CONTENTS

SUMMARY. KEYWORDS

Anniversaries

To 100 year anniversary of birthday
Memory pages of A. M. Paliy (1916—2010)

MECHANICAL AND THEORETICAL ENGINEERING

Yu. A. Buryan, D. O. Babichev, M. V. Silkov
Study of the dynamics and evaluation of effectiveness of vibration isolation of suspension with mechanical inertial motion converter

This study refers to the important direction of the applied mechanics — the theory of the vibration isolation of the vibration-active objects. The design is offered and the questions of the math modeling of the perspective structure of the gas spring with the parallel mounted mechanical inertial motion converter. The mathematical model of the suspension, allowing you to select options to reduce the factor of the force transmission to the base of a certain frequency range is obtained.

Keywords: vibration isolation, rubber-cord shell, pneumatic spring, inertial reformer motion.

Yu. A. Buryan, A. A. Ivanov, M. V. Silkov, D. O. Babichev
Hydro- pneumatic isolator with variable mass inside inertial motion converter

Anti-vibration support consisting of a rubber-cord shell filled with liquid and containing hydraulic inertial motion converter, which (anti-vibration support) is connected with a hydropneumatic accumulator through a flexible rubber membrane is presented in this work.
The influence of the discrete change of the reduced mass inside hydraulic inertial motion converter at anti-vibration characteristics of the support is considered. This change allows to perform system configuration to the minimum value of the factor of the force transmission to the base depending on the frequency of disturbance.

Keywords: anti-vibration support, rubber-cord shell, pneumatic spring, hydraulic inertial motion converter.

V. N. Tarasov, I. V. Boyarkina
Analytical solution of differential equation of acceleration and inhibition of working equipment of boom machines with linear the control law the control valve spool

There is performed a study of the dynamics of acceleration and deceleration of the working equipment of boom machines, linear control system, the control valve spool. There are two fluctuations of working equipment: driven motion, described by the differential equation with the right part of free and damped oscillations using a differential equation without the right side.

Keywords: power hydraulic cylinder, directional control valve, acceleration, braking working equipment, linear law the inclusion of the spool.

V. N. Tarasov, I. V. Boyarkina
Justification macroroughnesses linear motion on surface for processing machines with hydraulic attachments

There is completed study of the linear macroproject on the surface of the motion for the formation of vertical impacts from the road on the skeleton of the technological machinery, attachments and hydraulic operating equipment.

Keywords: white road, linear roughness, reduced mass, dynamic pressure, hydraulic power cylinders.

A. G. Koltsov, D. A Blokhin, I. A. Bugai, E. V. Vasilyev, P. V. Nazarov
Calibration of experimental grinding CNC-machine axis using laser interferometer

In the article the question of calibration grinding machine model 3D642E with CNC-system Mach3 using a laser interferometer is determined. It is about the structure and layout of the pilot grinding machine. Positioning accuracy is investigated and identified the main factors affecting the deviation of the actual displacement from the set. Recommendations on the Mach3 system calibration are presented.

Keywords: grinding machine, CNC-machine adjustment, laser interferometer, Mach3.

A. S. Niteiskii, A. V. Rasshchupkin
The use of single-tooth milling cutter during the finishing milling of complex profile thin-walled surfaces of intractable materials workpieces

The article considers advantages of the use of single-tooth carbide milling cutters during the finishing milling of curved surfaces of titanium alloys workpieces. The factors determining the occurrence of the tool vibration during the processing are examined. On the basis of experimental data, the analysis of the parameters of the cutting process, affecting the geometric and qualitative characteristics of the treated surface is performed. A special geometry of the end mill, typical for this type of processing, reduces the vibration in the cutting area is defined and treatment options are given.

Keywords: titanium alloys, roughness, computer numerical control, mill, radial depth, tool life.

V. A. Penner
Technological support assembly of conical threaded connections, couplings and tubing

In the article the analysis of factors influencing the relative lo-position clutch and pump-compressor pipe (PCP) during their Assembly is done. The dependence of the angles of misalignment of the parts with the threaded conical connection from the depths of the input and the offset axis («coupling-tubing») is shown. There is presented patterns to determine the error of basing when installing Sprague required parts in roller bearings.

Keywords: tubing pipe, coupling, errors of the bazi-based.

I. A. Sysuev, E. A. Kobenko, M. F. Fedorchuk, N. N. Kozina
Evaluation of color reproduction in electrophotography

The article deals with the reproduction of color images using the technology of electrophotography (laser and led printers). Criteria of estimation, in particular, the color gamut of printing systems «laser (led) printer—paper» are discussed. The results of the evaluation of six color reproduction printing systems using a variety of technology assessment are presented. The features of reproduction the modern models of laser and led printers.

Keywords: electrophotography, laser printers, print system, color gamut volume of the solid color coverage.

L. A. Shestel, S. S. Volkov, Yu. A. Sayapin, D. A. Kutashov, M. V. Afanaseva
Thermoultrasonic welding protection of polymer film

It is shown that the use of thermoultrasonic welding in the manufacture of the breathing bag insulated respiratory systems — means of individual protection of man, difficult made of polymer films increase the productivity of the process of manufacturing products, reduce their cost to improve the quality of welded joints and, consequently, the product as a whole.

Keyswords: welding thermoultrasonic, respiratory capacity, technology, fluorine-containing film, modified polyethylene, personal protective equipment.

A. M. Bazhenov, V. E. Shcherba, A. V. Grigoriev, A. Yu. Kondyurin, A. M. Paramonov
The analysis of influence of ratio of direct and return streams of liquid in slot-hole sealing of piston hybrid power machine on ratio of pumping pressure in pumping and compressor cavities

In work the influence of ratio of direct and return mass streams of liquid in slot-hole sealing of the piston hybrid power machine on a ratio of pressure of pumping in pumping and compressor cavities at which in slot-hole sealing with guarantee there is a liquid is considered. The method of calculation of pressure of pumping in compressor section with the known pressure of pumping in injection unit is developed. Results of calculations are presented.

Keywords: pump, compressor, hybrid power machine, hydrodiode.

A. M. Bazhenov, V. E. Shcherba, A. V. Grigoriev, A. Yu. Kondyurin, V. N. Blinov
The analysis of influence of eccentricity on ratio of mass streams of liquid in the direct and return directions in piston slot-hole sealing of step type piston hybrid power machine of volume action

In the work the technique of assessment of the influence of eccentricity of the bucket on overall performance of piston slot-hole sealing of

a step look is offered. By the developed technique of assessment the numerical experiment is made and it is shown that the increase in eccentricity of the bucket worsens overall performance of piston slot-hole sealing of a step look.

Keywords: pump, compressor, hybrid power machine, hydrodiode.

A. A. Shvarts, V. V. Bokhan, M. V. Ugrenev, V. A. Gidion, D. A. Romanyuk
A tensoresistive effect of conductive rubber

The paper describes the tensoresistive effect of the electroconductive rubber at large deformations. The manner is using of tensoresistive effect of the electroconductive rubber to measure the stress-strain state of rubber-cord constructions is proposed. The measurement technique for determining the strain gauge factor of the electroconductive rubber is described. The opportunity of measurement transducers based on the electroconductive rubber into rubber-cord constructions is shown.

Keywords: electroconductive rubber, electrical resistance, tensoresistive effect, rubber cord constructions.

I. S. Vavilov, V. V. Kositsin, A. I. Lykyanchik, P. S. Yachmenev, A. S. Vlasov, A. V. Lisakov
On the possibility of ammonia microwave discharge decomposition for corrective truster small spacecraft

The paper shows the method of calculating the gas-dynamic parameters of basic elements tract ammonium propulsion creating micro-thrust small spacecraft. Next, there are obtained flow characteristics used to identify the needs of the electric field of the microwave radiation, the dielectric constant of the medium, the output power. In general, the work is aimed at studying the possibility of using the working medium microwave heating for jet truster.

Keywords: small spacecraft, ammonia, thrust, rate, microwave.

ELECTRICAL ENGINEERING. POWER ENGINEERING

A. V. Bubnov, V. A. Emashov, A. N. Chudinov
Angular velocity error determination by indirect methods generalizing for synchrophase electric drive

The article deals with velocity error determination methods generalizing. Advantages and disadvantages are analyzed. The new method to improve the accuracy is proposed. The new device structure to implement the method is proposed. The device includes phase frequency detector, prescalers, QCO and MCU.

Keywords: angular velocity, phase-locked loop, electric drive.

V. R. Vedruchenko, V. V. Krainov, E. S. Lazarev, P. V. Litvinov
About economy increasing method selection of supercharged diesel working on low loading and idling

The theoretical analyze of calculated and experimental formulas for getting transport diesel turbocompressor characteristics is implemented. The method for selection and solving of main diesel and gas-turbocharger parameters is shown. The methods and tech decisions for economy work of supercharged diesels on low loading and idling are formed.

Keywords: supercharge, engine idling, turbo-supercharger and diesel characteristics, air charge density and pressure, cyclic fuel supply, economy, diesel details heat tensity.

V. K. Fedorov, E. N. Leonov, D. V. Fedorov
The influence of distributed generation to electric power losses and quality

The qualitative analysis of the distributed generation (DG) influence on activity of power grid with large infiltration DG is presented. DG influence on losses of electrical energy and voltage, and also on electric power quality characteristics is considered. The analysis of the indicated problem allows to draw a conclusion that DG influence largely depends on a degree of infiltration DG in a supply net and operational mode of DG.

Keywords: the distributed generation, voltage and power losses, quality of the electric power.

V. T. Cheremisin, A. A. Komyakov, V. I. Ivanchenko
Mathematical modeling the process of electricity consumption for train traction using a support vector machine

The objects of research are acting areas of railways, which use different types of rolling stock: freight trains, passenger trains and electric trains (suburban). In the work it is realized the formation of mathematical models based on statistical data for consumption and specific consumption of electric energy for train traction and on the basis the data of factors influencing these values such as the mass of the train, mean daily temperature, community and technical speed, axle load, time of the surge of passenger trains, down time, volume, recovery etc. The aim of this work is to carry out a comparison of mathematical models of the process of electricity consumption for train traction is obtained by means of application programs and based on such mathematical devices as the support vector machine, multiple regression and artificial neural network. For each object identified the mathematical model with the smallest values of the evaluation indicators better suited for predicting the original sample. As the evaluation indicators adopted mean absolute percentage error, mean square error and coefficient of variation. The result is a comparative table of evaluation parameters of models based on various mathematical methods, including support vector machines. The results obtained allow to justify the beginning of use the mathematical models, based on the considered methods, into the activity of enterprises of railway transport in order to plan the consumption of electric energy on a certain period of time.

Keywords: mathematical modeling, the electric energy, specific consumption of electric energy for train traction, factors, support vector machine, multiple regression, artificial neural networks.

O. A. Lysenko, A. V. Simakov
The research of magnetic system of synchronous machine with permanent magnets for PMSM-drive

The article presents the results of research of the magnetoelectric machine of alternating current of PMSM-drive. Calculation of the analyzed machine is carried out with using the latest version of the complex of programs “Elcut 6.2 Professional". The purpose of operation is creation of adequate geometric model of the object obtaining an overall picture of the magnetic field distribution lines of the machine getting results of dependences of the moment magnetic induction and harmonic analysis of the normal components of the magnetic induction. The results of the selected research method within the error are adequate. Based on the results of research the technique of obtaining a picture of the magnetic field of the synchronous machine and harmonic analysis is developed.

Keywords: permanent magnet, synchronous motor, Elcut, magnetic systems.

A. S. Tatevosyan, A. V. Radchenko
Nonstationary magnetic field research of electromagnet with split poles and polar tips in Elcut program

The article presents nonstationary magnetic field research connecting the winding of the electromagnet (EM) with a split poles and polar tips to the DC voltage source for the purpose of the transition process research in the circuit for a given geometry of the EM magnetic system and physical properties of the used materials, winding data and eddy currents influence in nonlaminated cores. The specific construction features of the EM are associated with their using as suspended electromagnetic separators intended for extraction of ferromagnetic subjects from the bulk materials transported by belt conveyors.
The need of transition process research in the electromagnetic winding circuit is connected with determination of its dynamic characteristics as a complex control object.

Keywords: DC electromagnet, pole gap, polar tips, split poles, nonstationary magnetic field, ponderomotive force.

A. S. Tatevosyan, A. A. Tatevosyan, N. V. Zakharova
Synthesis of the multicircuit equivalent circuit of linear electromagnetic engine with massive anchor on basis of numerical calculation of nonstationary magnetic field in complex of programs Elcut

In the article the decision of a circuit-field problem of calculation of a non-stationary magnetic field in the linear electromagnetic engine with the massive anchor arising owing to transient is given at connection of its winding to a source of a constant pressure at the fixed size of a working clearance changing within the limits of a course of an anchor. Linear electromagnetic engines with a massive anchor are an integral part of the power electromagnetic pulse systems which have received widespread use in many areas of technics where there is an indispensability of generation of power shock loads of the set frequency influencing agencies of technological cars or the processable environment. At calculation of a non-stationary magnetic field in package Elcut 6.0 (the professional version) is considered axial symmetry of magnetic system of the electromagnetic engine, vortical currents in the steel, arising in a massive anchor. The research of transition process in an electric chain of a winding on the basis of numerical calculation of non-stationary magnetic field in an Elcut package is directed to obtaining temporary dependence of current of a winding, allocation from it a free component and decomposition of the fading curve in an exponential row. On operational resistance of a circuit the equations of communication between peak values and factors of attenuation an exhibitor, participating in decomposition of a curve of a current of a

winding are established. On them parameters of a multiplanimetric equivalent circuit of the electromagnetic engine with a massive anchor are defined.

Keywords: the electromagnetic engine, massive anchor, transient, multiplanimetric equivalent circuit, working clearance, course of an anchor.

T. D. Gladkikh
The approach to service management of power grid equipment of oilfield consumers

A method of adjusting of the frequency of maintenance and repair of electrical networks of oilfield customers is offered. The basis of the approach is a qualitative risk assessment. The risk is determined by probabilistic failure and the severity of the consequences. The electrical failure probability is determined on the basis of failures statistical data, technical status and working conditions of electrical equipment, using fuzzy sets theory. The severity of the consequences of electrical equipment failure is associated with undersupply of products (oil, liquids). The suggested approach allows facilitating organizational work of operating service companies in order to reduce or eliminate failures consequences of oilfield consumers' electric networks.

Keywords: risk, technical condition, failure probability, electrical networks of oilfield consume.

L. A. Neyman, N. I. Shchurov, K. A. Obukhov
Mathematical model of dynamics of two-coil synchronous electromagnetic machine shock actions with reversing springs peen

A mathematical model of the dynamics of the electromagnetic shock assembly two-coil synchronous electromagnetic machine with spring reversing the striker, providing opportunities comprehensive analysis of electromechanical processes in the excitation of periodic shock pulse strength and interaction with deformable media is developed. The algorithm of calculation and an example of numerical implementation of the mathematical model of electromagnetic shock assembly containing multimass oscillating system with elastic links and receiving power from the power frequency voltage is presented.

Keywords: impact unit, synchronous electromagnetic machine, mathematical model, mechanical oscillatory system, spring linkages, Lagrange equation of the second kind**.**

E. V. Anoshenkova, I. L. Zakharov, I. E. Pestrikova
Modeling of chaotic processes in nonlinear electronic circuits with multiple generators

Theoretical aspects and experimental data of controlled transition in a nonlinear electronic circuit (NEC) are considered. The proposed methods control the system-forming centre of the transition from chaotic oscillations to constant fluctuations with the help of small perturbations on the nets. The proposed solutions provide an opportunity to balance the saddle cycles embedded in a strange attractor of nets.

Keywords: chain of Chua, chaotic mode, inphase changes, maintenance of chaotic changes.

P. V. Petrov, M. S. Sherstobitov, E. M. Rezanov, V. R. Vedruchenko
The methodology of calculation of effective thermal insulation of external walls of buildings walling during overhaul

The method of calculating the effective thermal insulation of external walls of buildings walling during the overhaul, which takes into account the definition of the optimum thickness of thermal insulation. Scientific development takes into account the regulations on thermal protection of buildings and rationale for economic decisions.
The expediency of application of the proposed methodology to reduce the adjusted cost at major overhaul of buildings is proved.

Keywords: efficiency, cost, thermal energy, heat transfer, building envelope, the optimum thickness.

INSTRUMENT ENGINEERING, METROLOGY AND INFORMATION MEASURING EQUIPMENT AND SYSTEMS

V. I. Glukhov, M. N. Lakeenko, S. N. Dolzhikov
Measuring method of location deviation base surfaces for roller bearings in shields locomotive traction engine

The article presents the accuracy research results of the bearing assemblies for locomotive traction motors to increase their reliability and durability. The objects of research are bearing shields, which are located outside of the ring roller motor bearings. The subject of research is the geometrical specifications relationship of the bearing shield main and auxiliary bases. The results are: the identification of the end shield the coordinate system with a set of main design bases, the introduction perpendicularity tolerance to limit the axis angular deviation and tolerance coaxiality to limit the axis linear displacement of the base hole for the bearing outer ring in two coordinate planes, the development of the reliable methods and measuring means for the normalized deviations location, protected by the patent. The results introduced in the Omsk region train depot for the locomotive electric traction engine repair and may be recommended for use in the design, manufacture, control and operation of all electric motors with two rotor bearing supports.

Keywords: technical products, components, geometrical specifications coordinate systems, real geometrical models.

N. A. Davletkildeev, E. Yu. Mosur, V. V. Bolotov, I. A. Lobov
Improving efficiency of non-covalent immobilization of hemoglobin during the formation of the nanocomposite «hemoglobin/carbon nanotubes»

The efficiency of non-covalent immobilization of hemoglobin (Hb) on the undoped and doped with nitrogen carbon nanotubes (CNTs) are investigated. It is found that the adsorption of Hb on the doped CNTs is significantly increased at pH values below the isoelectric point of the protein. It is shown that nitrogen-doped CNTs adsorb hemoglobin with greater efficiency than the undoped CNTs, due to the presence of additional electrostatic interaction between the protein and the nanotube.

Keywords: hemoglobin, carbon nanotubes, nanocomposite, spectrophotometry, physical adsorption.

I. V. Dulkeyt, S. A. Zavyalov, A. A. Bryksenkov, V. A. Kuzmin
Modern information telecommunication infrastructure in the Arctic Zone of Russian Federation as base of its economical development

In this paper issues of setting modern information telecommunication infrastructure in the Arctic Zone of Russian Federation are considered as one of the priority directions of developing this region.
Taking into account peculiarities of radio waves propagation in the Polar Regions and extremely low and irregular density of population, the need is noted to implement in the Arctic Zone various information telecommunication technologies that use different frequency bands.
Experimental data are presented that prove efficiency of using different frequency bands in the Arctic Zone. The feasibility of developing the multi-zonal hybrid telecommunication system is argued. Such a system can be based on setting local multi-level zones and embarking radio communication both inside and between those in different bands and, therefore, by using different telecommunication systems.

Keywords: information telecommunication system, radio communication, frequency bands, antenna.

A. V. Zubar, E. A. Geyntse, V. P. Pivovarov
The process of automatic correction damping guidance stabilizer actuator arms

The purpose of this research is measurement automation and maintenance of a given level of armament stabilizer parameters, namely, the amount of damping guidance actuators in vertical and horizontal planes. A feature of the process of automatic correction damping is used as a digital video camera angle detector. The structure of the measuring application that implements the methodvand held its experimental verification is given.

Keywords: stabilizer tank weapons; damping, digital video camcorder, measuring the application of angular misalignments.

M. E. Osinkina, G. N. Lobova
A method of checking printed circuit boards dased on SADT-methodology

It is shown that the use SADT-methodology to improve product quality and reduce the time for its elaboration. This article describes a statistical study on two groups of participants in the experiment. One group holds the methodology of structural analysis activities, the second group of activities performes in the traditional way.

Keywords: printed circuit board, SADT-methodology, the correlation method, Spearman's rank correlation coefficient.

P. G. Garms
On-board locomotive complex registration of critical parameters

The analysis of equipment failures of locomotives and the main reasons for their occurrence locomotives operational depot of the Far Eastern Railway is done. There is developed the complex of registration of the critical parameters of the locomotive, in particular the number of revolutions of the rotor of the traction motor. There is analyzed pulse sensor and the transition state defined voltage at which the transition

from off to on-state of the sensor. It is proposed schematic solution prevents false positives.

Keywords: failure of locomotive equipment, on-board system, Schmidt trigger immunity.

R. R. Fakhrutdinov, S. A. Zavyalov, A. V. Kosykh, K. V. Murasov
Analysis of methods for phase adjusting in power amplifier with Cartesian loop

Application of Cartesian loop in the radio transmitting equipment allows us to implement amplifier circuits with linear features. The main problem in creating of these systems is phase shifts due to RF signal delay through the main system components, resulting in reduced of system linearity and increasing of self-excitation probability. The article discusses methods of adjusting the phase in Cartesian loop, allowing increasing distortion suppression.

Keywords: Cartesian loop, power amplifiers, predistortion, phase adjusting, nonlinear distortions.

N. S. Chernysheva, B. P. Ionov, A. B. Ionov
Diagnosis of difficult measuring situation of non-contact temperature measurements

Measuring situation for the case of non-contact temperature measurements is analyzed. The main destabilizing factors causing an error in radiation thermometry are represented and examined. The key principles of constructing of intelligent measuring systems for industrial purposes are discussed. Our research demonstrates the possibility of high quality estimation of the current measurement situation by the calculation of confidence indexes within the intelligent radiation thermometer.
Keywords: temperature, intelligent measurement devices, information redundancy, reliability of information.

INFORMATION TECHNOLOGY

V. N. Zadorozhnyi
Optimization of transition probabilities in networks with queues

The problem of optimizing the transition probabilities in homogeneous Markov networks with queues is reviewed. The possibility of modeling roads with help multichannel systems with load-dependent service rate is studied. Methods to optimize routing matrices in transportation networks are developed. An optimization example is given.

Keywords: queueing networks, simulation, optimization, sensitivity analysis, problem of calculation gradients.

O. S. Logunova, E. A. Ilina, S. N. Popov, Yu. V. Kocherzhinskaya, N. S. Sibileva
Software module for the bibliographic information processing

The paper presents the solution of the design and implementation a software module for the bibliographic information processing. The proposed structure of the program module has allowed us to identify the main procedures and define the structure of connection between them.

Keywords: bibliographic information structure, software module, XML-document, analysis of bibliographic description, synthesis of bibliographic description, bibliographic source, tags.

I. V. Zyuzko, S. P. Shamets
Open international student Internet contest in Omsk State Technical University

The experience of the Open International Student Internet Contest OmSTU since 2009, shows the evolution of active participation of students of different faculties in all disciplines, deals with the application of modern distance learning technologies at different stages of the Olympics and Internet selected as one of the quality assessment tools training students.

Keywords: Open International Student Internet Contest statistics of participants and winners of competitions, evaluation of the quality of training of students.