РЕЗЮМЕ/ABSTRACTS

УДК 621.9.048

Kiselev M. G., Drozdov A. V., Moskalenko A. V., Bogdan P. S. Theoretical Validation of Rational Parameters of the Mode of Wire Tool Electroerosion Machining

A design model is presented enabling to determine the dimensions of a single crater formed as a result of electroerosion machining of the wire tool surface. Practicability of four-sided electroerosion machining is validated which ensures wire tool breaking strength reduction not over than 20 %. Rational parameters of the mode of electroerosion machining are presented (capacity and voltage of a reservoir capacitor, tool electrode vibration frequency, and length feed of a blank).

УДК 629.4.027.2

Pastukhov I. F., Pastukhov M. I. On the Influence of Casting Defects on Fatigue Resistance of Cast Parts

Cyclic load tests of defect-free and defective samples are conducted with the purpose of determining the influence of defects on fatigue resistance of STI 20GFL material. It has been established that defective sample durability is 2.65 times lower and their limit endurance is 15 % lower than those of defect-free ones.

Fatigue resistance tests for full-scale parts of Leszek Wagons (side frames and bolsters) have been also conducted which show that their breakdown occurs first of all along cross-sections with defects coming out on the surfaces of the part or located inside but not farther than 5 mm from the surface. It has been established that casting defects are fatigue crack births and they reduce part durability 2 times as compared with defect-free ones. Surface and pre-surface defects lead to part breakdown in operation in 2–23 years of their service instead of 32 years planned.

УДК 621.9.011:517.962.1

Turomsha V. I., Dovnar S. S., Trouskovskii A. S., Shoumskii I. I. Rigidity Balance for Milling and Boring Machine Stand with Symmetrical Disposition of Spindle Stock

FEA analysis for assembled stand of heavy horizontal milling and boring machine tool with symmetrical spindle stock disposition is conducted. Main modes of static deformation are revealed: stand torsion, stand bending and ram bending. It has been found that the stand is flexible in transversal (X) direction.

Contributions of deformation modes to the spindle total displacement as the function of current machine tool coordinates are found. Mode balance changes the stand rigidity up to 6 times. In the least rigid position (carriage raised, ram put forward) the modes of stand torsion, ram bending and stand bending correlate as 2 : 2 : 1.

Recommendations on deformation mode balance control and rigidity increase are given.

УДК 621.436.004.67

Ivanov V. P., Kastriuk A. P. The Influence of Engine Repair Quality on Engine Durability

The dependence of post-repair operating time on basic geometrical parameters of restored parts and assembly units including these parts is defined. The ways of improving engine repair quality are specified.

УДК 669.025.7:[621.791.3]

Mikhailov M. I., Nikitenko D. V., Kuzemchenko V. A. The Influence of Abrasive-Carrying Filling Material on the Strength of Brass Based Composite Material

Experimental studies of the strength of brass based composite material are summarized.

Size test of various compositions of abrasive-carrying filling material is conducted and the principles of distribution of its parameters are obtained.

The influence of abrasive-carrying filling material on the strength of brass based composite material is studied.

As a result of the studies an optimized composition of composite material is obtained ensuring improving material strength up to two times.

УДК 629.114.2

Popov V. B. The Analysis of Rated Load Capacity of Mounted Lifting Device of Multipurpose Power Unit of the Third Generation

The methods of determining mechanical losses during shifting harvesting machine unitized with UES-290/459 multipurpose power unit from operating to transport position are presented. After the analysis of two-dimensional analogue of a closed kinematic chain including linkage mechanism and mounted machine analytical expressions are obtained for the components of hydraulic cylinder piston rod reduced force of inertia. The analysis of rated load capacity reserve of the mounted lifting device is performed when UES-290/459 multipurpose power unit is unitized with KPR-9 rotary mower-crusher. The developed algorithm of analyzing rated load capacity of the mounted lifting device of multipurpose power unit enables to determine rated load capacity reserve when unitizing UES-290/459 with various harvesting machines. It can also be used in analyzing rated load capacity of "Belarus 2522" wheeled tractor when it is unitized with heavy adapter units.

УДК 538.24

Ostrikov O. M. The Role of the Surface in the Formation of a Stressed State of the Wedge Twin

A dislocation model is developed enabling to design the stressed state of the wedge twin located near the surface. It is shown that the surface does not have significant influence on normal stresses. It has considerable influence on shear stress.

УДК 621.791.75

Poddenezhny E. N., Boiko A. A., Drobyshevskaya N. E., Belyi D. I., Pavlenok A. V. Ceramic Fluoride Sputtering Targets Molded by Semi-Dry Pressing with Vacuum Compaction

Technological stages of the formation of MgF_2 and CaF_2 targets with the use of X-ray phase analysis are studied. Optimization of molding process of plane and disk fluoride sputtering target samples prepared from calcium and magnesium fluorides is provided with the use of semi-dry pressing process followed by blank thermo-treatment at 450–750 °C.

УДК 621.317

Karpov V. A., Kovalev A. V., Rostokina O. M., Karpov A. V. The Analysis of Active Resistive Bridge Circuits with Zero Common-Mode Component in Measuring Diagonal

It is known that there is a great number of measuring circuits for resistive transducers. However it is not always clear what a known bridge circuit is preferable to use from the point of view of the linearity of conversion of electric resistance into electric voltage. In addition resistive transducers can often include not a single but a number of sensitive elements electric resistance of which can vary subject to physical quantity both in-phase and in a differential way.

The paper presents a review and the analysis of the main active bridge measuring circuits with low common-mode component in the measuring diagonal for various types of resistive transducers from the point of view of the linearity of conversion of electric resistance variation into output voltage.

УДК 621.398.628.971

Tilitchenko M. P. Generator of Linear Varying Voltage – Voltage-to-Frequency Converter

The results of theoretical analysis of computational and experimental studies of the generator implemented based on operational amplifier microcircuits for negative and positive input voltages are presented in the paper. Based on the principle of superposition the expressions for rigorous calculation of the parameters of resistor-capacitor elements of the device are obtained and also the expression for voltage-to-frequency conversion $f(U)$. From the analysis of the expression for conversion the expressions are obtained for maximum allowable input voltage $U_{input\,\max}$ at which operating capacity is maintained and it is shown that at $U_{input} = U_{input\,\max}/2$ the device generates symmetrical pulses of maximum frequency. The expressions for calculating this frequency $f_{\max}$ and duration $t_{pulse} = t_{interval}$ are presented through the parameters of the elements of the device.

УДК 621.396

Erofeenko V. T., Komnatny D. V., Lozovskaya E. V. Simulating the Field of Pulsed Electric Discharge Channel in the Presence of a Spherical Screen and a Pin-Type Conductive Rod Using Addition Theorem Method

The calculation of the charge induced on the pin-type rod and spherical screen during the development of pulsed electric charge is conducted. The computation is done by formulation of boundary problem of electrostatic field calculation and its solving by the addition theorem method. For distributing the charge along the pin-type rod an integral equation of the first kind of Pocklington type is derived. It has been solved by the method of self-regularization. Calculation results show that the solution of the equation corresponds to physical considerations about the charge distribution so the solution of the equation is correct. Addition theorem method can find a wide application for solving problems of power engineering and high voltage engineering.

УДК 681.511.4

Tolstenkov A. A., Kozlov A. V., Saveliev V. A. The Synthesis of a Correcting Device by the Use of Improved Multi-Dimensional Time Operator Method

Most of the automatic control systems include nonlinear elements which complicate to a great extent their analysis.

To study and synthesize systems of this type analytical methods are used based on integral Laplace transform, calculus of approximations and engineering methods of synthesis which in a number of cases do not give results of required accuracy. The alternative to them is the application of multi-dimensional integral Laplace transform based on which a multi-dimensional time operator method of analyzing automatic control system is developed.

However when we use the multi-dimensional time operator method to solve the problems of synthesizing and identification of non-linear closed systems the number of independent variables $p_1, p_2, \ldots, p_n$ tends to infinity. That means that the synthesis of the regulators by the multi-dimensional time operator method is not practicable in the systems of this type.

In this work an attempt is made to develop an analytical method of the synthesis of regulators in nonlinear systems based on the existing multi-dimensional time operator method in combination with a dynamic compensation principle and decomposition of nonlinear elements of the system into mathematical series.

The improved multi-dimensional time operator method proposed enables to provide analytical synthesis in closed automatic control systems including nonlinear elements. Furthermore usual for classic theory of automatic control form of record is maintained (transfer functions, block diagrams). The methods have clear structure based on the known mathematical

tool of Voltera series and multi-dimensional Laplace transform while synthesis of regulators itself is within a well defined algorithm.

УДК 621.313.333

Grountovich N. V., Chaus O. V. On Some Methods of Obtaining Information in the Conditions of Uncertainty: Deterministic and Stochastic Aspects

A new approach to uncertainty limitation is proposed used in classification of defects based on stochastic and deterministic methods (method of binary markers, the method of Bayes) and the mechanism of fuzzy sets. In aggregate these methods give a sufficiently exact information picture of actual physical condition of the equipment tested. The performance of the methods is illustrated by case study examples. Using the method of binary markers a defective pump was found. Then the result was confirmed with the help of generalized Hamming distance (the theory of fuzzy sets). Theoretical computation of the prospects of technical system including a number of engines carried out by the Bayes method is in close agreement with the experimental results.

УДК 334.7:330.133

Drozd S. S., Tretyakova E. V. Methodological Aspects of the Enterprise Value Assessing

The development of market relations on the present day stage of economic development requires new approaches to the problem of the state enterprise property management contributing to improving the efficiency of the economy in whole. Methodic approaches to the enterprise value assessing in the period of property re-structurization are considered in the paper. The advantages and disadvantages of each of the approaches are presented. The assessment of RUP “GZLiN” enterprise taken as an example reveals the problem of objectivity and exactness of assessment results provided by free cash flow discounting and economic added value. The ways of practical solution of the problems of property management are proposed in a conceptual form.