MECHANICAL ENGINEERING AND MACHINE BUILDING

TECHNOLOGICAL METHODS OF INCREASING THE DURABILITY AND RESOURCE OF WORKING PARTS OF TILLAGE MACHINES

page 4–7

In this paper we discuss the problem of agricultural engineering is the need to improve the reliability of agricultural machinery based on the use of more efficient technologies both in their manufacture and in the repair industry. The main purpose of research is to study and choice of a method to increase the durability and life of working organs of tillers, taking into account design, technology and material science factors. Analysis of the causes that contribute to the wear rate of the cutting elements working organs of tillers, allows the development process of hardening of details as in their production and recovery. The dynamics of the deterioration of the basic elements of cutting the working bodies of the cultivator wing shares and plowshares. Based on the data developed and put into production technology of hardening of cutting elements working organs of tillers by the vibration deformation. The research results can be used in the manufacture of engineering for hardening of manufactured parts. We have developed a technique using vibration reduction hardening increases the service life and durability of working organs of tillers.

Keywords: resource intensity of wear, recovery method, deformation, vibration hardening.

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ANALYSIS OF IMPACT OF MANUFACTURE TECHNOLOGY ON THE EXPLOITATION PROPERTIES OF POWDER ANTIFRICTION MATERIALS FOR PRINTING MACHINES

page 8–11

The article presents the research results of the effect of technological modes of manufacturing on the functional properties of new antifriction powder materials based on copper with a solid lubricant CaF_2. It was shown that the developed technology for manufacturing of new antifriction materials based on powder metallurgy techniques ensured the formation of a fine-grained heterogeneous structure, which gives the material a high level of tribological properties.

New powder material is much higher than the known cast bronze for antifriction characteristics. Friction films — secondary structures have been researched, they provide a self-lubricating effect.

Micro-X-ray analysis showed the presence in friction films the chemical elements of the new material, counterface and air. It was studied the ratio of chemical elements in the friction films, which ensures the implementation of the self-lubricating effect.

New powder materials based on copper and alloyed by nickel, with additives of solid lubricant — CaF_2 can be successfully used in high-speed friction units of printing machines.

Developed technological modes cause the formation of structure which is capable to ensure a high level of operational properties of sliding bearings, which are used in friction units of printing equipment.

Keywords: powder material, technology, lubricant, antifriction properties, friction film, printing machines.

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DEVELOPMENT OF ALGORITHM TO CALCULATE RATIONAL ROLLING SCHEDULE ON A BLOOMING

page 12–15

Modern blooming is a powerful assembling mill. One of the key factors that determines the performance of blooming is the rolling mode which includes a compression mode and speed modes of the working cage. Though, the greatest impact on performance is done by compression mode.

It has been determined, that calculation of the mode compression can effectively be carried out by one of the key factors, i.e. acceptable capture angle. The resulting preliminary compression mode should be adjusted on the basis of engine's power, rolls durability, the degree of stability in caliber staffs, and according to the necessary final dimensions of the blooming. The new method of calculation as well as the block diagram of rolling on blooming mill is shown in the article.

The algorithm for computing the rational modes of compression during rolling on blooming mill is presented. It is shown, how the method simulates the process of blooming and allows you to choose the scheme based on rolling steel mark, the conditions of capturing and the number of passes. Algorithm calculates the compression mode according to the canting scheme. The block diagram is given, that allows determining the minimum number of passes when rolling on blooming mill.

Keywords: assembling, blooming, strength, flexibility, canting, angle capturing, crimp.

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SELECTION OF LOCATION OF FUEL PRESSURE SENSORS FOR REGISTRATION OF OSCILLATORY PROCESS

page 16–19

Due to the deterioration in the fuel quality, more drivers are turning to service centers for rehabilitation of the fuel system. It is necessary to develop a method of diagnosis of these systems, which allows for a minimum of material costs get the maximum amount of information about the tested system.

It was conducted a study on the selection of pressure sensors and their location on the fuel injection system of the vehicle for the diagnosis of the fuel equipment. It was conducted an experiment using two different types of sensors and two cars with different design of the fuel system. The pressure oscillograms were obtained simultaneously with the recorded signals of nozzle control, current strength at the nozzle and air flow. It was concluded that these sensors may be used to diagnose the gasoline systems with the fuel injection on the valve.

Keywords: sensor, fuel system, nozzle, pressure, oscillogram, pressure oscillation, amplitude.

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DESIGN AND TECHNOLOGICAL OPTIMIZATION OF OVERHEAD TRAVELING CRANES' BOX GIRDERS

page 20–25

The residual stress-strain state of welded joints of cranes' steel structures is understudied scientific and technical issue. Finite-element analysis of the post-weld residual stresses in longitudinal T-joints of overhead cranes' box girders was applied to this study. Goldak's moving heat source model based on double-ellipsoid heat flux distribution was used. Thermal and mechanical tasks were sequentially solved, wherein the phase transformation processes were taken into consideration. The effects of such factors as box girder geometry, welding speed, pre-heating technology on the residual stresses and phase distribution in longitudinal welds were further investigated.

The post-weld stress-strain state of the box girders' T-joints was detailed. The recommendations to streamline the overhead cranes girders' production technology intended to improve their quality and overall technological level were formulated. The necessity of taking into account the phase and structural transformations in the simulation is proved. The requirements for the finite-element modeling of longitudinal T-joints were established.

Keywords: crane, box girder, welding, residual stress, structure.

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GROUNDING OF THE COMBINED UNIT CHART FOR THE PRESOWING CULTIVATION AND SIMULTANEOUS SOWING OF THE ROW CROP CULTURES

page 25–29

This article describes how to combine sowing units with units for presowing cultivation. These units are complex in their design and operation. The fact that power means with two hinged systems hung several agricultural machines, which operate in a single operation. These machines can be used in combination or separately.

Use of combined units increases productivity, reduce costs and increase the engine load of the power means. Theoretical calculations in this article demonstrate the correctness of acquisition and use of such units in the fields of a small area. Also, the calculations show the need for resupply units by other agricultural machines. These machines can be placed on the technological platforms, which are available on the tractor. However, it must put the tires of a different size on units with a width of 8.1 meters. This leads to increase in the cost of field operations. Calculations show that with increasing width of the unit and the process speed it is reduced time for fieldwork.

Keywords: symmetrical combined sowing unit, depth of seeding, cultivator, beet planter.

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ENERGY, ENERGY-SAVING TECHNOLOGIES AND EQUIPMENT

NUCLEATION OF PORES AND THEIR INFLUENCE ON MATERIAL PROPERTIES

page 30–35

The pore formation is investigated and the theories of porosity are analyzed. It is proposed classification of the pore genesis, namely the separation on the diffusion genesis of and the destruction genesis. By diffusion genesis it is covered the pore formation at formation of gases in the material due to chemical reactions, to the difference of gas saturation limits of matter in different states of aggregation, to the transition to the gaseous state of one of the components of the original mixture. By destruction genesis — the pore formation by thermal degradation due to deformation of the body, and also due to the effects of radiation, followed by the collapse of the chemical bonds. The author gives a detailed account of each type of pore genesis.

These theoretical studies have established analytical dependence of the rate of pore formation and growth rate of diffusion for pore genesis. These relations allow determining the number of pores and volume at any time for the materials in which pore formation is occurred.

Keywords: pores, pore genesis, porous system, diffusion genesis, the genesis of degradation rate of pore formation.

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THE DEFINITION OF THE BASE (WHOLESALE) ELECTRICITY PRICES FOR INDUSTRIAL CONSUMERS

page 35–39

Based on the physics of normal operation power, the paper proposed a new science-based approach to determining the price of electricity for industrial and equated to them customers, in which voltage electric networks is seen as a potential form of electricity and network with nominal voltage 110 kV serve as counter energy market of Ukraine.

Given that pricing in the electricity system is the basic calculation system, which determines its functioning economy, it is proposed the vote at two levels: the base (wholesale) and retail.

The principles for determining the base (wholesale) prices for electricity, which take into account the physics of power transmission based on the properties of concept consumer connection to system

networks with a voltage of 110 kV are considered and the approach to the development of methods for determining the retail price of electricity is outlined.

Keywords: electricity, electricity supply, active power, reactive power, full power, wholesale price of electricity.

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STATE ESTIMATION OF ENERGY SAVING ON PRIMARY OIL REFINING MACHINES

page 39–43

The generalized description of the primary oil refining process at the electric desalting machine is made. The basic shortcomings of modern domestic thermal power plants in the primary oil refining are shown. Identification of the main places and causes of inefficient use of primary energy resources helps identify energy saving potential in manufacturing. It is determined that the economic effect tends to increase in the event of changes in the structure of heat exchange equipment, especially through the use of compressors in a closed technological cycle of heat recovery. Using recuperative heat exchange at the facility of primary oil processing makes it possible to solve the feasibility problem of saving primary energy resources. Reducing pressure temperature value between hot and cold process lines of primary oil refining machine to 20 % causes an increase in economic benefits by nearly 10 %. Modernization of existing schemes of primary oil processing machines can increase a depth of processing and energy saving potential in manufacturing.

Keywords: primary oil processing machine, economic impact, recuperative heat exchange.

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ELECTRICAL ENGINEERING AND INDUSTRIAL ELECTRONICS

THE DEVELOPMENT EXPERIENCE OF THE LABORATORY STAND FOR COMPARATIVE ANALYSIS OF THE SOURCES ENERGY EFFICIENCY OF THE ARTIFICIAL LIGHTING

page 44–47

In order to increase the level of knowledge in the field of energy efficient systems and technologies at the Department of Electromechanics SHEI «Kryvyi Rih National University» the laboratory «Energy efficient devices and technologies in electromechanics» was put into operation.

One of the developed stands presented in a laboratory is designed for analysis of the artificial light sources characteristics. The stand consists of two identical modules for analyzing of the lamp characteristics and the control module, which is designed to control and reference modes of the lamps and electrical parameters measurements of the light sources. It is offered a rather simple method of the ratio calculating of luminous efficiency, based on the measured values averaging of illumination at points located on the arc of the constant radius. The realization of the researches does not require any expensive equipment.

Currently, four laboratory works are executed on the stand: definition and comparison of the luminous efficiency ratio of the lamps of general and industrial purpose; compensation of the reactive power, which is consumed by the gas-discharge lamps with the induction ballast; definition and analysis of the ripple factor of the

lamps luminous flux; identification and analysis of the luminous efficiency ratio changes of the incandescent lamps by the reducing power supply voltage.

Conducted research has shown a sufficient degree of coincidence of the obtained results with the averaged Internet values.

The stand implies the possibility of further upgrading and increasing the number of performed laboratory works.

Keywords: laboratory stand, artificial light lamps, luminous efficiency ratio, luminous flux ripple factor.

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INVESTIGATION OF THE TIME STRUCTURE OF OUTPUT CURRENT OF ACSC SYSTEM SIGNAL TRANSMISSION CHANNEL

page 47–56

The signal transmission channel is important component of systems of automatic cab signaling of continuous type (ACSC). The existing systems of ACSC have insufficiently high flow capacity and reliability of transmission of messages. Research of shunt current as carrier of alarm information allows establishing the reasons of decrease in reliability. In the existing works mathematical models of this current are constructed on the basis of number of the simplifying assumptions that limits their value for the solution of practical tasks. Objective of this research is creation of the specified model of shunt current considering its movement. The signal transmission channel is presented in the form of consecutive RL chain with variable parameters. The case of the shunt movement with constant speed is considered. It is shown that current satisfies to the linear uniform differential equation with variables in time in coefficients. The solution of this equation representing required model of current of the moving shunt is found. The model provides possibility of the correct analysis of influence of signal impulse front form on reliability of ACSC signal reception.

Keywords: automatic cab signaling, rail line, shunt, signal impulse, parametrical chain.

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DEVELOPMENT OF CONTROL MEANS OF GEOMETRICAL PARAMETERS OF SMALL-SIZE OBJECTS WITH COMPLEX SHAPE

page 51–55

At the present stage of development of science and technology it is made manufacturing high-precision and small-sized parts. Great emphasis in the manufacture of parts is attended to monitoring their parameters. But there is a problem of the geometric parameters of objects of small-sized parts with complex shape, as a feature of its images is large blur and low contrast due to the inability to complete fixing and guidance of acuity.

In this paper, it is proposed the method of visualization and control of geometric parameters of small-sized objects with complex shape, the advantage of which is the recalculation of dimensions of the object for its sub-pixel coordinates in the blurred image.

Also it is proposed a mean of controlling the geometrical parameters of small-sized objects with complex shape, which is based on the proposed method, the feature of which is the probe introduction in the measuring zone with known dimensions, to determine the ratio for conversion of coordinates.

Keywords: sub-pixel coordinates, small-sized objects with complex shape, controlling the geometrical parameters.

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