface, lifting force, normal deformation.

**M. M. Shevelko, A. N. Peregudov, E. S. Gribkova, A. I. Lutovinov**
The characteristics of bulk and surface acoustic wave propagation under rotation and its use for angular motion sensors

The possibility to create the angular velocity sensors, based on bulk and surface acoustic waves, is researched. The theoretical analysis and experimantal results of rotation influence on acoustic wave propagation into solid-state media are presented. New concepts of angular velocity sensors development are proposed.

**Keywords**: bulk acoustic waves, surface acoustic waves, solid-state media, rotation, rotational velocity sensors.

**CHEMICAL SCIENCES**

**I. A. Kirovskaya, T. L. Bukashkina**
The influence of structure on physical and chemical properties CdSe-CdTe semiconductors of system

Taking into account physical and chemical properties of mother binary compounds (CdSe, CdTe) developed a technique and solid solutions (CdSe)x(CdTe)1-x are synthesized.
The radiographic researches to establish structure and to certify the received solid solutions are executed. Acid-base properties of their surface (pH of an isoelectric state) in comparison with binary connections are investigated.
On the basis of the cumulative analysis of the received results, and also with engaging of literary data the interdependent consistent patterns in change of bulk and surface physical and chemical properties with change of structure of system and among connections analogs are determined. Practical recommendations are made.

**Keywords**: diamond like semiconductors, solid solutions, physical and chemical properties, laws, forecasts, recommendations.

**I. A. Kirovskaya, E. V. Mironova, N. N. Leonteva, V. E. Leonov, A. I. Blesman, D. A. Polonyankin, A. V. Yureva**
Obtaining and physical-chemical studies of new adsorbents on the basis of system CdSe-ZnS

By the developed technique solid solutions of system CdSe-ZnS there are obtained and identified as solid solutions with structure of wurtzitic.
In the result of infrared spectroscopic and electron microscopic studies the chemical composition and structure of the surface components are determined.

On the basis of the research of acid-base properties slightly acidic nature of surface of the components of system exposed to air is detected. Such surface can be the most active with respect to the main gases.

Regularities in the change of acid-base and bulk physical-chemical properties of the components of system CdSe-ZnS depending on the composition, relationship between these regularities and influence of elemental constituents (Se, S) are defined, that it is important for the prediction of new efficient materials of semiconductor technique.

**Keywords**: semiconductor solid solutions, structure, chemical composition, acid-base properties of surface, related laws forecasts.

**A. E. Zemtsov, Ya. Yu. Mordakova, T. F. Sheshko, Yu. M. Serov**
Hair decontamination ways study for further toxicological analysis

According to literature and experimental results on toxicological hair analysis four unique summoned schemes of hair decontamination are suggested. Experimental comparing of those schemes' efficiency are made using spiked model hair samples. Results of research are presented and conclusions are made.

**Keywords**: decontamination, hair, toxicological analysis, GC-MS.

**G. I. Razdyakonova, A. Yu. Vishnevskaya, E. G. Fortuna**
The application of differential potentiometric titration for the determination of functional groups on the surface of carbon black

The acid-base titration are used to reveal the functional composition of oxidized carbon black. Data obtained by selective neutralization of acid groups with $NaOH$, $NaHCO_3$ and $Na_2CO_3$ bases according to the Boehm titration method are shown to agree well with the results of differential potentiometric titration of the carbon black suspensions in a $NaOH$ solution. This indicates that functional groups on the surface of carbon black can be determined by the potentiometric method.

**Keywords**: carbon black, oxidation, functional analysis, differential potentiometry.

**O. A. Fedyaeva**
Carbon monoxide oxidation by water vapor on surface of solid $Cd_XHg_{1-X}Te$ solutions

In work results of research of catalytic properties of the semiconductor materials CdTe and $Cd_XHg_{1-X}Te$ are presented to carbon monoxide oxidation reactions by water vapor. It is shown that presence of water vapor at air-gas mix interferes with formation of $CO_2$ in carbon monoxide oxidation reaction by oxygen. Interaction CO and $H_2O$ followed by education on a surface of CdTe and $Cd_XHg_{1-X}Te$ formiate of complexes and $CO_2$. The limiting stage of process is interaction of the reacting substances in the adsorptive layer. The mechanism of reaction is offered and the kinetic equation is received. The first order of reaction is established. Constants of speed and energy of activation are calculated.

**Keywords**: solid solutions, hydrogenation, mechanism of reaction, kinetic equation, energy of activation.